RETRACTION STIGMA COMMUNICATION VIA RETRACTION NOTICES: A CORPUS-BASED MULTIFACTORIAL INVESTIGATION

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CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

XU SHAOXIONG

ABSTRACT

Retraction is devised to remove from the scientific literature publications that have violated research and publication norms, and it operates mainly through publishing retraction notices. Consequently, retraction notices have become a high-stakes academic genre and are usually perceived to reflect negatively on authors of retracted publications. Such negative perceptions constitute retraction stigma, a discrediting evaluation of the professional competence and academic ethics of (individual and institutional) entities liable for retraction. However, there are increasing calls to forge a de-stigmatizing environment for more effective and efficient literature correction. Despite the widespread perceptions of retraction stigma and the calls for de-stigmatizing retraction in the scientific community, no empirical research has systematically investigated how retraction stigma is communicated via retraction notices.

In response, drawing on a corpus of 3,296 retraction notices, this study examined how retraction stigma is communicated rhetorically and linguistically to (de-)stigmatize authors of retracted publications. Specifically, retraction stigma communication via retraction notices was explored in four dimensions, namely rhetorical strategies for constructing retraction stigma, rhetorical strategies for managing retraction stigma, grammatical assignment of responsibility for retraction, and explicit attitudinal evaluation of retraction. Given the context-specific nature of stigma as a social phenomenon, this study also investigated whether retraction stigma communication is influenced by four contextual factors, namely retraction period (i.e., before 2010 vs. 2010–2019), academic discipline (i.e., hard disciplines vs. soft disciplines), retraction notice authorship (i.e., authors of retracted publications vs. journal authorities), and retraction reason (i.e., blatant misconduct vs. inappropriate conduct vs. questionable conduct vs. honest error).

Qualitative analyses of the corpus identified four categories of retraction stigma construction strategies (i.e., creating marks, making labels, assigning responsibility, and exposing peril), four categories of retraction stigma management strategies (i.e., concealing stigma visibility, refraining from labelling, manipulating responsibility assignment, and offering correction and remediation), three agent-identifying grammatical means (i.e., agent + active voice, passive voice + agent, and nominalization with an agent marker) and four agent-obscuring ones (i.e., passive agentless construction, active agentless ergative construction, active voice with an inanimate subject, and nominalization without an agent marker), and various evaluative resources inscribing different types of attitude (i.e., Affect, Judgement, and Appreciation) positively and negatively. These findings indicated a purposeful orchestration of various rhetorical strategies and linguistic resources in retraction notices to stigmatize or destigmatize authors of retracted publications to achieve intended communicative purposes.

Quantitative analyses of the retraction notices revealed that all the four contextual factors influenced retraction stigma communication. The retraction notices published before 2010 were more likely than those published between 2010 and 2019 to construct retraction stigma by creating marks and making labels, to manage retraction stigma by concealing stigma visibility, to identify agents of retraction-engendering acts, and to assign agency/responsibility more explicitly. The retraction notices in hard disciplines were more likely than those in soft disciplines to construct retraction stigma by assigning responsibility, to manage retraction stigma by manipulating responsibility assignment, and to communicate positive Affect. Authors of retracted publications were more likely than journal authorities to construct retraction stigma by assigning responsibility and exposing peril, to manage retraction stigma by offering correction and remediation, to identify agents of retraction-engendering acts, and to assign agency/responsibility more rigorously. Compared with blatant misconduct, inappropriate conduct or questionable conduct, honest error significantly predicted retraction stigma management through assigning responsibility and offering correction and remediation, communication of positive Affect and negative Appreciation, and identification of agents of retraction-engendering acts.

Taken together, the research findings of this study can advance our understanding of retraction as an ethical phenomenon and of retraction notices as a high-stakes academic genre. More importantly, they provide the scientific community with valuable implications for handling retraction properly and effectively. In particular, those who may need to issue retraction notices can be well-informed by the research findings in their production of retraction notices to better fulfil their prioritized communicative purposes.

PUBLICATIONS ARISING FROM THE THESIS

Part of the content of this thesis has been published in three research articles, and one manuscript derived from the thesis is under review.

Xu, S. B. & Hu, G. (under review). Construction and management of retraction stigma in retraction notices: An authorship-based investigation. *Current Psychology*.

Xu, S. B. & Hu, G. (in press). Retraction stigma and its communication through retraction notices. *Minerva*. https://doi.org/10.1007/s11024-022-09465-w

Xu, S. B. & Hu, G. (in press). A cross-disciplinary and severity-based analysis of reasons for retraction. *Accountability in Research*. https://doi.org/10.1080/08989621.2021.1952870

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ACKNOWLEDGEMENTS

The completion of this thesis is not only wrapping up my three-year PhD program at The Hong Kong Polytechnic University (PolyU) but also bidding farewell to the formal academic training that I started receiving at Nanyang Technological University (NTU) in 2015. Looking back at my academic adventure over the past seven years, I am now determined to make an unconventional but easy decision on how to write this piece of acknowledgements. That is, my acknowledgements should focus on Prof. Hu Guangwei, supervisor of my MA dissertation at NTU and PhD thesis at PolyU, and I would like to extend my gratitude to many other people (teachers, colleagues, and friends) on other occasions and in different manners. My decision to exclusively highlight Prof. Hu is justified by his all-positive influence on me at the academic level and throughout my two graduate research projects.

To the best of my knowledge, I am very likely the first and only person (by now) in the world who has investigated retraction for both of his MA and PhD research projects. Such world-class uniqueness I take pride in is like a windfall. In late November 2016, I approached and requested Prof. Hu to supervise the capstone research project of my MA program at NTU. Prof. Hu readily accepted my request but disapproved of my research proposal due to its questionable feasibility. Alternatively, he introduced to me "retraction" as a promising research topic. However, utterly ignorant of what the word *retraction* literally means, I tried to hide my increasing nervousness while listening to his introduction to the research topic. Probably without noticing my disguised awkwardness, Prof. Hu turned to his office computer and showed me the Retraction Watch website, through which I came to learn what retraction is about. By displaying interest in retraction as an unexplored research topic in the field of applied linguistics, I survived my first meeting with Prof. Hu as his MA supervisee. In January 2017, I started my research project on retraction, feeling like an untrained solider being deployed into a battlefield full of alien enemies. However, through an eight-month collaboration with Prof. Hu, my MA thesis on a move analysis of retraction notices as a high-stakes academic genre was successfully completed, which was then turned into two research articles in SSCI and ESCI journals and a book chapter published with Routledge.

The success of my MA research project made three things crystal clear to me. First, retraction notices as a high-stakes academic genre are like a rich gold mine worthy of further exploration. Second, doing academic research is interesting, and I should go for a doctoral degree to seek an academic career. Third, Prof. Hu was interested, as much as I was, in further investigating the phenomenon of retraction. These three perceptions led to my determination to follow Prof. Hu from NTU to PolyU for a PhD program.

In August 2019, a second stage of my retraction research commenced in the Department of English and Communication at PolyU, which has proven more rewarding than the previous one at NTU. Part of the data from my doctoral research project has been published in two SCIE and one SSCI journals and is under review by another SSCI journal. Proudly, one of the three publications is a theoretical piece which conceptualizes retraction stigma and develops retraction stigma communication into a theoretical construct. Informed by the theoretical framework of retraction stigma communication, my doctoral research investigated what rhetorical strategies and linguistic resources are employed in retraction notices to communicate retraction stigma and whether the use of them is influenced by four contextual factors (e.g., retraction period, academic discipline, retraction notice authorship, and retraction reason). Honestly, my belief and confidence in the novelty and significance of my doctoral research freed me from the "publish or perish" pressure and thus empowered me to prioritize research quality over publication counts. Prof. Hu is the source of my publication pressure-eliminating belief and confidence. Upon my completion of all the courses required for the PhD program in June 2020, it was time to work out a research design for my doctoral study. In Prof. Hu's office after lunch on a scorching summer weekday, we discussed in what direction my doctoral research should take. Brilliantly, by sharing with me the controversial stigma debate on EAL writers between John Flowerdew and Christine Casanave, Prof. Hu suggested exploring the stigmatizing nature of retraction notices, which I readily agreed to. Three months later, I came up with a thorough literature review of stigma research, which informed my subsequent conceptualization of retraction stigma. Another four months later, my confirmation report crystalized what to probe into about retraction stigma communication via retraction notices.

Prof. Hu adopted a "hands-off-and-step-in" approach to supervising and mentoring me. Prof. Hu's "hands-off" displayed his absolute trust in my capacity and determination to handle critical technical problems. More importantly, it created golden opportunities for me to explore independently, which boosted my sense of self-realization in cases of successful self-exploration. Prof. Hu stepped in to my rescue at every crucial moment by pointing out the best direction for me to move on in. For example, he suggested investigating the stigmatizing nature of retraction notices and reversed my reluctance to examine attitudinal evaluation of retraction. His "step-in" was always timely and tended to all the problems that remained unsolved after my self-exploration, big and small, usually in one go. For instance, he not only provided critical constructive feedback on the theoretical and analytical frameworks I developed for retraction stigma communication via retraction notices but also even corrected all the writing mechanics in my draft manuscripts for publication. Thanks to Prof. Hu's responsiveness, resourcefulness,

and reliability, I enjoyed high-level learner autonomy, as well as a strong sense of security and achievement, throughout my academic training under his supervision.

Being a research student without receiving proper teacher feedback is like running a marathon in the dark. Fortunately, I'm blessed to have Prof. Hu, an expert feedback giver. Prof. Hu's feedback focused on linguistic effectiveness and efficiency, appropriateness of rhetorical strategies, and scientific robustness, which has transformed my academic writing. His feedback was always issue-oriented, problem-solving, and thus stress-relieving. Prof. Hu habitually impersonalized his feedback, making his rarely personalized (positive) feedback more encouraging. Over the years, there have been countable instances of his personalized attitudinal evaluation of my work. In his feedback on the first draft of my doctoral confirmation report, Prof. Hu used the word *interesting* to describe my classification of stakeholders and targets of retraction stigma but reminded me to cite the source from which he assumed I had developed the classification. I was excited to see his positive personalized evaluation of my creation, so much so that I doubted that he may have used the word *interesting* negatively like many other scholars do. It was then confirmed with him that his *interesting* was used in a positive sense. Feedback from Prof. Hu usually came like a rain storm. However, I was not always able to fully absorb it immediately, and it usually took me time, longer or shorter, to internalize his feedback and transform it into visible improvement. Mysteriously, Prof. Hu never exhausted his patience in repeatedly providing feedback on my recurring mistakes, making me feel guilty for being a slow learner. Prof. Hu's infinite patience made him not only a perfect supervisor who provides excellent feedback but also a great mentor who educates with abiding faith in my growth.

My gratitude to Prof. Hu for his all-positive influence on me cannot be fully expressed without a deep reflection on my struggle for an academic career. Since my MA research project in 2017, I have been researching retraction and publishing internationally in the English language, which I started learning as a foreign language at the age of thirteen in the exam-oriented educational system in the mainland of China. Shortly before the completion of my MA research project at NTU, I revealed to Prof. Hu that I had elected to do an MA mainly to improve my English. In recognition of my potential in academic writing, Prof. Hu encouraged me to aim higher. This unexpected feedback was life-changing as it rekindled my broken dream of an academic career. I dreamed about obtaining an MA degree at Beijing Film Academy and becoming a scholar in film studies throughout my four years as an undergraduate and another four as an EFL teacher at Huanggang Normal University (HNU). Unfortunately, I failed successively three times in the National Postgraduate Entrance Examination, and my academic dream was shattered in 2009 when I lost my teaching position due to lack of a higher academic

degree and scientific research output at HNU. To survive materially, I accepted HNU's coercive employment replacement (in name but demotion in effect) and started working as an administrative staff for the subsequent six years. Thanks to a chain of unexpected happenings at HNU, I was offered a windfall-like opportunity to move to Singapore in July 2015 for the Postgraduate Diploma for English Language Teaching program and then an MA program in Applied Linguistics at NTU, where I met Prof. Hu.

Shortly before my departure for Singapore in 2015, my engagement with a lady was terminated painfully mainly due to my inability to achieve a work-life balance and my poor financial condition. Given my aborted engagement, shattered academic dream, and demoted employment, I defined myself as a complete loser for the first 35 years of my life. In response, I have been working super hard and with extraordinary determination to write a brand-new chapter of my life since my postgraduate studies at NTU. Apart from rewarding me with a strong-sense of self-realization, my retraction research has led me to conclude that it was unfair for me to suffer both financially and mentally due to my academic incompetence at HNU. I was academically incompetent but clean, but some people at HNU secured their jobs and seized promotions unethically. During the pilot data collection for my doctoral research project, I was stunned to find out that HNU had contributed sixteen retractions involving people with different academic titles (e.g., full professor, associate professor, and lecturer) and administrative ranks (e.g., vice president of the university, department director, and office clerk). Academic hypocrites and abusers of the academic publishing industry at HNU, including but not limited to those retraction contributors, shamelessly took advantage of the university KPI system which ruthlessly and cunningly exploited, penalized, humiliated, and labelled me as a loser.

During my classification and analysis of the retraction notices collected for my doctoral project, I was shocked from time to time by my encounter with retraction notices spotlighting some Chinese researchers' ridiculous retraction-engendering misbehaviors. My shock was then escalated into trauma by the finding that China is now the world champion far ahead of other countries in the absolute number of retractions. During a talk with Prof. Hu, I revealed to him my traumatization, and he kindly cheered me up by emphasizing that I was doing the right thing to research the phenomenon of retraction. To be honest, the deep-rooted and hidden motivation for me doing the right thing has been to seek inner peace through upholding the spirituality of my research work. My increasing collection of academic achievements and research publications is an enlarging inventory of spiritual weaponry targeting my unbearable past failure in life and work. Finally, I can now stay at peace with the bitter memories of my past academic incompetence especially when every new publication of mine breaks the record

of WoS-indexed publications in English I kept within the School of Foreign Studies at HNU. Without the opportunity to receive formal academic training and conduct research on retraction, I would have not been able to see the value of my life.

I am grateful to Prof. Hu for making it possible for me to let go of the dark past and start a new chapter in my life. Thanks to Prof. Hu's trust in my academic potential and his endorsement of my character, the Department of English and Communication made an exceptional decision to admit me to the current PhD program at PolyU. The best way to reciprocate all that Prof. Hu has done for me is to keep doing the right thing and become a real scholar. To be a real scholar requires many good qualities, such as disinterestedness, enthusiasm, diligence, and resilience. Most importantly of all, a real scholar values the spirituality of scientific endeavors and prioritizes it over material rewards of academic achievements. Unfortunately, the worldwide academic environment is being polluted with materialism and cut-throat competition, which leads to pervasive research and publication misbehaviors. However, as once a victim of the contaminated academic environment at HNU, I am blessed to have been inspired by Prof. Hu as a role-model scholar. Prof. Hu is a leading scholar in the research areas of ESP and EAP, as indicated by his Google Scholar citation counts. Furthermore, he remained dedicated to teaching, supervision, and administrative services throughout his 19-year employment at NTU. Mysteriously, his outstanding achievements and contributions were not duly recognized with conferment of full professorship at NTU. Together with many of his students, I feel indignant at the injustice inflicted on him. However, Prof. Hu's spirituality is so admirably powerful that I have never heard him mention the injustice or speak of NTU negatively. I wish that my spirituality was up to Prof. Hu's level and had refrained me from lamenting my adverse experiences at HNU.

There is no perfect academic environment, but it is always wise for scholars, especially research students like me who are now in their early forties, to strive for a better environment to work in and look for better people to work with. Retraction as a research topic is an under-exploited rich gold mine, and retraction notices as a high-stakes academic genre can be and should be further researched to advance the scientific community's understanding of the phenomenon of retraction. Despite my strong determination to pursue an academic career and high aspiration to become a real scholar, I have no confidence in how far I will be able to go in that direction. However, to reciprocate Prof. Hu's academic nurture of me, I promise to keep working with him on retraction until his retirement in whatever way possible if he also wants to continue our collaboration. If my promise is fulfilled, the stories about Prof. Hu and me as a decade-long (i.e., 2017–2027) duo of retraction studies that I have shared above would be read by supervisors and supervisees with pleasure and admiration in the future. Now, let me

conclude this extraordinary piece of Acknowledgements by repeating my sincere gratitude once again and expressing my best wishes.

> *Dear Prof. Hu, THANK YOU for empowering me to try a new direction in my life and explore a desirable possibility for my life. May you lead a long and healthy life full of joy, continuously make significant contributions to the field of applied linguistics, and keep nurturing scholars of younger generations selflessly for the field.*

PS: The writing of the Acknowledgements started in Amstelveen, the Netherlands in late July 2022, shortly before the completion of my three-month Attachment Program sponsored by PolyU and jointly hosted by Vrije Universiteit Amsterdam and Amsterdam University Medical Centers. The Acknowledgements was completed on 9 August 2022 when I remained physically confined to a Community Isolation Facility (quarantine hotel room) designated by the Hong Kong SAR government exclusively for people with a confirmed case of COVID-19.

TABLE OF CONTENTS

LIST OF ACRONYMS

A&HCI: Arts & Humanities Citation Index

AI: agent identification

ARP: author of retracted publication

ARS: agency/responsibility score

BM: blatant misconduct

COPE: Committee on Publication Ethics

DOI: Digital Object Identifier

EoC: expression of concern

HD: hard discipline

HE: honest error

IC: inappropriate conduct

IRB: Institutional Review Board

JA: journal authority

NLM: National Library of Medicine

OA: open access

ORI: Office of Research Integrity

QC: questionable conduct

REA: retraction-engendering act

RN: retraction notice

RP1: 1st retraction period (i.e., before 2010)

RP2: 2nd retraction period (i.e., between 2010 and 2019)

RWDB: Retraction Watch Database

SCIE: Science Citation Index – Expanded

SD: soft discipline

SSCI: Social Sciences Citation Index

UC: uncategorizable conduct

WoS: Web of Science

Note. The acronyms listed above are used in this thesis only when use of their corresponding full expressions may impair the flow of the text or affect the layout of tables. On other occasions, their full expressions are used to facilitate reading by reducing the amount of working memory needed for unpacking the acronyms.

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: INTRODUCTION

This introductory chapter aims to provide the research background for the present study. It starts with a brief introduction to the dark side of the current academic journal publishing system, namely the salient characteristics of the academic journal publishing industry, competition in academic journal publishing, pre-publication peer review as a flawed gatekeeping mechanism against publishing bad science, ethical violation in research and publishing, and the efforts made to ensure the integrity of the academic literature. The chapter then zooms in on the phenomenon of retraction as a post-publication mechanism which is intended to correct the literature and ensure its integrity. In particular, the stigmatizing nature of retraction is highlighted as a potential obstacle to effective handling of retraction. The chapter concludes by introducing retraction stigma communication via retraction notices as the research problem of the study and highlighting the significance of the study.

1.1 The Dark Side of Academic Journal Publishing

The recorded history of academic journal publishing started with the almost-concurrent debut of the French *Journal des sçavans* and the English *Philosophical Transactions of the Royal Society* in 1665 (Larivière et al., 2015; Mudrak, n.d.). Academic journal publishing produces and disseminates academic literature, which plays a vital role in advancing the development of science. However, in the era of digitalisation and commercialisation of academic publishing, the system of academic journal publishing is not flawless, and its dark side is being unveiled in various respects, which triggers increasing concerns and discussions within the academic community.

1.1.1 Academic journal publishing as an industry

Academic publishing plays three different roles: “as a means of disseminating validated knowledge, as a form of symbolic capital for academic career progression, and as a profitable business enterprise” (Fyfe et al., 2017, p. 2). Academic publishing has become an industry (Fyfe et al., 2017), and a significant part of it is journal publishing. According to Zuckerman and Merton (1971) and Mabe (2012), academic journals serve four major functions, namely registration (“third-party establishment by date-stamping of the author’s precedence and ownership of an idea”), dissemination (“communicating the findings to its intended audience usually via the brand identity of the journal”), certification (“ensuring quality control through peer review and rewarding authors”), and archival record (“preserving a fixed version of the paper for future reference and citation”) (as cited in Johnson et al., 2018, p. 14). In addition, they serve a fifth function, which is navigation (“providing filters and signposts to relevant

work amid the huge volume of published material [and increasingly to related material, such as datasets]") (Johnson et al., 2018, p. 14).

The academic journal publishing industry has three salient characteristics. First, it has enormously expanded since the 1990s, in terms of the numbers of academic journals, publications, and publishers. According to the SCImago database, the past two decades saw a constant annual increase in the number of academic journals worldwide (from 15,939 in 2001 to 26,200 in 2019) and those indexed in the Web of Science (WoS, from 10,036 in 2001 to 17,884 in 2019). As indicated in the fifth STM report [1] (Johnson et al., 2018), Ulrich's Web Directory listed 42,491 active scholarly peer-reviewed academic journals as of August 2018, and 33,119 of them were English-language ones; the annual growth rate of active, peer-reviewed English-language academic journals increased from 3% to 6% between 2000 and 2013. The WoS Core Collection indexed about 1.5 million articles annually (Ware & Mabe, 2015) and about 70 million articles in total as of June 2018 (Johnson et al., 2018). Approximately 1.64 million documents (including journal articles, books, and grey literature) published between 2011 and 2019 were estimated to be indexed by Google Scholar, an increase of over 46.4% from the estimate of 1.12 million between 2001 and 2010. The global academic publishing industry was estimated to comprise 5,000–10,000 journal publishers in 2015 (Ware & Mabe, 2015), whereas the estimate was increased to approximately 10,000 in 2018 (Johnson et al., 2018).

A second salient characteristic of the academic journal publishing industry is its commercialisation and monopoly. Traditionally, academic publishing was for scholarship rather than for profit and sponsored by the generosity of various patrons (i.e., royal or aristocratic patrons, government departments, learned societies, and university presses) until the end of the Second World War, when the trend of commercialisation started (Fyfe et al., 2017). Academic journals and publications are now produced by four groups of entities, namely commercial publishers, learned societies, university presses, and academic libraries (Johnson et al., 2018). While the majority of the last three groups of academic publishers are not-for-profit (Johnson et al., 2018), commercial publishers take a lion's share of the academic publishing market. The ten largest publishers owned 12,842 journals in 2015 (Ware & Mabe, 2015), accounting for 45.6% of the whole market; the number increased to approximately 13,130 in 2018, about 94% of which were owned by eight for-profit publishers (i.e., Elsevier, Wiley, Springer, Taylor & Francis, SAGE, Wolters Kluwer, Hindawi, and Emerald) (Johnson

[1] It was issued by the International Association of Scientific, Technical & Medical Publishers (STM) (https://www.stm-assoc.or).

et al., 2018). Five giant commercial publishers (i.e., Elsevier, Wiley, Springer, Taylor & Francis, and SAGE) produced more than half of all the academic publications in 2013 (Larivière et al., 2015).

Commercial academic publishers tend to secure incredibly high profits from their publishing businesses (Beverungen et al., 2012). For instance, the profit margin of Elsevier, Wiley, SAGE, Emerald, and Informa ranges from 18.6% to 41.1% (Harvie et al., 2012). The huge commercial success of academic publishers is a direct result of their exploitation of academia, which is publicly denunciated by Barok et al. (2015) in a collective open letter:

> Consider Elsevier, the largest scholarly publisher, whose 37% profit margin[1] stands in sharp contrast to the rising fees, expanding student loan debt and poverty-level wages for adjunct faculty. Elsevier owns some of the largest databases of academic material, which are licensed at prices so scandalously high that even Harvard, the richest university of the global north, has complained that it cannot afford them any longer. Robert Darnton, the past director of Harvard Library, says "*We faculty do the research, write the papers, referee papers by other researchers, serve on editorial boards, all of it for free … and then we buy back the results of our labour at outrageous prices*.[2]" (para. 2)

A third salient characteristic of the academic journal publishing industry is its overwhelming digitalisation and increasing open access. Since 1990, when *Postmodern Culture* appeared as the first online-only journal (Mudrak, n.d.), more and more traditional print academic journals have gone electronic. According to the fifth STM report (Johnson et al., 2018), 73 million Digital Object Identifiers (DOIs) had been assigned to journal articles as of June 2018. According to the Scopus content list released in October 2020 (Elsevier, 2020), more than half (10,580) of the 19,408 active English-only academic journals covered by Scopus are available online (with an electronic ISSN). Of the 19,408 journals, 1,599 (8.2%) are electronic-only (with an electronic ISSN but not a print ISSN), and 4,291 (22.1%) are open access (OA) ones listed by the Directory of Open Access Journals and/or the Directory of Open Access scholarly Resources. According to the Diretory of Open Access Journals (2020), there were 15, 573 OA journals as of 17 November 2020, which had published over 5.4 million articles.

The aforementioned three salient characteristics of the academic publishing industry should be taken negatively rather than positively. On the one hand, they indicate that more scientific knowledge has been produced, disseminated, and accessed more easily and quickly

thanks to the various services provided by academic publishers [2]. On the other hand, the academic literature has very likely been not only inflated but also contaminated due to the three salient characteristics of the academic journal publishing industry. The commercialisation of academic publishing and the monopoly of the academic journal publishing market cast doubt about the giant for-profit publishers' intention and efforts to strive for a cost/benefit balance (i.e., providing quality services vs. making profit) (see Fyfe et al., 2017). Although OA publishing is intended to accelerate knowledge dissemination, increase the accessibility of the literature, and reduce the cost of knowledge consumption, OA journals and publishers are criticised for inadequate quality control and excessive volume of publication. What is worse, pervasive predatory journal publishing, which characterise scholarly communication (Tsigaris & Teixeira da Silva, 2021) [3], mass-produce millions of low-quality or even fraudulent publications (Beall, 2013), which not only waste academic resources (Moher et al., 2017) but also inflate and contaminate the literature. One tell-tale example is that in 2005 a ten-page spoof paper entitled "Get me off Your Fucking Mailing List" was rated "excellent" by a spurious reviewer and accepted by *International Journal of Advanced Computer Technology* (obviously a predatory journal) for an article processing charge of 150 US dollars (Stromberg, 2014). Admittedly, however, innocent researchers and their decent research work may have fallen prey to predatory journals and publishers. Taken together, all these consequences undermine the ecosystem of academic publishing, which is detrimental to the development of scholarship. Logically, the undermined ecosystem of academic publishing would have become a breeding bed for research and publication malpractices, which have led to an increasing number of retractions and an unknown number of retractable but not-yet-retracted publications. Notably, based on a historic analysis of the UK's academic publishing, Fyfe et al. (2017) have made valuable recommendations for various stakeholders of academic publishing to battle the adverse impacts that the academic publishing industry has on the ecosystem of academic publishing.

1.1.2 Competition in academic journal publishing

Wa-Mbaleka (2015) identifies three "not so good reasons" (p. 13) for academic publication, namely to show off knowledge, to cope with the publish-or-perish pressure, and to gain reputational and material rewards. What lies behind all these three reasons is the competition in academia. It is acknowledged by numerous scholars (e.g., Ben-Yehuda & Oliver-Lumerman,

[2] For a comprehensive list of the services that publishers provide for academic publishing, see https://scholarlykitchen.sspnet.org/2016/02/01/guest-post-kent-anderson-updated-96-things-publishers-do-2016-edition/

[3] For more discussion about predatory publishing, see Beall (2016); Eriksson and Helgesson (2017); (Nejadghanbar & Hu, 2022); and Teixeira da Silva et al. (2019).

2017; Broad & Wade, 1982; Fang & Casadevall, 2015; Fink et al., 2022; Halffman & Radder, 2015; Jubb, 2014; Kumar, 2008; Landes et al., 2012; Martinson et al., 2005; Moore et al., 2017; Toch, 1981) that the modern science enterprise is replete with competition. "The contestable nature of academic publishing" (Jandrić & Hayes, 2019, p. 384) is highlighted by Balietti's (2016) critical description of science as "a winner-take-all enterprise" (para. 22). The competition is so fierce that publications are treated as a hard currency in academia (Lawrence, 2003), where academic resources are limited and institutional appraisals of research output are metrics-driven. To survive the competition, researchers are pressured to publish more in higher-ranked publishing outlets faster than others do, which has unfortunately turned academic publishing into a ruthless "academic rat race" (Landes et al., 2012, p. 73).

While junior researchers compete fiercely for academic publication to secure tenure, promotion, and pay rise, senior researchers may more likely be in competition for academic reputation, prestige, and authority. Unfortunately, however, data from the entire Scopus database indicate that only a small number of academic elites (<1%, 150,608 out of an estimated 15,153,100) managed to get published every year between 1996 and 2011, and their outputs accounted for 41.7% of all the publications and 87.1% of publications with more than 1000 citations in the same time period (Ioannidis et al., 2014). Research found that publications by journals' editorial board members experience shorter publication delays and attract more citations than those by non-board members and that editorial board members dominate the first or corresponding authorship (Xu et al., 2021). These research findings are clear manifestations of the Matthew effect in science (Merton, 1968, 1988; Perc, 2014; Rossiter, 1993). Research students and postdocs contend for job opportunities in academia, where publication has become a crucial, if not the only decisive, employment criterion. Back in 1973, over 50% of biologists in the U.S. secured a tenure-track job within six years after obtaining their doctorates, whereas the figure decreased to 15% in 2006 (Fang & Casadevall, 2011). According to the National Academy of Sciences et al. (2014), between 1993 and 2010, only 13.5–18.6% of U.S.-trained doctorate recipients in science, engineering, and health landed tenure and tenure-track appointments in academia within three years after their completion of doctoral programmes, and the percentage increased to just 18.5–27.0% between three and five years after their attainment of doctoral degrees. Competition also takes place among academic journals and publishers. Academic journals compete for prestige (Wood, 2020), often judged by coverage in reputed abstracting, indexing, and ranking databases (e.g., WoS, Scopus, and SCImago) and various metrics based on data from those databases (e.g., Journal Impact Factor and CiteScore). They also rival each other in promoting ground-breaking scientific discoveries through the general media, although some of them may sometimes refrain from media promotion and

discussion by imposing embargoes (Science Media Centre, 2003). Most problematically, predatory journals and publishers compete against legitimate ones to strive for a larger market share and higher profitability. The giant academic publishers' monopoly of the academic journal publishing market (see Johnson et al., 2018; Ware & Mabe, 2015) is both an indicator and an outcome of the fierce competition.

Although "a focus on the bright side of competition has recognized its role in promoting fairness, right judgment, innovation and productivity" (Anderson et al., 2007, p. 439; for more discussion about positive competition in science, see Ben-David & Zloczower, 1962; Feller, 1996; Hagstrom, 1974; Joseph, 1960; Merton, 1969), it should be noted that competition for publication may lead to various adverse consequences. The first consequence is inflation and contamination of the academic literature. According to a citation analysis (using a five-year citation window) of papers published between 1900 and 2005, 12%, 27%, 32%, and 82% of the publications remained uncited in medicine, natural sciences, social sciences, and the humanities, respectively (Larivière et al., 2009). Far worse than its inflation, the academic literature is also contaminated, as indicated by the large number of retracted publications archived by the Retraction Watch Database (RWDB, http://retractiondatabase.org). One major source of the literature contamination could be predatory journals because they have produced "millions of useless articles that create an awful lot of academic noise" (Beall, 2013, p. 82). Researchers' and journals' desire to win the competition (Wood, 2020) may lead to a publication bias (prioritized publication of positive research findings over negative ones; also known as "the file drawer problem"), which is reported to exist in various disciplines (e.g., Fanelli, 2012; Franco et al., 2014; Jennions & Moller, 2002; Tincani & Travers, 2019). Another consequence of competition for publication is unobjective peer reviewing and unfair rejection of submissions. The competition for publication, as observed by Ben-Yehuda and Oliver-Lumerman (2017), "is so fierce that even one critical and negative review may condemn a paper (or a book, or a research proposal) to be rejected" (p.152). Moreover, to cope with the publication pressure, researchers may have to prioritize quantity and fast publication over quality of publications. The phenomenon of salami publication (also known as bite-size publishing and piecemeal publishing) and the increasing number of predatory journals are clear indicators of this disturbing tendency. Researchers, especially junior ones, may be seduced into investing their time and energy on less challenging scientific inquires that can lead to many and rapid publications, rather than choosing to explore the untouched territory of science. The fierce competition for publication may also lead to a brain drain from academia. As there must be losers in the competition, those who publish less, in lesser publishing outlets and not fast

enough, may get too dispirited to keep their pursuit of an academic career alive even though they may have great potential.

The worst negative consequence of the competition for publication is that more and more researchers would strive to win the publishing game by compromising standards of ethical conduct in their research and publishing endeavours. Researchers who have (co-)authored scores of retracted publications (see Retraction Watch, n.d.-b for a list) are infamous for treating academic publishing as a game that they chose to play unfairly. Although research shows that competition and the publish-or-perish pressure do not necessarily cause academic misconduct (Fanelli et al., 2015) but may reduce it (Lacetera & Zirulia, 2011), it is still reasonable to maintain that the fierce competition and the high publication pressure can lead to misconduct (Ben-Yehuda & Oliver-Lumerman, 2017; Broad & Wade, 1982; Fink et al., 2022; Kumar, 2008; Martinson et al., 2005; Moore et al., 2017), which is supported by qualitative interview data elicited from 51 mid- and early-career scientists in the USA (Anderson et al., 2007). Notably, the same study by Fanelli et al. (2015) revealed that misconduct policies and academic culture were negatively associated with the likelihood of occurrence of misconduct. Unfortunately, various gatekeepers of academic integrity (e.g., publishers, journals, research funding agencies, and research organizations) have actually become direct beneficiaries of the academic publishing industry, and their interests involved may affect, explicitly or implicitly, their policing behaviors against research and publication misconduct. Consequently, the ecosystem of academic research and publishing is conceivably undermined. This speculation is supported theoretically by Vaughan's (1998, 1999) theory on the dark side of organizations and empirically by Ben-Yehuda and Oliver-Lumerman's (2017) deviance-theory-informed analysis of organizational responses to research fraud. That said, admittedly, more research drawing upon emic data elicited from various stakeholders is needed to further verify the speculation that the ecosystem of academic research and publishing is unhealthy and prone to misconduct.

1.1.3 Flawed defence against publishing bad science

Pre-publication peer review (hereafter referred to as peer review unless otherwise specified) is devised to serve as a major defence against publishing bad science. Scientific peer review is defined by Brown (2004, p. 7) as "the evaluation of scientific research findings or proposals for competence, significance and originality, by qualified experts who research and submit work for publication in the same field (peers)". Due to the scope of the present study, our focus here is on the use of peer review for evaluating scholarly manuscripts submitted for publication. Despite its institutionalisation by the Royal Society of Edinburgh in 1731 (Fyfe, 2015; Shema, 2014), peer review was not adopted as a common practice until after the Second World War

(Shema, 2014). Since the late 20th century, it has been widely adopted and considered as "the imprimatur for research articles" (Benos et al., 2007, p. 145). According to the level of anonymity, peer review can be single-blind, double-blind, triple-blind, and open. Typical peer review processes involve journal editors, reviewers, and manuscript authors.

Peer review serves as "an expert advice system" to assist journal editors in assessing the scientific value (i.e., validity, significance, and originality) and publishability of scholarly manuscripts, which "helps to make journals a reliable source of new information and discoveries for other scientists to investigate or build on" (Brown, 2004, p. 7). In other words, peer review is "a form of self regulation for science" (Science Media Centre, 2003, p. 1) and functions as a "quality control system" (Grainger, 2007, p. 5199). As a result, peer review has become a hallmark of quality assurance claimed, truthfully or falsely, by almost all academic publishing outlets and indexing databases. For instance, peer review is one of the journal selection criteria adopted by WoS (2020c). As expected, the peer review process was found effective (Goodman et al., 1994), and the majority of researchers thought that peer review improved the quality of their manuscripts in content, organization, and conclusions (Weller, 1996). More recent large-scale surveys (e.g., Elsevier & Sense about Science, 2019; Johnson et al., 2018; Mark Ware Consulting, 2016; Sense about Science, 2009; Taylor & Francis, 2015) have also revealed the academic community's wide recognition of the significance of the peer review system and researchers' consistent satisfaction with the benefits of peer review. However, those findings should be interpreted with caution because the large-scale surveys were conducted or sponsored by major commercial academic publishers which adopt and benefit from the dominant, almost cost-free peer review system.

The importance of the current peer review system is obvious. As emphasised by Nicholas et al. (2015), "peer review remains clearly the central pillar of trust" (p. 16) and "still king in the digital age" of academic publishing (p. 15). As pointed out by Benos et al. (2007), the peer review system should be preserved because abolishment of it would entail three significant repercussions. One major consequence will be the loss of an opportunity to make good use of pre-publication criticisms from experts whose value is further highlighted by authors' lack of motivation to respond to post-publication criticisms (Horton, 2002) and the readership's inactivity in scrutinising peers' publications (Bingham, 1998). Another consequence is that lack of pre-publication peer review would compromise health of patients who receive a medical treatment based on published research findings which have not undergone peer review. Finally, abolishment of the peer review system would very likely lead to an increase in fraudulent publications; in Belluz and Hoffman's (2015) words, "it's possible even more bad science will sneak through" (para. 22).

Despite the acknowledged importance and the perceived benefits of the current peer review system, it must be noted that there have also been warnings of its looming crisis (Wilson, 2015). Throughout its practice over the years, the current peer review system has been criticised for its unsustainability and ineffectiveness. The process of peer review tends to be time-consuming (Benos et al., 2007; Smith, 2006) and thus may slow down knowledge dissemination and the research process (Björk & Solomon, 2013). Although reviewers may enjoy some advantages (e.g., learning from others' drawbacks) (Wilkinson, 2020), competent and punctual reviewers are hard to identify and retain (eContent Pro, 2017), very likely due to the lack of time and stronger incentives to willingly serve as devoted reviewers. Peer review may be prone to bias (Smith, 2006). For instance, peer reviewers' editorial recommendations may be influenced by their favour for or prejudice against authors' demographic factors in the case of single-blind peer review (Garfunkel et al., 1994; Peters & Ceci, 1982) and, in particular, peer review may involve gender bias (Gilbert et al., 1994; Helmer et al., 2017; Lerback & Hanson, 2016; *Nature*'s sexism, 2012). Due to the high level of subjectivity involved in the process of peer review, reviewers may lack consistency in evaluating scientific works (Bailar, 1991; Peters & Ceci, 1982; Rothwell & Martyn, 2000; Schroter et al., 2006). Not all peer reviewers and journal editors are open to new ideas (Carroll, 2018), which may consequently prevent advancements in science (Siler et al., 2015). Some reviewers may take advantage of reviewing others' works to pursue their personal agendas (Brown, 2004; Grainger, 2007; Smith, 2006), such as deliberately delaying review, disclosing confidential information, failing to report conflicts of interest, or even stealing ideas from manuscripts under review (see Shore, 2019 for a telling example).

Moreover, peer review cannot always guarantee the selection of good-quality (especially innovative) research for publication and may also fail to improve the quality of submissions under review (Demicheli & Di Pietrantonj, 2007; Jefferson et al., 2002). Even worse, the effectiveness of peer review in detecting flaws of manuscripts is in doubt. For instance, many experiments (e.g., Bohannon, 2013; Callaham et al., 1998; Godlee et al., 1998) have found that just a small portion of deliberately designed problems with research articles can be spotted by reviewers. Worse still, according to the RWDB [4], eight hoax papers had survived the review process to be published as of 31 December 2019, and another case is not archived by the RWDB but covered by *Nature* (Gilbert, 2009). Another major criticism of the peer review system is its inability to detect fraud. Peer review scams happen from time to time (Ferguson et al., 2014), and one single scam may involve scores of or even more than one

[4] All the data search queries whose timespan is reported in this thesis as having no beginning point but ending with 31 December 2019 were conducted on 7 February 2021.

hundred publications (e.g., Anonymous, 2014b; Callaway, 2015; SAGE, 2014; Stigbrand, 2017). In addition to peer review scams, other forms of misconduct may game the review system, such as authorship issues, salami publications, and unauthorised use of data. Post-publication detection of all these forms of misconduct may lead to retraction. To be fair, however, the peer review system is devised to help to avoid errors in publications but not supposed to detect fraud (Brown, 2004). Although reviewers may be able to detect some forms of misconduct (e.g., plagiarism and data falsification/fabrication) occasionally, using their expertise and experience, they usually have no way of discerning deliberate wrongdoing during the review process until it is uncovered through post-publication scrutiny by the academic community (Brown, 2004).

1.1.4 Ethical violation in academic research and publication

Ben-Yehuda and Oliver-Lumerman (2017) identified research fraud as deviance in science and attributed it to publication pressure and competition in science. Since it generates and intensifies pressure, competition is identified as the core reason for deviance in science. Unfortunately, the institution of science is a jungle replete with competition and rivalry (Toch, 1981). In their book *Betrayers of Truth*, Broad and Wade (1982) sharply point out that intense competition in science induces deviant research behaviors. From a rational choice perspective, both academic institutions and individual researchers are highly incentivised to commit misconduct when they are under pressure and in competition for scarce resources (Ben-Yehuda & Oliver-Lumerman, 2017). Competition for limited academic resources is crucial for the survival of academic institutions (Vaughan, 1998, 1999) and, consequently, may lead to their relaxed gatekeeping of academic integrity (Broad & Wade, 1982). Competition for scientific discoveries, academic status and influence, and grants is so intense that some researchers are often tempted to cut corners to win out by conducting fraudulent research (Kumar, 2008). For instance, underdog researchers, who are under-rewarded in competition, are more likely to conduct research "with unfavorable risks-benefits ratios for subjects" to obtain more desirable data more quickly (Barber et al., 1973, p. 83). Ghost and gift authorship of publications is another shortcut that some researchers may take to cope with their publication pressure.

In response to the negative consequences of the intense competition and rivalry in the scientific enterprise, ethics is utilised as a weapon to tame the jungle of science (Toch, 1981). Accordingly, numerous international governing and advisory organizations of academic integrity have proposed various guidelines on research and publication ethics. The well-known organizations among them include the International Science Council, the World Conference on Research Integrity Foundation, the Committee on Publication Ethics (COPE, https://publicationethics.org), the Council of Science Editor, the International Committee of

Medical Journal Editors, and the International Association of Scientific, Technical, and Medical Publishers. The guidelines proposed by those governing and advisory bodies are institutionalised by academic publishers, academic institutions, and learned societies worldwide. At the national level, many countries have established governmental offices to handle affairs regarding scientific ethics, such as the U.S. Office of Research Integrity (ORI), the German Research Ombudsman, the Danish Committees on Scientific Dishonesty, and the UK Research Integrity Office. Research organizations, where most academic research is conducted, set up their own departments to guide research activities (e.g., Institutional Review Board [IRB] and research committees) and investigate allegations of misconduct in research and publishing. Encouragingly, the past decade has witnessed an increase in online platforms that are dedicated to policing violations of research and publication ethics, such as Retraction Watch, PubPeer, Plagiarism.org, Stop Predatory Journals, and For Better Science.

While the establishment of organizations and the guidelines that those organizations have proposed or advocated are important steps toward curbing misconduct in research and publishing, it should be emphasised that how and to what extent those guidelines are followed in practice is equally, if not more, important. However, ethics as a weapon against deviance in science is put into use only "sparingly to assure continuance of the game" (Toch, 1981, p. 192). This somewhat disappointing observation is supported by Ben-Yehuda and Oliver-Lumerman's (2017) investigation into 748 known cases of research fraud between 1880 and 2010. According to their analysis, organizations do not necessarily follow or strictly follow ethical guidelines in handling cases of research fraud (see Section 3.3.2 for a detailed discussion). A recent case study reveals that institutional responses to research misconduct prioritize minimizing reputational damage over the impact of data fabrication on extant and future research (Golden et al., 2021).

The compromised conformity to, or even complete ignorance of, ethical guidelines can be attributed to the gap between the idealised normativity and the context-specific utility of guidelines on scientific ethics. Such a gap can be seen clearly through a comparison between the norms of science advocated by Merton (1942/1973) and the codes of scientific ethics proposed by Resnik (1998/2005). Specifically, Merton proposes that the ethos of modern science be comprised of a set of four institutional imperatives, namely universalism, communism, disinterestedness, and organized scepticism. Differently, Resnik proposes twelve standards of ethical conduct in science, namely honesty, carefulness, openness, freedom, credit, education, social responsibility, legality, opportunity, mutual respect, efficiency, and respect for subjects (see Section 2.1.1 for a detailed discussion). Apparently, the Mertonian norms of science are more idealised and general and consequently less operable than the codes of

scientific ethics proposed by Resnik. Furthermore, the ethical guidelines advocated by global advisory organizations have greater affinity with Resnik's proposal than with Merton's. The adoption of the global advisory bodies' ethical guidelines could be subject to purposeful modification to suit the contexts of local governing bodies. Local governing bodies' ethical guidelines can be compromised during individual institutions' case-specific handling of ethical violations. As a result, Mertonian norms of science, Resnik's codes of ethical conduct in science, global and local guidelines on scientific ethics, and individual institutions' implementation of those guidelines constitute a five-level continuum, where the idealism of the Mertonian norms of science is increasingly weakened down to the level of implementation. Such weakening can be attributed to the increasing materialisation or capitalism/commercialism of the modern science enterprise (e.g., Atanassov & Tchalakov, 1998; Hersen & Miller, 1992; Jessop, 2017, 2018; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004) and competition therein (Ben-Yehuda & Oliver-Lumerman, 2017; Broad & Wade, 1982; Fang & Casadevall, 2015; Kumar, 2008; Toch, 1981).

1.1.5 Ensuring the integrity of the academic literature

To ensure the integrity of the academic literature, pre-publication efforts are made to prevent flawed research from making its way to publication in the first place. Since unethical research and publishing practices inevitably end up with problematic publications, numerous guidelines on ethical conduct in research and publishing have been proposed at both global and local levels, and these guidelines have been institutionalised by research organizations. As a result, it is increasingly made mandatory that research students receive adequate training on research and publication ethics to prepare them ethically well for their academic careers. Moreover, lists of predatory journals and publishers (e.g., Beall's list, Kscien's list, the Dolos list, and the Stop Predatory Journals list) have been publicised to alert researchers to publishing outlets that are characterised by lack of rigorous peer review. More importantly, governing and advisory bodies at different levels have been established, which have put forward various guidelines and regulations on ethical research and publishing conduct (see Resnik & Master, 2013). Additionally, improved techniques and services are available for facilitating pre-publication scrutiny of submitted manuscripts, such as iThenticate and Turnitin for detecting plagiarism and Forensic Droplets, Adobe Bridge, and ImageJ for identifying image manipulation. In response to its various defects, the traditional peer review system is being modified and reformed. Ideas for improvement include providing more formal training to starter peer reviewers, increasing incentives for serving as a peer reviewer, adopting full blind review, encouraging pre-submission peer review, and changing attitudes to peer review (Carroll, 2018).

Pre-publication peer review and publication should not be seen as "the end of the review process" (Gray et al., 2019, p. 264) or "a final stamp of approval" but "as steps on the road to assurance" (Carroll, 2018, para. 20), suggesting the necessity and importance of replication, post-publication peer review, and other post-publication corrective actions. Replication is "the cornerstone of science" (Moonesinghe et al., 2007, p. 218; Simons, 2014, p. 76) and works as an important control mechanism "against fraud and deviance in science" (Ben-Yehuda & Oliver-Lumerman, 2017, p. 153). Unfortunately, there is a replication crisis (Ioannidis, 2005; Maxwell et al., 2015; Pashler & Wagenmakers, 2012; Simmons et al., 2011), and journals tend to allow only limited publishing opportunities for replication studies (Ben-Yehuda & Oliver-Lumerman, 2017). In addition to replication, various other post-publication efforts are made to rectify and weed out flawed research that have managed to get published (for whatever reason). Recently, post-publication peer review has been advocated by many scholars (e.g., Bastian, 2014; Belluz, 2015; Eyre-Walker & Stoletzki, 2013; Hunter, 2012; Smith, 2011; Teixeira da Silva & Dobránszki, 2015) to allow more extensive scrutiny of published research work. As a result, more and more academic journals and scholarly publishing platforms have adopted open post-publication peer review, such as the *Winnower*, *eLife*, *F1000Research*, *Royal Society Open Science*, PubPeer, PubMed Commons, and Open Review. In addition to increased post-publication peer review, post-publication corrective measures have been in use. Traditionally, researchers and journal authorities publish corrections (i.e., errata and corrigenda) to rectify minor errors that go unnoticed pre-publication but are detected post-publication. When publications are suspected of serious problems, an expression of concern (EoC) is usually issued by journals or publishers to alert readers before the suspected problems are confirmed. More drastically, retraction is in place as a post-publication self-correcting mechanism to invalidate publications with serious scientific and/or ethical problems. Corrigenda and retractions are regarded as "the last line of defence" against getting bad science published and circulated (Harms et al., 2018, p. 61). The phenomenon of retraction, as the research topic of the present study, is introduced in detail below.

1.2 The Phenomenon of Retraction

Retraction as a post-publication phenomenon occurred in the system of journal publications as early as in the sixteenth century (Biagioli, 2000). In the contemporary context of academic journal publishing, retraction is a self-regulatory and self-corrective measure (Chen et al., 2013; Ranjan, 2018) taken post-publication to "obliterate, at times, works from the publication record" (Shema et al., 2019, p. 98). The phenomenon of retraction is "a shameful act for the scientific community, but a necessity to maintain the purity of science" (Sheth & Thaker, 2014, p. 93). The importance of retraction is highlighted by Eugen Garfield, the creator of citation indexing

and founder of WoS, as a necessary means for the academic community to self-police (Atlas, 2004).

1.2.1 Prevalence, gravity, and consequences

Flawed research and problematic publications are characterised as a "virus" which contaminates the literature when not handled effectively (Montgomery & Oliver, 2017, p. 53). Boon or bane, retraction has a long history. The possibly first English-language retraction in history could be traced back to 1756 (Oransky, 2012a). The oldest retraction notice (RN) archived in PubMed was issued in 1966 to retract a paper published in 1959 (Goldstein & Eastwood, 1966), and the earliest retraction notice indexed in WoS was published in 1927 to retract an article published in 1926 (Whelden, 1927). The phenomenon of retraction has become more common since the turn of the 21st century (Vuong, 2019c) and has become a pandemic afflicting the international industry of academic journal publishing. As archived by the RWDB (Brainard et al., 2018), more than 18,000 publications were retracted as of 2018. By 31 December 2020, as many as 23,896 retracted publications were documented by the RWDB, involving 127 academic subjects and 139 countries and regions across the world. As reported by Grieneisen and Zhang (2012), 4,449 scholarly publications indexed in WoS were retracted between 1928 and 2011, involving over 82% of the WoS-defined academic disciplines in natural sciences, social sciences, arts, and humanities. According to the RWDB, the absolute number of annual retractions increased, but the retraction rate (i.e., the number of retracted publications divided by the number of publications) was about 0.04%, which remained relatively stable since 2012 (Brainard et al., 2018).

Although retraction is considered as an indicator of "pathologies in science" (Walsh et al., 2019, p. 444), Castillo (2014) suspected that the prevalence of retractable publications may be underestimated. This suspicion is not ungrounded. A case study by Friedman (1990) on Robert Slutsky [5] revealed that 25% of his 12 fraudulent and 23% of his 48 questionable publications were not retracted. Similarly, 10% of Joachim Boldt's [6] publications that warranted retraction were not retracted (Elia et al., 2014). Retraction notices and correction notices are not reliable indicators of the presence of misconduct in publications (Abritis, 2015; Drimer-Batca et al., 2019), and misconduct is likely more prevalent in practice than has been exposed and handled. According to a survey by Fanelli (2009), 2% of academics admitted to falsifying or fabricating data, and 28% claimed to know colleagues who had done so. A recent

[5] Robert Slutsky was a faculty member at the University of California San Diego School of Medicine and, according to the RWDB, 20 of his research articles were retracted between 1985 and 1986.
[6] Joachim Boldt was an anaesthetist based in Germany and, according to the RWDB, 129 research articles he co-authored were retracted between 2010 and 2020.

meta-analysis (Xie et al., 2021) indicated that 2.9% and 15.5% of researchers had committed at least one form of research misconduct (i.e., falsification, fabrication, plagiarism) and (unspecified) questionable research practices, respectively. In addition, 15.5% and 39.7% of researchers witnessed others' involvement in at least one form of research misconduct and questionable research practice, respectively. A large-scale national survey (de Vrieze, 2021) revealed that approximately 8% and over 50% of Dutch scientists had committed outright fraud (i.e., fabrication or falsification of research results) and questionable research practices (e.g., hiding flaws in research design or selective citation of literature), respectively. A more recent investigation revealed that more than two-thirds of 39,985 PubPeer comments on 24,779 publications were posted between March 2019 and January 2020 to whistle-blow some type of misconduct (Ortega, in press). Furthermore, as it usually takes time for earlier flawed publications to be discovered and retracted, it is impossible to tell how many such retractable publications there are. Although it is extremely hard to make an accurate estimate of the extent of retractable research, many researchers (e.g., Ben-Yehuda & Oliver-Lumerman, 2017) believe that "fraud in research is probably more like an iceberg phenomenon than like a bad apple one" (p. x). As more journals and publishers are stepping up policing efforts to protect the scientific integrity (Steen, 2011b; Vuong, 2019b), their enhanced scrutiny should lead to more frequent retractions of both earlier and recent problematic publications.

High-profile retractions come to light from time to time, suggesting the gravity of retractable publications and the inadequate effectiveness of the academic gatekeeping mechanism. In July 2014, the publisher SAGE retracted from *Journal of Vibration and Control* 60 research papers in one go (Anonymous, 2014b). The retraction was due to compromised peer review and citation manipulation committed by a computer scientist in Taiwan, who co-authored all the 60 retracted papers (SAGE, 2014). In the wake of the publishing scandal, Taiwan's then minister of education resigned for co-authoring several of the 60 retracted papers (Leung & Sharma, 2014). In April 2017, the journal *Tumor Biology* retracted 107 articles, all of which were related to Chinese research institutions, due to fake peer review and other forms of misconduct (Stigbrand, 2017), creating "a new record" in the number of articles retracted with one single retraction notice (McCook, 2017b). After the "record-creating" retraction, *Tumor Biology* was transferred from Springer to SAGE with a new editorial board (Tumor Biology, n.d.) and removed from the Science Citation Index in WoS (Biobool, 2017). Less than two years later, the record was broken by *Journal of Fundamental and Applied Sciences*, which retracted 434 papers in one go (Journal of Fundamental and Applied Sciences, 2018; Oransky, 2019). According to the RWDB, the Institute of Electrical and Electronics Engineers retracted 7,650 publication items from its

affiliated journals as of 31 December 2019, very likely being the most productive contributor to retractions among all academic societies and publishers.

Retracted research entails a wide range of negative consequences for science and society. As they tend to be cited positively even after retraction (Rapani et al., 2020), retracted publications, together with publications that cite them positively, may mislead subsequent research and impede scientific advancement (Craiga et al., 2020), as evidenced in the cases of Piero Anversa [7] (Kolata, 2018; Lüscher, 2019; O'Riordan, 2019) and Sylvain Lesné [8] (Piller, 2022), and distort academic metrics (Madlock-Brown & Eichmann, 2015; Teixeira da Silva & Dobránszki, 2018). More seriously, retracted false research in the fields of life sciences and medicine may have endangered the health of patients enrolled as research subjects (e.g., Steen, 2011a) and those who received or declined medical treatment due to the invalid research findings (e.g., Abu-Omar, 2001; Godlee, 2011; Husten, 2014; Kotzin & Schuyler, 1989; Newman, 2010). Consequently, retracted research would not only erode public trust in science (Byrne, 2019) but also lead to junior researchers' loss of interest in science and consequent abandonment of it (Reich, 2009). Retraction of one publication may lead to the retraction of subsequent studies which are based on the retracted publication (Budd et al., 2011; Davis, 2012; Greitemeyer, 2014; Grieneisen & Zhang, 2012; Redman et al., 2008) and thus cause a massive waste of academic resources (Budd et al., 1998; Marcus & Oransky, 2017). As reported by Stern et al. (2014), each retracted publication accounted for an average of $392,582 in direct costs, and retracted research due to misconduct accounted for approximately $58 million in direct funding by the National Institutes of Health between 1992 and 2012. Retraction also penalises direct stakeholders, namely authors of retracted publications, their home institutions, and journal authorities.

Despite the negative consequences of retracted research, retraction is viewed positively and optimistically by some scholars. Given the relatively low retraction rate in comparison with the enormous volume of publications (Hilgard & Jamieson, 2017), it is believed that retraction is largely a good sign of a closer scrutiny of science (Fanelli, 2013) and "the good health of the peer review system" (Wray & Andersen, 2018, p. 2010). Similarly, retraction is also seen as a sign of "maturity" of academic research (Spoelstra et al., 2016). Accordingly, Fanelli (2013) called on researchers and editors to proactively retract flawed publications, for

[7] Piero Anversa, a former employee at both Harvard Medical School and Brigham and Women's Hospital, was (in)famous for his once-hailed "revolutionary" but then proven false discovery that stem cells in bone marrow could be used to regenerate heart muscle. According to the RWDB, 18 of his publications were retracted due to research misconduct between 2014 and 2019.

[8] Sylvain Lesné, a neuroscientist at University of Minnesota, was found through a six-month investigation by *Science* guilty of fabricating data in his research into Alzheimer's disease, which threatened a dominant theory of Alzheimer's disease and has misled research on the disease worldwide.

retraction represents academic journals' and publishers' assumption of social responsibilities (Wager & Williams, 2011). Moreover, retraction is taken as an opportunity for drawing lessons, initiating improvement (Singh et al., 2014; Steen et al., 2013; Wager & Williams, 2011), and reflecting on the image of science (Spoelstra et al., 2016). Retracted literature can be used to teach students and researchers to review the literature critically (Burnett et al., 2014; Spoelstra et al., 2016). In summary, both the negative and positive consequences of retraction justify the necessity and significance of research on retraction.

1.2.2 Retraction as a self-correcting mechanism

Retraction is a mechanism "for correcting the literature and alerting readers to articles that contain such seriously flawed or erroneous content or data that their findings and conclusions cannot be relied upon", and its main purpose is "to correct the literature and ensure its integrity rather than punish the authors who misbehave" (Committee on Publication Ethics Concil [COPE Council], 2019, p. 4; Wager et al., 2009, p. 2). The process of retracting a publication tends to be complicated (COPE Council, 2020; Williams & Wager, 2013) and often involves the participation of various stakeholders, depending on the specific problems with retracted publications (Ranjan, 2018). In terms of the extent of their involvement in handling retraction, retraction stakeholders can be categorized into three groups, namely the inner group (i.e., authors of retracted publications, their affiliations, and journal authorities), the middle group (i.e., research funding agencies, victimised peer researchers, competing peer researchers, and interested peer researchers), and the outer group (i.e., mistreated research participants, consumers of retracted research findings, and social sponsors of retracted research) [9]. In particular, the stakes are high for the inner group, as observed by Hu et al. (2019):

> Retraction is a no-win situation for all stakeholders: for authors (funding restrictions, demotions, firings), for research affiliations (soiled reputations, jeopardized names), for journals (the loss of high-quality submissions and the decreased chance of being indexed in commercial publication databases in the future), and for publishers (the loss of fame, poor evaluations). (p. 326)

The complexity of the retraction process is well reflected in the flowcharts proposed by the COPE as comprehensive guidance on handling various forms of violation against research and publication ethics (COPE Council, 2020). A case of retraction involves at least two groups of stakeholders, namely the author(s) of the retracted publication (hereafter referred to as author(s) unless otherwise specified) and the journal authorities (i.e., publishers and journal

[9] Based on this three-group categorization of retraction stakeholders, a three-circle classification of retraction stigma stakeholders is developed in Section 2.1.4.

editors). In some cases, other entities may also be involved as stakeholders, such as home institutions of authors of retracted publications, funding agencies, interested readers of the retracted publications, and individuals and organizations whose legal interests are jeopardised by the retracted publications (Grieneisen & Zhang, 2012; Ranjan, 2018). Retractions tend to be initiated/requested by authors of retracted publications and/or journal authorities (COPE Council, 2019; Grieneisen & Zhang, 2012; Wager et al., 2009; Xu & Hu, 2021), and journal editors have the final say on a decision of retraction in most cases (COPE Council, 2019; Wager et al., 2009). Retraction may be triggered by interested readers or whistle-blowers who alert journal editors to suspected problems with publications (COPE Council, 2020; Xu & Hu, 2021).

The mechanism of retraction operates mainly through issuing a publication-retracting document in print and/or electronically in academic journals and/or at their official websites. Publication-retracting documents are published under various names (e.g., Correction, Erratum, Letter to the Editor, Publisher Note, Retracted Article, Retraction Note, Statement of Retraction, Withdrawal, Withdrawal Notice, Withdrawn) but have been termed *Retraction Notices* or *Retraction* as a unique publication type in more and more journals and databases. MEDLINE started listing retractions as a unique publication type in 1980 (Wager & Williams, 2011). The U.S. National Library of Medicine (NLM) used to index publication-retracting documents as *Letter to the Editor* or *Editorial* (Kotzin & Schuyler, 1989) and then started indexing them as retraction notices in 2002 (NLM, 2002). Differently, WoS started categorizing publication-retracting documents as *Correction, Addition* (which included additions, errata, and retractions) (WoS, 2016) and then *Retraction* as an independent publication type (WoS, 2018). Notably, retraction notice authorship remains a neglected and disputed issue. Many scholars (e.g., Bilbrey et al., 2014; Wager & Williams, 2011) appear to identify initiators or performers of retraction as retraction notice authors. However, using a set of authorship identification criteria developed through textual analysis, Xu and Hu (2018) have found that retraction notice authors can be different from initiators and performers of retraction. Specifically, their findings show that retraction notices may be authored by journal authorities, authors of retracted publications, both journal authorities and authors of retracted publications, or entities which cannot be identified unambiguously.

1.2.3 Criteria for retracting academic publications

Retraction is "science's ultimate post-publication punishment" (van Noorden, 2011, p. 26) or even "the harshest possible punishment for a scientist" (Steen, 2011c, p. 252). Given the punitive nature of retraction, the importance of retraction criteria (i.e., what warrants retraction and what justifies decisions on retraction) cannot be exaggerated in handling retraction. Retraction criteria are developed and adopted by governing bodies of scientific integrity, such

as journals, publishers, academic societies, and others. Admittedly, retraction may take place even when retraction criteria are not available, and the criteria adopted in practice may deviate from those officially promulgated.

The globalization of scientific advancement necessitates international standards for scientific integrity. In response to such a need, COPE was established in London in 1997 as a platform committed to enhancing research and publication ethics worldwide. Its membership and services are open to all institutions and individuals engaged in scientific research and academic publishing. As of 1 April 2020, COPE had 12,808 members, including leading international publishers (e.g., Elsevier, SAGE, Springer, Wiley, Palgrave Macmillan, and Taylor and Francis) and top-tier academic journals (e.g., *Nature*, *Science*, *Cell*, and *PNAS*). To address the academic community's urgent need for guidance on handling retraction (Williams & Wager, 2013), COPE proposed its first set of guidelines on retraction and publicised it on 30 November 2009 (hereafter COPE retraction guidelines 2009) (Wager et al., 2009).

Included in the COPE retraction guidelines 2009 are four primary retraction criteria (hereafter COPE retraction criteria 2009), namely unreliable research findings due to misconduct or honest error, redundant publication, plagiarism, and unethical research (Wager et al., 2009). There are three problems with those retraction criteria. First, the four retraction criteria are unexpectedly simplified or minimised into the first criterion (i.e., unreliable research findings due to misconduct or honest error), which is reflected in the definition of retraction as a mechanism "for correcting the literature and alerting readers to articles that contain such seriously flawed or erroneous content or data that their findings and conclusions cannot be relied upon" (Wager et al., 2009, p. 2). Consequently, the other criteria may not receive sufficient attention in practice. Second, due to the lack of a comprehensive, if not exhaustive, list of what constitutes misconduct, honest error, and unethical research, the first and the last criteria may be subject to varied interpretations and applications. Third, plagiarism as a retraction criterion is challenged by the proposition that publications involving only text plagiarism should be corrected rather than being retracted (Chaddah, 2014). This proposition is echoed by Smith's (2003, p. 884) proposal that retraction should be "reserved for studies that involve academic misconduct and severe errors that are not discernible from text."

Publications have been retracted for reasons that are not covered in the COPE retraction criteria 2009 (e.g., Fanelli et al., 2015; Grieneisen & Zhang, 2012). Inconsistency with the guidelines can be attributed to three factors. First, some publications were retracted long before the debut of the first set of COPE retraction criteria issued in 2009, without following any global guidelines. As of 2002, only 18% of the medical journals indexed in WoS adopted a

policy on handling retraction, and "anecdotal evidence suggested a lack of consistency in journal policies and practices regarding retraction" before the debut of the COPE retraction guidelines 2009 (Wager & Williams, 2011, p. 567). Second, the COPE retraction criteria 2009 are not mandatory for COPE member journals and publishers, which are only encouraged rather than required to institutionalise them. An investigation into the retraction policies adopted by 15 leading science, technology and medicine publishers and publishing-related bodies, 13 of which were COPE members, found deviations in both wording and meaning from the COPE retraction guidelines 2009 (Teixeira da Silva & Dobranszki, 2017). Third, the applicability of the COPE retraction criteria 2009 may have been restricted due to the case-specific nature of retraction (Williams & Wager, 2013) and the problems delineated in the preceding paragraph.

As expected, COPE introduced a second set of retraction guidelines on 10 December 2019 (hereafter COPE retraction guidelines 2019) (COPE Council, 2019), which revised and expanded the earlier COPE retraction guidelines. Specifically, the COPE retraction criteria 2019 include: 1) unreliable research findings due to major error or data fabrication or falsification, 2) plagiarism, 3) redundant publication, 4) unauthorised use of data, 5) legal issue (including copyright infringement), 6) unethical research, 7) compromised or manipulated peer review and, 8) conflict of interest. The COPE retraction criteria 2019 are conceivably more applicable and useful than the COPE retraction criteria 2009 since the former have formulated more specific retraction criteria than the latter did. More importantly, *misconduct* as a retraction criterion is now specified as data fabrication or falsification, which is more operationalizable. Furthermore, *honest error* as a retraction criterion in the COPE retraction guidelines 2009 is replaced by *major error* in the COPE retraction guidelines 2019. Such a change in wording indicates that decisions on retraction may not consider the role of intention in retraction-engendering behaviors, which can make the process of handling retraction less complicated. Unfortunately, plagiarism and unethical research as retraction criteria remain unspecified and too general for handling context-specific cases of retraction. Therefore, the COPE retraction criteria 2019 may be further revised in the future to strengthen the handling and functioning of retraction.

1.2.4 Negative consequences of retraction for perpetrators

Retraction as a mechanism is mainly intended to correct the contaminated literature rather than to punish misbehaving researchers (COPE Council, 2019; Wager et al., 2009). However, as retraction tends to expose or signal misconduct in research and publishing (Hesselmann et al., 2017; van Noorden, 2011), it entails various negative consequences for retraction stakeholders, especially authors of retracted publications, who are held responsible for the majority of

retractions. Harms et al. (2018, p. 64) observed that "publication of corrigenda and retractions is viewed as a career death knell by many researchers, selection committees, and promotion and tenure committees." The "deadly" impact of retraction is well captured by Collier's (2011, p. E385) observation that "[i]f one were inclined, for some reason, to strike fear into the heart of a medical researcher, it would take little more than whispering a single word: retraction."

Retraction-induced punishment affects authors of retracted publications in particular. Authors of retracted publications are immediate and most prominent victims of their own retractions. A wide range of negative consequences of retraction have been reported. The retraction of one publication may trigger a closer scrutiny of all other publications by the same author of the retracted publication, which may result in more retractions (e.g., International Journal of Obstetric Anesthesia, 2013). Authors of retracted publications have been reported to suffer a 10% citation drop for their earlier non-retracted publications (Azoulay et al., 2017), and retraction of a single publication triggered an average 6.9% citation drop per year for earlier unflawed publications of authors of retracted publications (Lu et al., 2013). Even worse than citation penalty, authors of retracted publications tend to suffer from reduced post-retraction academic productivity (Mistry et al., 2019; Mongeon & Larivière, 2014; Stern et al., 2014) and, so do their co-authors, especially first authors (Mongeon & Larivière, 2014, 2016). Moreover, a publishing ban may be imposed on authors of retracted publications (Springer, n.d.), whose duration may vary from a few years (e.g., Salam, 2013; Williams & Wager, 2013) to even a lifetime (e.g., Mokhtari & Pourabdollah, 2014), although this goes against the COPE retraction guidelines' explicit disapproval of punishment for misbehaving authors (COPE Council, 2019; Wager et al., 2009).

Retraction may also incur financial and career losses, revocation of academic degrees, legal consequences, and even loss of life. Retraction due to misconduct may lead to drastically decreased opportunities for funding (Stern et al., 2014) and even a fine (e.g., White, 2015). Reports are not uncommon of academics resigning or even terminating their careers because of a high-profile retraction (e.g., McCook, 2016a; Oransky, 2014). Notably, junior authors tend to be penalised more severely than their senior collaborators: while their academic career may be terminated by the retraction, their senior co-authors may survive unscathed, suggesting that research eminence can help offset retraction-caused reputation damage (Jin et al., 2019). Unsurprisingly, retraction may also lead to the revocation of an academic degree (e.g., Lieb, 2004). Authors of retracted publications may also be involved in a lawsuit (e.g., Coons, 2015), which may end up with a sentence of imprisonment (e.g., Kintisch, 2005). In the worst scenario, retraction may lead to suicide of authors of retracted publications (e.g., Cyranoski, 2014). To

minimise the negative consequences of retraction, authors of retracted publications may hinder the process of retraction and consequently reduce the effectiveness of retraction.

1.2.5 Reasons for the inadequate effectiveness of retraction

Retraction as a mechanism is mainly intended "to correct the literature and ensure its integrity" (COPE Council, 2019, p. 4; Wager et al., 2009, p. 2). Although research (Furman et al., 2012; Pfeifer & Snodgrass, 1990; Yang et al., 2022) showed that retracted publications experienced a considerable drop of citation after retraction in comparison to before retraction, the effectiveness of retraction has been questioned (Davis, 2012). The primary negative evidence for the effectiveness of retraction is positive post-retraction citations to retracted publications, as reported in numerous studies (e.g., Al-Ghareeb et al., 2018; Bar-Ilan & Halevi, 2017; Bolland et al., 2021; Bornemann-Cimenti et al., 2016; Budd et al., 2011; Budd et al., 1998; Budd et al., 1999; Davis, 2012; Dinh et al., 2019; Fanelli et al., 2021; Fang et al., 2012; Furman et al., 2012; Garfield & Welljams-Dorof, 1990; Grieneisen & Zhang, 2012; Horbach et al., 2021; Kochan & Budd, 1992; Madlock-Brown & Eichmann, 2015; Mongeon & Larivière, 2014; Moylan & Kowalczuk, 2016; Neale et al., 2010; Rai & Sabharwal, 2017; Redman et al., 2008; Rubbo et al., 2019a; Steen, 2012; Suelzer et al., 2019; Teixeira da Silva & Bornemann-Cimenti, 2016; Teixeira da Silva & Dobránszki, 2017), although retracted publications in general experience decreases in post-retraction citations (Peterson, 2013). Publications citing retracted publications after retraction need to be corrected, to say the least, and even have to be retracted, causing a massive waste of academic resources (Marcus & Oransky, 2017), if subsequent research is based on the false research findings reported in the retracted publications. The continued citations to retracted publications can be attributed to various factors, such as silent retraction, unavailability of charge-free retraction notices, problematic indexation of retracted publications and retraction notices, untimeliness of retraction and retraction notices, inadequate disclosure of retraction reasons, and tangible sanctions on retraction. Those contributing factors are discussed below in detail.

Publications may be retracted without issuing a retraction notice, which is referred to by Jaime A. Teixeira da Silva (2015, p. 5) as "silent or stealth retraction". Silent retraction goes against the COPE retraction guideline that a retraction notice should be issued to clearly identify the retracted publication (COPE Council, 2019; Wager et al., 2009). According to the RWDB, as of 31 December 2019, 226 publications had been retracted without issuing a retraction notice. Although publications retracted silently are no longer traceable or retrievable after retraction (Jaime A. Teixeira da Silva, 2015), they may continue to be cited by fellow researchers who read or cite them before their retractions or keep them in personal libraries, being unaware of their retraction status in the absence of retraction notices. It is expected that

those publications retracted silently may have attracted more post-retraction citations than those retracted explicitly through retraction notices. However, this speculation has not yet been corroborated systematically with quantitative data.

Paywalled retraction notices are those that are monetized and thus inaccessible without payment. Paywalling retraction notices violates the COPE retraction guideline that retraction notices should "be freely available to all readers (i.e., not behind access barriers or available only to subscribers)" (COPE Council, 2019, p. 3; Wager et al., 2009, p. 2). Many studies have reported the prevalence of paywalled retraction notices. For instance, a paywall denied free access to 23.4% of the 184 retraction notices published between 1991 and 2015 in the surgical literature indexed in PubMed (King et al., 2018). Although the COPE retraction guidelines recommend that retracted publications be clearly identified (e.g., watermarked as "RETRACTED") to highlight their status of retraction, this has not become a universal practice. Of the 22,729 retracted publications archived by the RWDB as of 31 December 2019, 1,415 had paywalled retraction notices, and the accessibility of another 219 remained unknown. Paywalled retraction notices and unmarked retracted publications may prevent academics from becoming aware of the retractions and thus may contribute to post-retraction citations.

To avoid positive citations to retracted publications, researchers should above all be aware of their status of retraction. Since researchers usually rely on journal websites and specialized indexing databases in search for relevant literature, incomplete and inaccurate annotation and non-annotation of the core retraction-related publications (i.e., retracted publications and retraction notices) would lead them to misidentify and cite retracted publications as valid literature. Unfortunately, however, as the annotation of retracted publications requires time and resources, retracted publications may not be annotated timely or even mis-annotated, especially when they are not marked off from other types of publications by academic journals in the first place. As reported in many studies (e.g., Decullier et al., 2013; Rosenkrantz, 2016; Steen, 2011c), up to one-third of retracted publications are not marked, and a small proportion are even deleted. Retraction notices are not included in the table of contents of some journals (Yank & Barnes, 2003). Twenty percent of the retracted publications on non-publisher websites remain unmarked, so do 80% of those in personal repositories (Davis, 2012; Rosenkrantz, 2016). More seriously, retracted publications and retraction notices may be annotated inconsistently. As reviewed by Schmidt (2018), many studies on retraction (e.g., Amos, 2014; Davis, 2012; Foo, 2011; Furman et al., 2012; Grieneisen & Zhang, 2012; Steen, 2011a, 2011b; Stretton et al., 2012; Wager & Williams, 2011) drew on data from PubMed and/or WoS and used the publication types of *Retraction Notice* and *Retracted Publication* to search for data. However, apart from those two publication types, various other relevant

publication types are used, such as *Published Erratum*, *Corrected and Republished Article*, and *Duplicate Publication* in PubMed and *Correction*, *Addition* and *Correction* in WoS. PubMed started establishing retracted publications and retraction notices as unique publication types in 2002 (NLM, 2002), WoS (2018) did so as late as in 2018, and ScienceDirect and Scopus had not made such a move even by 2018 (ScienceDirect, 2018). Retracted publications were reported to be erroneously annotated as retraction notices in WoS (Furman et al., 2012). Retraction notices may be indexed in WoS without indicating the titles of retracted publications when they are titled as such in journals in the first place (e.g., Poe, 2006; Shafer, 2016).

Retraction notices should be "published promptly to minimise harmful effects", as recommended by the two sets of COPE retraction guidelines (COPE Council, 2019, p. 3; Wager et al., 2009, p. 2). The tardiness of retraction (Wray & Andersen, 2018) means longer circulation of false works, and thus "increase[es] opportunity for them to be read, cited, and to steer the work of other researchers in unproductive directions" (Craiga et al., 2020, p. 5). The publication-to-retraction time lag varies due to various factors, such as disciplinary practices, time windows, retraction reasons, and even the professional status of people involved in misconduct. As reported by Vuong (2019c), three publications were retracted right on the day when they were published, whereas an article published in 1923 was retracted almost 80 years later in 2003. The process of retraction is time-consuming (Bar-Ilan & Halevi, 2018), especially when misconduct is involved (Barbour et al., 2017). Retraction due to fabrication or falsification took 2.0–2.8 times longer than retraction due to plagiarism did (Dal-Ré & Ayuso, 2019). The publication-to-retraction time lag averaged 79 months when the retraction was due to misconduct by senior researchers; in contrast, the lag was only 22 months when the retraction was due to misconduct by junior researchers (Trikalinos et al., 2008). The publication-to-retraction time lag was reported to increase over the years in a couple of studies (e.g., Steen, 2011c), but the majority of studies found that the publication-to-retraction time lag had decreased over the years (e.g., Foo & Tan, 2014; Furman et al., 2012; Pantziarka & Meheus, 2019; Redman et al., 2008; Shema et al., 2019; Singh et al., 2014; Steen et al., 2013). For example, Dal-Ré and Ayuso (2019) reported that the time span between publication and retraction due to misconduct during the period 2006–2018 was statistically shorter than that during the period 1970–2000. The decrease in the publication-to-retraction time lag may indicate improvement in the effectiveness of retraction as a mechanism for correcting the literature. However, the average publication-to-retraction time lag for 4,871 retracted publications published between 1959 and 2018 and indexed in PubMed was about 46.8 months (Dinh et al., 2019), which is long enough for some of the retracted publications to be widely

circulated and cited. Even worse, in some cases (e.g., Elia et al., 2014; Friedman, 1990), not all problematic publications were retracted even when misconduct was confirmed.

According to the two sets of COPE retraction guidelines (COPE Council, 2019; Wager et al., 2009), retraction reasons should be disclosed in retraction notices. The COPE proposal for disclosing retraction reasons is echoed by science journalist Oransky (2015) and many scholars (e.g., Atlas, 2004; Cox et al., 2018; Teixeira da Silva & Al-Khatib, 2019). Disclosure of retraction reasons was even adopted as a criterion for assessing the quality of retraction notices (Bilbrey et al., 2014), highlighting the importance of such disclosure in correcting the literature. However, retraction reasons cannot be found in all retraction notices. The percentage of retraction notices that do not disclose retraction reasons varies considerably: less than 5% (e.g., Decullier & Maisonneuve, 2018; Stretton et al., 2012), less than 10% (e.g., Bozzo et al., 2017; Decullier et al., 2013; King et al., 2018; Moylan & Kowalczuk, 2016; Rai & Sabharwal, 2017; Resnik & Dinse, 2013; Singh et al., 2014; Steen, 2011c; Vuong, 2019c; Wager & Williams, 2011), more than 10% (e.g., Grieneisen & Zhang, 2012; Nath et al., 2006), over 20% (e.g., Bilbrey et al., 2014; Huh et al., 2016), and even over 30% (e.g., Fang et al., 2012). Retraction reasons remained unknown for approximately 41% (n = 8,736) of the 22,729 retracted publications archived by the RWDB as of 31 December 2019. If all the 6,880 retracted publications from the IEEE whose retraction reasons were not disclosed are excluded, the rate was approximately 12%. In the Retraction Watch blog, retraction notices not disclosing retraction reasons are categorized as "unhelpful retraction notices" (Oransky, 2015, para. 1). More often than not, the body text of a retraction notice is but one short sentence, saying "This article has been retracted" (e.g., Anonymous, 2011, p. 2798). Even when disclosed, retraction reasons may be communicated in too vague language to be clearly identified (e.g., Levin & Stevens, 2013; Steen, 2011b). Even worse, an retraction notice may have just a title but no body text (e.g., Anonymous, 2008). Without knowing the retraction reasons, researchers may be inclined to cite retracted publications positively especially when they mistakenly attribute the retraction to ethical issues (e.g., authorship issues, redundant publication, and plagiarism) rather than scientific issues (e.g., data fabrication/falsification and unreliable data/findings).

In summary, the inadequate effectiveness of the mechanism of retraction can be attributed to two major factors, namely the lack of prompt visibility and accessibility of retraction notices and the sanctions on retraction. As discussed in this section, the first factor may result from retraction without announcement, paywalled retraction notices, incomplete and/or inaccurate annotation of retraction-related publications, a prolonged publication-to-retraction time lag, and lack of transparency about retraction reasons. Sanctions on retraction, tangible or intangible, may deter not only potential offenders from committing research and

publication misconduct, which is good, but also keep *de facto* offenders from proactively retracting their problematic publications, which is bad. In addition to trying to avoid the tangible sanctions on retraction, as discussed in Section 1.2.4, authors of retracted publications and other retraction stakeholders may be reluctant to retract flawed publications due to the intangible sanction on retraction, that is, the stigmatizing nature of retraction, as discussed briefly in the next section and more fully in Chapter 2.

1.2.6 The stigmatizing nature of retraction

Apart from incurring tangible punishment on authors of retracted publications, retracted publications and retraction notices tend to be stigmatized (Baskin et al., 2017; Enserink, 2017; Glass & Flier, 2017; Hosseini et al., 2018; Smart, 2018; Teixeira da Silva & Al-Khatib, 2019; van Noorden, 2011; Vuong, 2019b). Stigmatizing retraction causes reputational damage to authors of retracted publications, journal authorities (Teixeira da Silva, 2017; Teixeira da Silva & Al-Khatib, 2019), and home institutions of authors of retracted publications (Horbach et al., 2019). Since reputation as a currency for academics (Partha & David, 1994) cannot be restored once lost (Bean, 2017), "the stigma associated with retraction may make the literature harder to clean up" (Brainard et al., 2018, p. 393). Specifically, scientists tend to perceive retractions as "dirty secrets" (Gewin, 2014, p. 389) and thus may feel deterred from proactively admitting their fault and self-correcting the literature (Kullgren & Carter, 2015). As revealed by researchers with a record of retraction due to honest error, perceptions of a retraction stigma hinders efforts to self-correct the literature (Hosseini et al., 2018). Journal authorities may see retraction as damage to their journal reputation (Alrawadieh & Zareer, 2019; Coudert, 2019; Katavic, 2014, p. 218), especially in cases of frequent high-profile retractions, and thus may choose not to handle cases of retraction actively (Castillo, 2014). Moreover, home institutions of authors of retracted publications may worry about the tarnishing of their image by their employees' retraction of publications and thus opt to act uncooperatively in investigating alleged retraction-engendering misbehaviors. Perceptions of retraction stigma have been widely reported by retraction researchers, at least one of whom is known to have a record of retraction [10]. However, it remains unknown to what extent other retraction stakeholders (e.g., authors of retracted publications, journal authorities, fellow researchers, and the general public) would have such perceptions.

The stigmatization of retraction can be attributed to various perceptions and practices. It is a common belief that authors of retracted publications must be held responsible, regardless

[10] Since the incident of his retraction, the researcher has become active in researching academic publishing and published a considerable number of opinion and research articles on retraction, many of which are widely cited.

of the specific retraction reasons (Ranjan, 2018). Retraction due to misconduct has a spill-out effect, which "casts a long shadow that clouds all other accomplishments" (Bean, 2017, p. 917). Retraction due to honest error tends not to be distinguished from retraction due to misconduct (Teixeira da Silva, 2017), probably because misconduct accounts for most cases of retraction (Campos-Varela & Ruano-Raviña, 2019; Fang et al., 2012). Moreover, retraction is seen as a widespread sign of failure for the peer review system and the current model of academic journal publishing (Benson, 2015; Jamie A. Teixeira da Silva, 2015; Teixeira da Silva, 2016). The retraction stigma is further reinforced by a lack of transparency of retraction notices in disclosing retraction reasons (Resnik & Dinse, 2013; van Noorden, 2011) and by adopting the annotation label "research misconduct article" in the Korea Citation Index (Park et al., 2018). Hard-line approaches to curbing the causes of retraction also play an important role in stigmatizing retraction. Foo and Tan (2014) even call for publishing online "a shame list" (p. 208) of authors of retracted publications and their home institutions to help deter potential misconduct and reduce retraction. Moreover, emerging watchdogs of academic integrity (e.g., Retraction Watch and PubPeer) "employ a variety of different shaming techniques" in their active participation in the movement of post-publication peer review (Didier & Guaspare-Cartron, 2018, p. 166) and are consequently accused of creating a shaming environment for correcting the literature (Teixeira da Silva & Al-Khatib, 2019).

Despite the existence of a retraction stigma, there is broad agreement that retraction should not be a retaliatory action but rather a means of ensuring the transparency and integrity of the literature (Cagney et al., 2016; Wager, 2015; Wager et al., 2009). Some commentators believe that destigmatizing retraction can not only help clean up the literature (Teixeira da Silva & Al-Khatib, 2019) but also encourage young researchers, "who are prone to mistakes", to uphold "a proactive attitude to endure in science" (Vuong, 2019a; cited in Vuong, 2019b, p. 10). Accordingly, solutions have been proposed to destigmatize retraction. The first destigmatizing strategy is to be transparent about retraction reasons (Gewin, 2014; Katavic, 2014; Vuong, 2019b) and distinguish between honest error and misconduct (Wager et al., 2009) because retraction due to misconduct damages authors' reputation more seriously than retraction due to honest error does (Azoulay et al., 2017; Harms et al., 2018; Shuai et al., 2017; Singh et al., 2014; van Noorden, 2011).

Another proposal is that self-retraction (Fanelli, 2016; Hosseini et al., 2018) "should not be stigmatized or penalised" (Jawaid, 2018, p. 2) and that a reward program should be established to encourage self-report of errors (Teixeira da Silva & Al-Khatib, 2019). As part of the destigmatizing effort, proactive self-retraction should be recognized as a "heroic act" (Vuong, 2019b, p. 5) and "virtuous retraction" (Fanelli et al., 2018, p. 5). This proposal is

supported by the research finding that those who self-retracted their publications did not lose out on citations to their earlier valid research, whereas those who failed to do so lost up to 12.5% of citations per year per paper after retraction (Lu et al., 2013). Notably, Fanelli's (2016) proposal to set up a "self-retraction" system for honest errors was supported by over 90% (n = 446) of the 494 respondents in an online poll conducted at the Retraction Watch blog as of 30 May 2020 (McCook, 2016b) [11]. Although publications might be retracted pre-emptively to avoid an allegation or exposure of misconduct (Jaime A. Teixeira da Silva, 2015), the risk is outweighed by the benefits of pro-active retraction (Fanelli et al., 2018).

A third proposal is to allow the republication of retracted publications (Heckers et al., 2015), which has been put into practice by some publishers and journals (McCook, 2016c). However, self-retraction and retraction-and-republication as retraction mitigators could be abused by journal authorities (Teixeira da Silva, 2017), as evidenced by the retraction of a republished retracted publication (McCook, 2017c). Apparently, such retraction mitigators are as likely, if not more, to be abused by authors of retracted publications as by journal authorities. The most recent proposal is to avoid using the word *retraction* and replace with it new terms, as well as reduce the use of it. For instance, Enserink (2017) redefined *withdrawal* and introduced a few new terms (i.e., *retired*, *cancelled*, *self-retraction*, and *removal*) in an attempt to destigmatize retraction. Differently, Barbour et al. (2017) recommended renaming *corrections* and *retractions* as *amendments* to separate correction of the literature from investigation into misconduct. Such a practice is expected to accelerate the correction of the literature by avoiding the use of the stigmatizing labels "corrections" and "retractions". More recently, Fanelli et al. (2018) proposed a comprehensive taxonomy of editorial options for amending the academic literature, which restricts the application of retraction to only cases of proven misconduct to help destigmatize other editorial options.

1.3 The Research Problem of the Study

Stigma is a universal human phenomenon (Link et al., 2004; Smith, 2007a; Yang et al., 2007). Since the publication of Goffman's (1963/1990) seminal book *Stigma: Notes on the Management of Spoiled Identity*, research interest in stigma has seen a dramatic increase (Bresnahan & Zhuang, 2016; Link & Phelan, 2013). Stigma research has covered a wide range of social topics, such as health-related issues (e.g., obesity, smoking, mental illness, and HIV/AIDS), financial issues (e.g., bankruptcy and poverty), family and relationship issues (e.g., singlehood, voluntary childlessness, and sexual orientation), the uptake of social benefits (e.g.,

[11] The online poll was conducted through a post in the Retraction Watch blog in 2016 and remained available for voting on 30 May 2020.

Medicaid and public housing), place/territory (e.g., neighbourhood and inner-city community), and crime (e.g., incarceration and sexual assault) (Pescosolido & Martin, 2015). Stigma research has also investigated occupations (Ashforth et al., 2007; Halter, 2008), organizations (Devers et al., 2009), and even common human behaviors like breastfeeding in public (e.g., Bresnahan et al., 2019; Grant, 2016; Sheehan et al., 2019; Xu et al., 2016). Despite their wide applications to various social phenomena, stigma theories have never been adopted to explore the high-stakes phenomenon of retraction. On the one hand, as observed by Hesselmann et al. (2017), the phenomenon of retraction has not yet caught the attention of sociologists of science. On the other hand, perceptions of retraction as stigmatizing are widespread in the academic community (e.g., Coudert, 2019; Enserink, 2017; Glass & Flier, 2017; Hesselmann et al., 2017; Hosseini et al., 2018; Hu & Xu, 2020; Jawaid, 2018; Marcus & Oransky, 2017; Smart, 2018; Teixeira da Silva & Al-Khatib, 2019; van Noorden, 2011; Vuong, 2019b; Xu & Hu, 2018, 2021). Teixeira da Silva and Al-Khatib (2019) created the term *retraction stigma* but did not go further to define it and elaborate on its underlying theoretical constructs.

Retraction as a mechanism for correcting the academic literature indicates the inadequate effectiveness and competence of the pre-publication gatekeeping of academic publishing, which is attributable to human factors at both individual and institutional levels. However, as a remedial endeavour to curb research and publishing malpractices, retraction should be perceived and responded to positively. Therefore, investigating retraction through the theoretical lens of stigma can not only highlight retraction as a negative consequence of individual academics' disgracing violations of academic norms but also uncover the academic community's perceptions, attitudes, and responses to the phenomenon of retraction. The mechanism of retraction functions through retraction notices in most cases, and retraction notices are intended to serve two global communicative purposes, namely correcting the literature (COPE Council, 2009; 2019) and (de-)stigmatizing individuals accountable for retraction. To develop a fuller understanding of the phenomenon of retraction, the two global communicative purposes of retraction notices should be investigated. However, most previous studies on retraction focused on examining the literature-correcting function of retraction notices mostly by identifying the scientometrical characteristics of retraction-related literature (e.g., retracted publications, retraction notices, and publications citing retracted publications). Consequently, those studies tended to be descriptive rather than explanatory, and the interpretations of their research findings were usually "more commonsensical than theoretically and empirically supported" (Hesselmann et al., 2017, p. 12). By contrast, the stigmatizing nature of retraction, which is often taken for granted but neglected in previous research on retraction, can be explored through research into retraction notices adopting stigma

as a theoretical lens. Informed by stigma theories, an investigation into retraction notices could reveal to us whether and how retraction is (de-)stigmatized through and in retraction notices, which could enhance our current understanding of the phenomenon of retraction.

Drawing on stigma theories (Goffman, 1963/1990; Heatherton et al., 2000; Jones et al., 1984; Meisenbach, 2010; Smith, 2007a) and informed by research on retraction (e.g., Azoulay et al., 2015; Fang et al., 2012; Grieneisen & Zhang, 2012; Hesselmann et al., 2017; van Leeuwen & Luwel, 2014; Wager & Williams, 2011) and retraction notices (Hu & Xu, 2020; Xu & Hu, 2018, 2021), this study establishes retraction stigma as its central theoretical concept, which is defined as the discrediting evaluation of the professional competence and academic ethics of individuals held responsible for retraction. Specifically, retraction stigma is conceptualized through a comprehensive analysis of its seven core dimensions (i.e., concealability, course, disruptiveness, aesthetics, origin, peril, and collectivity) and its functional justifications at both social and psychological levels. The concept of retraction stigma is further theorized through a delineation of its various stakeholders and communication mechanism and then enriched through an in-depth analysis of various stakeholders' potential attitudes to and involvement in retraction stigma communication.

Adopting retraction stigma as its theoretical framework, this study aims to explore how retraction stigma is communicated linguistically and rhetorically in retraction notices. Specifically, this study focuses on examining how linguistic and rhetorical resources are utilised in retraction notices to (de-)stigmatize authors of retracted publications. To this end, guided by the theoretical framework and informed by previous research on retraction and retraction notices, four analytical frameworks are developed to investigate the rhetorical and linguistic resources used in retraction notices to communicate retraction stigma, namely strategies for constructing retraction stigma, strategies for managing retraction stigma, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction. Given the context-specific nature of stigma as a social phenomenon (Hebl & Dovidio, 2005; Jones et al., 1984; Major & O'Brien, 2005; Pescosolido & Martin, 2015; Stafford & Scott, 1986), this study also investigates whether use of the rhetorical strategies (i.e., content cues) and linguistic resources would be influenced by four contextual factors, namely retraction period, academic discipline, retraction notice authorship, and retraction reason. Methodologically, this study focuses on retraction notices in which only authors of retracted publications are identified as being accountable for retraction because fault by authors of retracted publications accounts for the vast majority of retractions, as revealed by research on retraction (Grieneisen & Zhang, 2012; van Leeuwen & Luwel, 2014; Xu & Hu, in press; Zhang et al., 2020) and the RWDB (the most inclusive and the largest specialized

database on retraction in the world). More specifically, drawing on a large-scale specialized corpus of retraction notices, this study seeks to address two overarching research questions:

1) What rhetorical strategies and linguistic resources are used in retraction notices to communicate retraction stigma?
2) Does the use of those rhetorical strategies and linguistic resources in retraction notices vary by retraction period, academic discipline, retraction notice authorship, and retraction reason?

1.4 Significance of the Study

By fulfilling its research objectives and addressing the overarching research questions introduced in the preceding section, the present study has the potential to make the following four major contributions.

First, the theoretical conceptualisation of retraction stigma and the empirical verification of hypotheses based on it through a multidimensional linguistic analysis of retraction notices can not only expand the applicability of stigma theories to a wider array of social phenomena but also deepen our understanding of the phenomenon of retraction. While a large number of the extant studies on retraction were conducted, most of them, especially scientometric ones, were purely descriptive (Hesselmann et al., 2017), and only a few investigations into retraction were informed by theories, including theory of deviance (Hesselmann et al., 2017) and image repair theory (Hu & Xu, 2020; Xu & Hu, 2021). Despite their application to a wide range of social phenomena, stigma theories have never been adopted to investigate the phenomenon of retraction. An empirical investigation into retraction notices through the conceptual lens of retraction stigma can enable us to understand how and why rhetorical strategies and linguistic resources are utilized purposefully to handle the complex issue of retraction. In other words, retraction stigma can provide a particularly revealing window onto the psychology of the immediate stakeholders of retraction as well as the larger academic community's attitudes and responses to the gnawing phenomenon.

Second, all the four analytical frameworks adopted in the present study can be used to analyze the communication of not only retraction stigma but other types of stigma as well. Neither the model of stigma communication (Smith, 2007a) nor the theory of stigma management communication (Meisenbach, 2010) has much to say about how the construction and management of stigma is realized at the linguistic level. To fill the lacuna, one analytical framework proposed in this study identifies various grammatical means that can be used to assign agency/responsibility for retraction-engendering acts, and a second one focuses on how evaluative language resources can be used to communicate different retraction-related attitudes in retraction notices.

Third, the present examination of the relationship between the four contextual factors (i.e., academic discipline, retraction reason, retraction notice authorship, and retraction period) and retraction stigma communication can further our understanding of retraction as an ethical phenomenon and of retraction notices as a high-stakes academic genre. What such an examination reveals can provide the academic community with valuable implications for handling retraction properly and effectively. It may also inspire future investigations into other possible contextual factors (e.g., journals and publishers' cultural backgrounds and experiences of handling retractions) that may influence the production of retraction notices and the handling of retraction.

Last but not least, this study is expected to yield useful information for both readers and authors of retraction notices. The analytical frameworks and the prospective research findings of the study can raise retraction notice readers' and authors' awareness of the important role that language plays in retraction stigma communication via retraction notices. More importantly, if the stigmatizing force of retraction notices is found to be manipulatable through the identified rhetorical strategies and linguistic resources, those who may need to produce retraction notices can apply or adapt the analytical frameworks and the research findings in their production of retraction notices to better fulfil their prioritized communicative purposes.

1.5 Overview of the Thesis

This thesis consists of six chapters. This introductory chapter has provided the research background for the present study. The first section of the chapter presented a bird's-eye view of various problems with the current academic journal publishing system and ended with a brief introduction to the efforts that are made both before and after publication to ensure the integrity of the academic literature. The second section of the chapter focused on the phenomenon of retraction and introduced retraction as a major post-publication mechanism for correcting the literature and ensuring its integrity. Specifically, the section started with an introduction to the prevalence, high-profile cases, and consequences of the phenomenon of retraction, followed by a discussion on how retraction works as a self-correcting mechanism and what global retraction criteria have been available. Next, it summarized the adverse consequences of retraction exclusively for authors of retracted publications, analyzed the reasons for the questioned efficiency of retraction as a mechanism, and discussed the stigmatizing nature of retraction and retraction notices. The chapter then delineated the research problem of this study and concluded by highlighting the significance of the study.

Following the brief discussion about the stigmatizing nature of retraction in the first chapter, the second chapter of this thesis introduces retraction stigma and its communication via retraction notices as a theoretical framework guiding the whole research project and then

proposes four analytical frameworks for analyzing how retraction stigma is communicated rhetorically and linguistically in retraction notices. The third chapter reviews three major lines of retraction research, namely scientometrical examination of retracted publications and the mechanism of retraction, linguistic research on retracted publications and retraction notices, and sociological investigation into the phenomenon of retraction. Based on the research gaps identified through the literature review, four sets of eight specific research questions on four dimensions of retraction stigma communication via retraction notices (i.e., retraction stigma construction strategies, retraction stigma management strategies, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction) are formulated at the end of the chapter. The fourth chapter introduces the research design of the study and provides a detailed account of data collection, corpus construction, data coding, and data analysis. The fifth chapter presents and discusses the research findings addressing the four sets of research questions, followed by a holistic qualitative analysis of a mini corpus of retraction notices to sketch a miniatured panoramic view of retraction stigma communication via retraction notices. The sixth chapter concludes the thesis by recapping the major research findings of the study, highlighting its theoretical, empirical, methodological, and practical contributions, pointing out its limitations, and providing suggestions on future research on retraction stigma.

CHAPTER II: THEORETICAL AND ANALYTICAL FRAMEWORKS

This chapter introduces the theoretical and analytical frameworks adopted in this study. Drawing upon stigma theories and relevant research on retraction, the chapter first proposes retraction stigma as a central theoretical concept and develops a theoretical framework centring on the concept for the present study. The framework defines retraction in terms of the core characteristics of stigma, presents the core dimensions of retraction stigma, discusses its intended and perceived functions, identifies stakeholders of retraction stigma, explains the mechanism of retraction stigma communication, and discusses stakeholders' attitudes towards retraction stigma communication. Based on this theoretical framework and informed by relevant research on retraction, the chapter proposes four complementary frameworks for analysing how retraction stigma is communicated in retraction notices through various rhetorical strategies and linguistic resources.

2.1 Retraction Stigma as a Theoretical Framework

This section posits the concept of retraction stigma by conceptualising retraction as the stigmatizing violation of research and publications norms, explicates seven core dimensions of retraction stigma, and explores its functionality. It also identifies various stakeholders of retraction stigma, explains how retraction stigma is communicated through retraction notices, and concludes with a discussion about reasons for core retraction stakeholders' potentially varying uses of retraction stigma power [12].

2.1.1 Defining retraction stigma

Stigma is defined by Goffman (1963/1990) as "an attribute that is deeply discrediting" (p. 13) and "the situation of the individual who is disqualified from full social acceptance" (p. 9). It occurs when an individual's "actual social identity" (i.e., the attributes manifested by actual behaviors) does not match his/her "virtual social identity" (i.e., the attributes supposed to be demonstrated through behaviors) (p. 12). Similarly, Stafford and Scott (1986) define stigma as a human characteristic (i.e., behavior, belief, and status) that violates a given social norm, a commonly recognized and shared belief about the way of doing things in certain circumstances (Blake & Davis, 1964; Gibbs, 1965; Homans, 1974; Morris, 1956), leading to social disqualification and discreditation.

Retraction results from a severe violation of the research and/or publication norms upheld by the academic community. Research fraud is identified by Ben-Yehuda and Oliver-Lumerman (2017) as deviance in science, that is, violation of scientific norms. As proposed by

[12] The content of this section had been published as Xu and Hu (2022b) before this thesis was submitted.

Resnik (1998/2005), scientists are expected to maintain the following 12 standards of ethical conduct in science:

1) Honesty

   Scientists should not fabricate, falsify, or misrepresent data or results. They should be objective, unbiased, and truthful in all aspects of the research process.

2) Carefulness

   Scientists should avoid errors in research, especially in presenting results. They should minimize experimental, methodological, and human errors and avoid self-deception, bias, and conflicts of interest.

3) Openness

   Scientists should share data, results, methods, ideas, techniques, and tools. They should allow other scientists to review their work and be open to criticism and new ideas.

4) Freedom

   Scientists should be free to conduct research on any problem or hypothesis. They should be allowed to pursue new ideas and criticize old ones.

5) Credit

   Credit should be given where credit is due but not where it is not due.

6) Education

   Scientists should educate prospective scientists and insure that they learn how to conduct good science. Scientists should educate and inform the public about science.

7) Social Responsibility

   Scientists should avoid causing harms to society and they should attempt to produce social benefits. Scientists should be responsible for the consequences of their research and they should inform the public about those consequences.

8) Legality

   In the process of research, scientists should obey the laws pertaining to their work.

9) Opportunity

   Scientists should not be unfairly denied the opportunity to use scientific resources or advance in the scientific profession.

10) Mutual Respect

    Scientists should treat colleagues with respect.

11) Efficiency

    Scientists should use resources efficiently.

12) Respect for Subjects

Scientists should not violate rights or dignity when using human subjects in experiments. Scientists should treat non-human, animal subjects with appropriate respect and care when using them in experiments. (numbering and bolding added and italicised in original, pp. 48-61)

Closely related to the above 12 standards of ethical conduct in science, nine international standards for scholarly publishing were proposed by Wager and Kleinert (2011) at the 2nd World Conference on Research Integrity, Singapore in 2010, namely soundness and reliability, honesty, balance, originality, transparency, appropriate authorship and acknowledgement, accountability and responsibility, adherence to peer review and publication conventions, and responsible reporting of research involving humans or animals [13]. Similar standards are also upheld in governmental policies that define research misconduct and scientific integrity (e.g., OSTP, 2000). Notably, those standards of ethical conduct in research and publishing have been incorporated into COPE's retraction guidelines (COPE Council, 2019; Wager et al., 2009) and procedure for handling issues regarding publishing ethics (COPE Council, 2020), which have been promoted and adopted world-wide.

The retraction reasons identified by numerous retraction studies (e.g., Fang et al., 2012; Grieneisen & Zhang, 2012; van Leeuwen & Luwel, 2014; Xu & Hu, in press) and those archived by the RWDB violate seven of Resnik's 12 standards of ethical conduct in science (i.e., honesty, carefulness, credit, social responsibility, legality, mutual respect, and respect for subjects) and virtually all of Wager and Kleiner's nine standards for scholarly publishing (except balance). Among the identified retraction reasons, misconduct (i.e., data fabrication, data falsification, and plagiarism) accounts for most retractions (Brainard et al., 2018; Fang et al., 2012; Grieneisen & Zhang, 2012; Xu & Hu, in press). Thus, most retractions have resulted from violations of the norm of honesty. Being dishonest means being a liar, which is one of the "blemishes of individual character" in Goffman's (1963/1990, p. 14) classification of stigma (p. 14). Adopting Sherif and Sherif's (1953) group norm theory of attitudes, Crandall et al. (2002) conducted a large-scale survey study (N = 1,504) to measure the effects of social norms on the public expression of prejudice (i.e., perceived stigma) against 105 social groups, using a 2-point scale of mean prejudice acceptability scores (MPAS). It was found that liars (MPAS = 1.487, 17th) outranked both fat people (MPAS = 0.228, 70th) and people with AIDS (MPAS

[13] As one reviewer of the published article insightfully pointed out, it cannot be taken for granted that these standards are adhered to in actual research or publication. There is the question of "whether these standards guide every-day conduct or emerge only when problems and troubles occur." As the reviewer notes, "such behaviors as condescendence, insults, contempt, delegitimization, academic power-politics tactics all do happen - sometimes in the 'invisible college' - outside issues of retractions and are not explicitly or directly forbidden by different ethical standards.

= 0.227, 71st) by a huge margin. Given that obesity and HIV/AIDS have been investigated as two different types of stigma in numerous studies (e.g., Bresnahan et al., 2016; Emlet, 2006; Mak et al., 2007; Maman et al., 2009; Puhl & Heuer, 2009, 2010; Simbayi et al., 2007; Turner et al., 2020; Wohl et al., 2013), there is good reason to posit the existence of retraction stigma anchored in dishonesty, among violations of other scientific norms. The postulation of retraction stigma is also based on many scientists' advocacy of incriminating research fraud (e.g., Hadjiargyrou, 2015; Redman & Caplan, 2005, 2015) and the general public's perception that "both data fraud and selective reporting are morally wrong" (Pickett & Roche, 2018). Given what is presented above, retraction stigma is defined as a discrediting evaluation of the professional competence and academic ethics of (individual and institutional) entities held responsible for retraction.

2.1.2 Seven core dimensions of retraction stigma

Previous theorising on stigma has conceptualised the construct in terms of seven core dimensions, namely concealability, course, disruptiveness, aesthetic qualities, origin, peril, and collectivity, with the first six dimensions proposed by Jones et al. (1984), and the last one by Dovidio et al. (2000). All these seven dimensions, represented in Figure 2.1, are applicable to retraction stigma, as defined and delineated below.

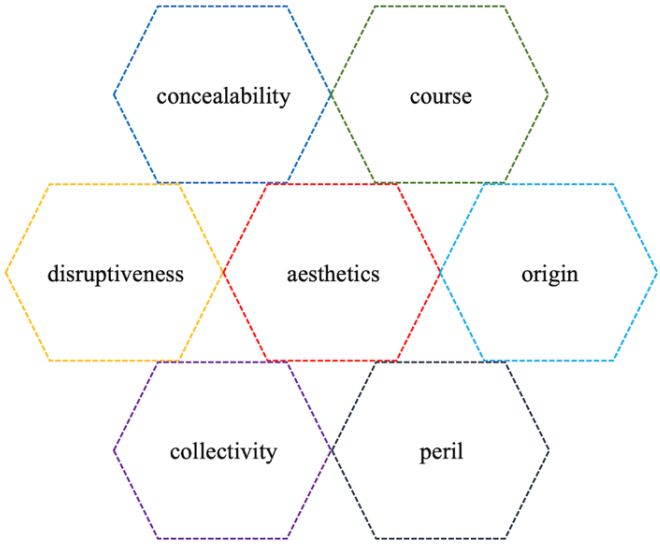

Figure 2.1 *Seven core dimensions of retraction stigma*

Concealability refers to the extent to which the stigmatized mark is visible, and its visibility can be controlled (Jones et al., 1984). The mark of retraction stigma is the retraction status of publications. Unlike "abominations of the body" (e.g., physical abnormalities) and "the tribal stigma" (e.g., membership in racial, ethnic, and religious out-groups) in most cases (Goffman, 1963/1990, p. 14), the mark of retraction stigma is not visibly carried by its bearers (i.e., those who committed retraction-engendering acts). Although retracted publications

indicate their culpable authors' "blemishes of individual character" (Goffman, 1963/1990, p. 14), the public connection of these retracted publications to their culpable authors can be manipulated and, consequently, the mark of retraction stigma can be concealed to varying extents.

On a macro level, retraction as a mechanism renders scientific misconduct visible in and beyond the academic community (Hesselmann et al., 2017). In most cases, retractions are publicised through official announcements (i.e., retraction notices) published in academic journals. As a result, the concealability of retraction has been decreasing as the academic community is paying more and more attention to the phenomenon of retraction. It has become an increasingly common practice that retracted publications and retraction notices are indexed and annotated in various databases (e.g., WoS, PubMed, and RWDB). Currently, the RWDB, the most comprehensive cross-disciplinary database of retracted publications and retraction notices published worldwide, archived 23,896 retracted publications by 31 December 2020. Retraction-related information made publicly and freely accessible in the RWDB includes retracted publication titles, names of authors of retracted publications, their geographic locations and affiliations, journal and publisher names, publication dates of retracted publications and retraction notices, retraction reasons, among others. Of the retracted publications documented by the RWDB as of 31 December 2020, only 5.8% (n = 1,389) restricted public access through their paywalled retraction notices. More and more behind-the-scenes information on retraction has been disclosed on watchdog platforms (e.g., Retraction Watch and PubPeer), and high-profile retractions may even have been covered in mass media. Many of the retracted publications are watermarked "RETRACTED" usually in red to indicate their status of retraction. Notably, the reference management software EndNote recently has introduced the function of automatically notifying its users of retracted publications in their EndNote libraries (EndNote, 2021). These developments have made it more difficult to conceal the mark of retraction stigma.

On a micro level, however, there is still much room for manipulating the mark of retraction and its visibility. For instance, in contrast to the active promotion of their publications, researchers have rarely been seen publicising their records of retraction in their resumes (Teixeira da Silva et al., 2020), social media (see Conroy, 2020, for exceptions), or on academic networking platforms. According to the RWDB, as of 31 December 2020, approximately 39% (n = 9,250) of its archived retracted publications were retracted without retraction notices or with retraction notices disclosing no or limited information on the retraction reasons. Similarly, numerous studies (e.g., Bilbrey et al., 2014; Fang et al., 2012; Grieneisen & Zhang, 2012; Huh et al., 2016; Moylan & Kowalczuk, 2016; Rai & Sabharwal,

2017; Vuong, 2019c) have reported that retraction reasons are found missing from a considerably number of retraction notices. Furthermore, as frequently reported in the literature (e.g., Abritis, 2015; Azoulay et al., 2017; Cox et al., 2018; Craiga et al., 2020; Hesselmann et al., 2017; Moylan & Kowalczuk, 2016; Jaime A. Teixeira da Silva, 2015; Vuong, 2019b), retraction notices are characterised by brevity, uninformativeness, vagueness, use of euphemisms, and ambiguous wording. More tellingly, agents of retraction-engendering acts could not be identified in 56% of the 250 retraction notices examined by Hu and Xu (2020), and even the entities responsible for retraction could not be determined for 135 (1.8%) of the 7,650 retraction notices analyzed by Xu and Hu (in press).

Course refers to the mark's "pattern of change over time" and its "ultimate outcome" (Jones et al., 1984, p. 24) As recommended by the COPE flowcharts (COPE Council, 2020) and noted by Xu and Hu (2021), suspected problems with publications may be reported to journal authorities and/or their authors, and the publications should subsequently be retracted once the suspicions are confirmed. Publications corrected for minor errors through errata and corrigenda may end up being retracted when retraction-engendering problems are detected and confirmed later. The RWDB documented 237 such cases as of 31 December 2020. An EoC may be issued before allegations of retraction-engendering acts are confirmed. Once the allegations are confirmed, the issued EoC may be superseded with a retraction notice. According to the RWDB, EoCs were issued to 854 publications as of 31 December 2020. Publications with alleged problems may first be withdrawn from publishing platforms and then restored when non-substantial changes are made. Such a practice is termed "temporary removal" by the RWDB, which archived 68 temporal removals as of 31 December 2019. In general, retractable publications take a long time to be detected and retracted (Bar-Ilan & Halevi, 2017; Dal-Ré & Ayuso, 2019; Dinh et al., 2019; Wray & Andersen, 2018).

Once a publication is retracted, its status of retraction is rarely revoked unless post-retraction evidence proves that the retracted publication is actually valid. In their examination of 7,650 valid unique retraction notices indexed in WoS [14], Xu and Hu (in press) identified only two revocations of retraction. However, retraction may not be the death penalty for a problematic publication. For instance, some retracted publications may be republished after their retraction-engendering problems are addressed (Heckers et al., 2015; McCook, 2016c). The RWDB documented 308 cases of "retraction and replacement" as of 31 December 2020. It is not uncommon that one case of retraction may trigger a follow-up investigation into other publications of authors of retracted publications, which may result in additional retractions.

[14] See Section 4.2 for how those retraction notices were collected and the criteria for identifying valid unique retraction notices.

Consequently, repeat offenders (those with a record of more than one retraction) are found accountable for a majority of retractions (Grieneisen & Zhang, 2012; Lei & Zhang, 2018). It should also be noted that the course of retraction can be influenced by authors of retracted publications themselves. As reported by Xu and Hu (2021), some authors may proactively request a retraction, when they detect problems with their publications, or behave cooperatively in an investigation into their publications. By contrast, other authors may be uncooperative or unreachable in retraction-related investigations and even disagree to the retraction decision made by journal authorities.

Disruptiveness answers the question of whether the mark "block[s] or hamper[s] interaction and communication" (Jones et al., 1984, p. 24). Academic publications are intended for knowledge dissemination and academic communication. Since they are scientifically invalid and/or ethically flawed, retracted publications should not be cited, and subsequent studies should not be based on retracted research findings. In other words, retracted publications, together with publications citing them positively, may mislead subsequent research (Craiga et al., 2020), as evidenced by the case of Piero Anvers (Kolata, 2018; Lüscher, 2019; O'Riordan, 2019). Moreover, retractions may have undesirable spill-over effects; that is, they negatively affect citations to valid publications of authors of retracted publications (Azoulay et al., 2017). Retracted publications also distort academic metrics (Madlock-Brown & Eichmann, 2015; Teixeira da Silva & Dobránszki, 2018), thus undermining the reliability of metrics-based evaluation of research outputs. A publishing ban may be imposed on authors of retracted publications, as explicitly prescribed by Springer (n.d.), and its duration may vary from a few years (e.g., Salam, 2013; Williams & Wager, 2013) to even a lifetime (e.g., Mokhtari & Pourabdollah, 2014), which disturbs academic communication. Although publishing bans as sanctions on retraction go against the COPE retraction guidelines' explicit disapproval of punishment for misbehaving researchers (COPE Council, 2019; Wager et al., 2009), 70 publishing bans were issued as of 31 December 2019, according to the RWDB. Notably, it is not clear to what extent retraction has led to covert publishing bans. Last but not least, retracted publications disrupt academic communication by depriving competing manuscripts of the valuable and limited publishing opportunities.

Aesthetics refers to the extent to which "the mark makes the possessor repellent, ugly, or upsetting" (Jones et al., 1984, p. 24). Although Jones et al. (1984) view the aesthetic dimension as being more applicable to the human body-related stigma (e.g., deformity and disfigurement) than to human character-related stigma (e.g., liar and thief), it can be argued that the mark of retraction damages guilty authors' face (i.e., academic image) and make them repellent reputation-wise. Physically, retracted publications are often watermarked

"RETRACTED", usually in red, across all pages. The watermark, together with its derogatory connotation, explicitly and forcefully stains the image of the authors of retracted publications (e.g., Ji et al., 2019; Khan et al., 2015; Yao et al., 2019). Furthermore, photos of authors of retracted publications are often displayed in Retraction Watch blog posts (Marcus, 2020a, 2020b) to connect them with grave cases of academic misconduct. Such connections can make authors of retracted publications ethically "repellent, ugly, or upsetting" (Jones et al., 1984, p. 24).

Origin answers three questions about stigma: "Under what circumstances did the condition originate? Was anyone responsible for it and what was he or she trying to do?" (Jones et al., 1984, p. 24). In most cases, authors of retracted publications are agents of retraction-engendering acts (Grieneisen & Zhang, 2012; van Leeuwen & Luwel, 2014; Xu & Hu, in press), most of which are committed for short-term personal interests, such as an increase in the number of publications, coping with the publish-or-perish pressure, and attainment of tenure, promotion, and monetary rewards. Retraction-engendering acts are committed either intentionally as misconduct, which accounts for most retractions, or unknowingly as honest error, which leads to a small proportion of retractions, as reported in the literature (Fang et al., 2012; Grieneisen & Zhang, 2012; Xu & Hu, in press) and documented by the RWDB. In an investigation into 7,650 retraction notices, (Xu & Hu, in press) found that entities other than authors of retracted publications (i.e., journal authorities, joint entities [authors and journal authorities], and third parties) are also responsible for a considerable number of retractions and that in some cases either no entities were found at fault or the responsible entities could not be identified in the retraction notices due to their lack of transparency and informativeness.

Peril refers to the danger posed by the mark as well as its imminence and seriousness (Jones et al., 1984). Retracted publications are usually cited positively post-retraction (Rapani et al., 2020), which may result in retraction of citing publications, causing waste of limited academic resources (Budd et al., 1998; Marcus & Oransky, 2017) and distortion of academic metrics (Madlock-Brown & Eichmann, 2015; Teixeira da Silva & Dobránszki, 2018). Retracted research findings may mislead the advancement of science (Craiga et al., 2020) and lead the general public to mistakenly accept or refuse certain medical treatments and/or to form unscientific lifestyles (e.g., Abu-Omar, 2001; Godlee, 2011; Kotzin & Schuyler, 1989; Newman, 2010; Steen, 2011a). More seriously, retraction would erode public trust in science (Byrne, 2019) but also lead to junior researchers' loss of interest in science and consequent abandonment of it (Reich, 2009), both of which are detrimental to the sustainable development of science in general. Given such consequences, retractions pose a danger to the functioning and wellbeing of not only the academic community but also society at large.

Collectivity refers to "the extent to which a stigmatized mark is shared with other members of a group and is thus a social identity (*collective*) versus seen (by self or others) as a solely individual mark (*personal*)" (Major et al., 2018, p. 5; see also Dovidio et al., 2000). A case in point is the stigma associated with blacklisted artists during the "red scare" in Hollywood between 1945 and 1960 (Pontikes et al., 2010). Since the vast majority of retracted publications were co-authored (Brainard et al., 2018), the huge number of retracted publications archived in the RWDB and other databases would mean that thousands of researchers have a record of retraction. Researchers with a record of retraction tend to be perceived as a deviant group within the academic community and thus bear a collective rather than personal identity. Moreover, because of the prevalence due to misconduct (Fang et al., 2012; Teixeira da Silva & Al-Khatib, 2019), the accountable author of a retracted publication is often seen as one of those bad guys (or rotten apples) in science. Thus, authors of retracted publications are perceived as sharing something in common (i.e., grave violation of research and publication ethics) and consequently a collective identity. Notably, although bearers of some stigmas may form a social group to fight against the stigmas imposed on them (e.g., anti-racialism) (Jones et al., 1984), it is unlikely for authors of retracted publications to organize and engage in such self-protective group activities. Instead, researchers with a long list of retracted publications may be identified collectively through "a shame list" proposed by Foo and Tan (2014), as Retraction Watch (n.d.-b) does.

2.1.3 Functional justifications of retraction stigma

Potential origins of stigma have been uncovered by scholars (e.g., Cottrell & Neuberg, 2005; Fishbein, 2002; Kurzban & Leary, 2001; Neuberg et al., 2000), taking a social evolutionary approach and following three fundamental propositions formulated by Cottrell and Neuberg (2005):

> (a) Humans evolved as highly interdependent social beings; (b) effectively functioning groups tend to possess particular social structures and processes; and (c) individuals possess psychological mechanisms "designed" by biological and cultural evolution to take advantage of the opportunities provided by group living and to protect themselves from threats to group living. (p. 771)

Based on the assumption of reciprocity-based effective group living (i.e., dependence of effective group living on group members' sharing of effort, knowledge, and material resources), Neuberg et al. (2000) argue that stigmas follow one fundamental principle: ''People will stigmatize those individuals whose characteristics and actions are seen as threatening or hindering the effective functioning of their groups'' (p. 34). Accordingly, they identify three

types of stigma targets, namely non-reciprocators (e.g., thieves and the physically disabled), the treacherous (e.g., cheaters and traitors), and those who counter-socialise (e.g., homosexuals and heathens).

In the context of retraction, retracted publications affect the common good of the academic community and meaningful communication between academics, and authors of retracted publications can be justifiably discredited as selfish, treacherous exploiters who game the system of academic publishing merely for personal interests. Therefore, there is good reason to expect authors of retracted publications, especially those who have committed blatant misconduct, to be stigmatized within the academic community. In particular, journal authorities and home institutions of authors of retracted publications, as gatekeepers of academic integrity, would be highly motivated to deter potential retraction-engendering acts through the stigmatization of retraction (Hu & Xu, 2020). More importantly, stigma can arouse shame and guilt in the stigmatized (Ablon, 2002), and emotions such as guilt and shame often deter people from violating social norms (Elster, 1998). According to reintegrative shaming theory (Braithwaite, 1989), deviants will change to conform when shamed. As pointed out by Horwitz (1990), "informal sanctions are more powerful than formal ones because coercive social control is effective to the extent that it harms reputational status and social attachments" (pp. 224-225). This observation is supported by an experimental study (Brocas et al., 2021), which showed that people were significantly less likely to steal when shaming rather than punishment was introduced, suggesting that social image plays an important role in shaping people's decision-making and deterring selfish behaviors. Given that stigma can generate shame and guilt, which can function as a powerful deterrent, journal authorities could employ retraction stigma as a weapon to fight against potential retraction-engendering behaviors.

Since stigmatization is "a power-laden process" (Link & Phelan, 2001, p. 371) and because journal authorities are more powerful than authors of retracted publications throughout the process of academic publishing, it is within their purview to exploit retraction stigma when handling retractions for which authors of retracted publications are held accountable. Phelan et al. (2008) propose that stigmatization can enhance group or personal interest by serving three social functions, which are collectively conceptualised by Link and Phelan (2014) as stigma power, to enhance group or personal interest: (1) keeping people down (i.e., exploitation and domination through stigmatizing those with less power to maintain inter-group inequalities through denial of resources), (2) keeping people in (i.e., norm enforcement through deterring deviants from violating ingroup norms), and (3) keeping people away (i.e., disease avoidance through alerting group members to threats to group well-being). The most important goal of stigmatization, as argued by Dijker (2013), is "for those in power to maintain and legitimize

their position by publicly associating those that threaten their power and values with a bad reputation, and exposing them as 'bad examples' and objects of public punishment and denigration" (p. 23). To help fulfil their duty as gatekeepers of academic integrity, journal authorities are in a position to exercise the power of retraction stigma by keeping authors of retracted publications in. Notably, since published problematic research is metaphorically identified as a "virus" which contaminates the literature when not handled effectively (Montgomery & Oliver, 2017, p. 53), fellow researchers should be kept away from retracted publications. In this sense, retraction stigma can also serve the function of "keeping fellow researchers away".

Researchers competing with authors of retracted publications and those victimised by retractions can be as motivated as the gatekeepers of academic integrity, if not more so, to stigmatize authors of retracted publications because their own interests are harmed by authors of retracted publications in various ways. Such stigmatization can psychologically and behaviorally exclude authors of retracted publications (especially repeat offenders) from the academic community. Retraction stigma of this nature is consistent with Neuberg and colleagues' (2000) proposition regarding outgroup stigmatization; that is, the onset of outgroup stigmatization depends on the need to compete for valuable resources, and when resources become insufficient, "intergroup competition heats up and stigmatization should follow" (p. 51). The institution of science provides fertile ground for such stigmatization because it is a jungle replete with competition and rivalry (Toch, 1981). In summary, both individual and collective interests can be served by exercising retraction stigma power. Psychologically, stigmatizing others can enhance the stigmatizer's self-esteem (Dovidio et al., 2000). Self-esteem enhancement can be achieved through both interpersonal downward comparison (Wills, 1981) and favourable inter-group comparison (Blascovich et al., 2000; Crocker et al., 1998; Dovidio et al., 2000; Turner, 1982), which can "reward" stigmatizers with competitive group advantages (Allport, 1954/1979; Feagin, 2000; Tajfel & Turner, 1979). Therefore, it would not be surprising that researchers without a record of retraction may stigmatize authors of retracted publications, especially when in direct competition with them for limited academic resources or when victimised by retractions. A personal experience is a case in point. Learning about my research on retraction, a friend of mine working at a large famous hospital once approached me for a list of her colleagues with a secret record of retractions when she was striving to win out a stiff competition for promotion [15]. In such cases, retraction stigma is weaponised to advantage stigmatizers in both psychological and material terms.

[15] I declined her request but directed her to the RWDB for a possible blacklist that she desired.

2.1.4 Targets and stakeholders of retraction stigma

Retraction has two sides. On the one hand, retraction is an undesirable phenomenon that reflects the failure of the current quality control mechanism of science, especially the traditional pre-publication peer review system (Hilgard & Jamieson, 2017; Marcus & Oransky, 2017). On the other hand, retraction also has a positive role to play because it is intended to function as a post-publication self-correcting mechanism to rectify the current imperfect quality control system of science by cleaning up the contaminated literature (Fanelli, 2013; Marcus & Oransky, 2017). In other words, it is not retraction itself but retraction-engendering misbehaviors and the malfunctioning quality control system of science that are at fault. Accordingly, targets of retraction stigma are entities that have committed retraction-engendering acts and gatekeepers who are entrusted to ensure the quality and integrity of science, that is, authors of retracted publications, their home institutions, and journal authorities, among others.

According to attribution theory (Corrigan et al., 2003; Weiner, 1995; Weiner et al., 1988), the more accountable a target is held for the occurrence of retraction, the more stigmatized the target would be by the retraction. Apparently, since they are expected to be responsible for everything related to the validity and ethicality of their published research, authors of retracted publications are the primary targets of retraction stigma, unless other entities, such as journal authorities and peer researchers (Grieneisen & Zhang, 2012; Xu & Hu, in press), are found accountable for the retraction of their publications. Notably, when a retracted publication is co-authored by two or more researchers, the retraction-engendering act may not involve every co-author. However, even when innocent co-authors are distinguished from accountable ones, the former may still be stigmatized due to their close association with their accountable co-authors. This is a case of courtesy stigma, in which the retraction stigma "spread[s] from the stigmatized individual [guilty co-author] to his close connexions [innocent co-author(s)]" (Goffman, 1963/1990, p. 43).

Journal authorities may become targets of retraction stigma in two situations. First, they made honest errors or were involved in a conflict of interest in handling submissions (Xu & Hu, in press). The RWDB archived 817 such retractions by 31 December 2020. Second, even when not involved in retraction-engendering acts, journal authorities as gatekeepers for academic integrity may be perceived as partly liable for failure to detect and prevent retractable submissions before they were published. This is another form of courtesy retraction stigma. Similarly, home institutions of authors of retracted publications may also become targets of courtesy retraction stigma because they are expected to oversee their employees' compliance

with academic norms and are consequently likely to be seen as indirectly accountable for their employees' misconduct.

Courtesy retraction stigma can be justified or even escalated into retraction stigma. The justification or escalation takes place when those victims of courtesy retraction stigma do not play a positive role in correcting the contaminated literature or making known the retraction reasons. This is because stigmatized individuals are perceived to be not only accountable for the cause of their stigmatization (Jones et al., 1984) but also responsible for eliminating the threat or damage posed by their stigmatizing conditions (Deaux et al., 1995; Frable, 1993). However, more often than not, the process of retraction is complicated and difficult due to the involvement of various stakeholders' interests (Marcus & Oransky, 2017). For instance, not all co-authors or none of them may agree to a decision of or a request for retraction (Xu & Hu, 2021). Journal authorities may be reluctant to execute retraction or may issue retraction notices without disclosing or specifying retraction reasons out of certain considerations (Marcus & Oransky, 2017). Authors of retracted publications and their home institutions do not always behave proactively or cooperatively during investigations into allegations of retraction-engendering acts (Marcus & Oransky, 2017). In all those cases, it is justifiable to subject authors of retracted publications, their home institutions, and journal authorities to retraction stigma.

As a stigmatizing attribute/condition exists in social interactions or relationships (Goffman, 1963/1990; Jones et al., 1984) and because stigmatization is intended to ensure effective group functioning and collective survival (Cottrell & Neuberg, 2005; Fishbein, 2002; Kurzban & Leary, 2001; Neuberg et al., 2000), retraction stigma involves a variety of stakeholders that can be categorized into three concentric circles according to their stakes in the retracted research. The inner circle consists of authors of retracted publications, their home institutions, journal authorities, and research funding agencies, given their greater likelihood of being held responsible for the cause and handling of retraction-engendering acts. The middle circle includes three types of peer researchers whose interests are affected by the retracted research: (a) the victimised, whose published works have been plagiarised, whose unpublished ones have been stolen, or whose publications have to be retracted as they are unknowingly based on the retracted research; (b) the competitors, who rival authors of retracted publications for personal interests (e.g., tenure, promotion, career advancement, academic authority, and monetary rewards); and (c) the interested, who are academics working in areas different from that of the retracted research but having a general interest in the latter. The outer circle includes mistreated research participants, consumers of retracted research findings, and non-academic sponsors of retracted research. Individuals (mostly authors of retracted publications) who have

committed retraction-engendering acts lie at the centre (the red circle in Figure 2.2) of the three concentric circles. The inner and middle circles are comprised of only people who work in academia, whereas the outer circle includes the general public. Notably, in specific cases of retraction, stakeholders in the inner and middle circles can also be members of the outer circle. When such overlapping occurs, the group identity of the concerned stakeholders is determined by their most immediate and highest stakes. For instance, a social scientist (a stakeholder in the inner or middle circle) may become a victim of a seriously flawed medical treatment derived from retracted research by a group of researchers in life sciences and medicine. In this case, the victimised social scientist should be identified as a stakeholder in the outer circle rather than in the inner or middle circle.

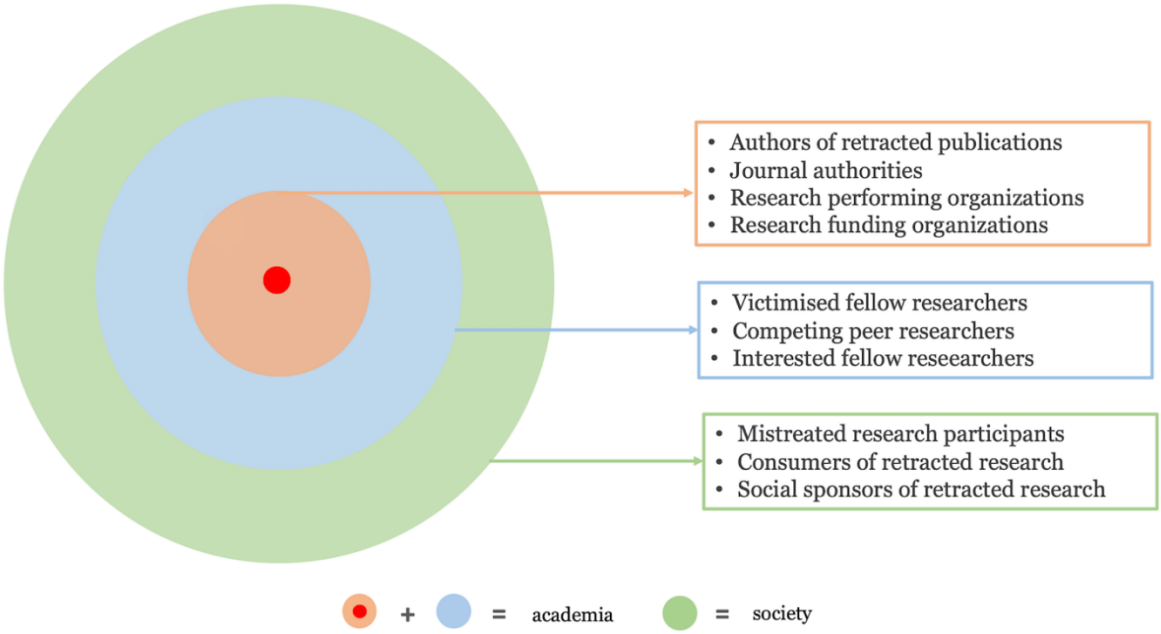

Figure 2.2 *Three concentric circles of retraction stakeholders*

2.1.5 Retraction notices in retraction stigma communication

Stigma communication involves a process of creating and sharing stigmatizing messages (Smith, 2007a), which aims to "generate protective action tendencies" (p. 462) by alerting people to a danger or threat posed by a stigmatizing character or condition. As pointed out by Meisenbach (2010), communication research on stigma tends to focus on health and disability problems (e.g., Agne et al., 2000; Smith, 2007b; Thompson, 2000) and, to a lesser extent, on occupational and workplace stigmas (e.g., Drew et al., 2007; Lutgen-Sandvik, 2008). Retraction stigma communication refers to disseminating retraction-related information within and beyond the academic community to correct the literature, prevent potential in research and publishing misbehaviors, and to arouse retraction stakeholders' awareness of the threats posed by retraction-engendering violations of research and publishing ethics. Since the mechanism

of retraction operates through retraction notices (COPE Council, 2019; Wager et al., 2009), retraction notices are the primary source of retraction-related information for retraction stigma communication.

Retraction notices, occasionally accompanied by supporting or supplementary materials (e.g., institutional investigation reports), are officially produced and published to announce retractions and are encouraged to be made publicly accessible for free. Due to their main purpose of correcting the literature (COPE Council, 2019; Wager et al., 2009), retraction notices are mainly intended for academics. However, retraction-related information, especially high-profile cases of retraction (e.g., McCook, 2017b; Oransky, 2019; SAGE, 2014), may also reach the general public mainly through mass media (for a review, see Hilgard & Jamieson, 2017). In other words, retraction stakeholders in the inner and middle circles are more likely exposed to retraction notices and their supporting/supplementary materials available in academia-oriented outlets, whereas retraction stakeholders in the outer circle are more likely to come to know about eye-catching retractions through mass media.

The two systems (i.e., academia-oriented communication channels and mass media) for communicating retraction-related information result in two sequential rounds of retraction stigma communication, as visualised in Figure 2.3. The first round involves mostly inner-circle retraction stakeholders' handling of retraction and ends with publication of retraction notices. The subsequent, second round of retraction stigma communication involves mostly retraction stakeholders in the middle and outer circles, who are rarely engaged in retraction handling, and starts with their acquisition of retraction-related information from retraction notices and/or mass media.

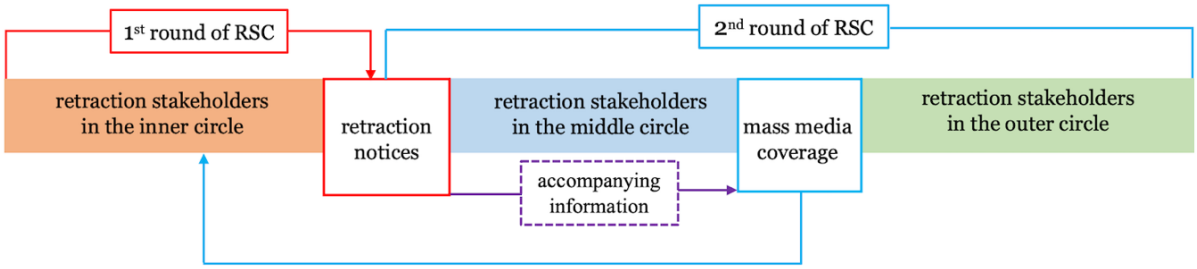

Figure 2.3 *A model of retraction stigma communication (RSC)*

It should be noted that retraction stakeholders in the inner and middle circles may experience both rounds of stigma communication regarding specific retractions. For instance, in cases of high-profile retraction (e.g., 107 and 434 articles retracted in one go from *Tumor Biology* and *Journal of Fundamental and Applied Sciences*, respectively), retraction stakeholders in the inner and middle circles may not only come to know about them through academia-oriented communication channels but also be re-exposed to (more about) the retractions through mass media (Keyouwang, 2019).

Due to this study's focus on retraction notices and the importance of retraction notices as the overlapping pivot of the two rounds of retraction stigma communication, the discussion hereafter focuses on the production of retraction notices as stigmatizing messages. On the one hand, production of stigmatizing retraction notices involves presenting often discrediting messages that can invoke retraction stigma. In light of the model of stigma communication developed by Smith (2007a), retraction notices as stigmatizing messages may contain content cues regarding marks, labels, responsibility, and peril of retraction (see Section 2.2.1 for definitions of these content cues). Journal authorities as gatekeepers of academic integrity may tend to deploy many cues of these four types for the dual purpose of correcting the literature (e.g., through content cues of responsibility for retraction) and deterring potential offenders (e.g., through content cues of peril). On the other hand, conflicting personal interests of various retraction stigma stakeholders may compromise or even undermine the construction of retraction stigma, depending on which stakeholders produce retraction notices. For instance, when penning retraction notices, authors of retracted publications may tone down the stigmatizing nature of their retractions to mitigate the threat to their image. Thus, various stigma management strategies, such as those proposed by the theory of stigma management communication (Meisenbach, 2010) (i.e., accepting, avoiding, evading responsibility, reducing offensiveness, denying, and ignoring/displaying), are found in retraction notices to mitigate retraction stigma (Xu & Hu, 2018, 2021).

2.1.6 Stigmatizing force of retraction notices

The stigmatizing force of retraction notices refers to the extent to which retraction notices stigmatize the targets of retraction stigma through the information they disclose and the way the information is communicated. The stigmatizing force of retraction notices is co-determined by stigmatizing content cues and stigma management strategies, which work as two opposing forces on retraction notices, as illustrated in Figure 2.4. Specifically, the more stigmatizing content cues are communicated, and the fewer stigma management strategies are employed, the more stigmatizing the retraction notices are. This assumption is partially supported by empirical data (Hu & Xu, 2020; Xu & Hu, 2021) which show that retraction-related information tends to be selectively disclosed and strategically presented in retraction notices to help repair the tarnished image of authors of retracted publications. The stigmatizing force of retraction notices is also modulated by the linguistic realisation of stigmatizing content cues and retraction stigma management strategies, as found in a study on the linguistic representation of agency/responsibility for retraction-engendering acts in retraction notices (Hu & Xu, 2020) and the pervasive use of euphemism in retraction notices (Marcus & Oransky, 2013, 2015). Furthermore, the polarity (i.e., positive vs negative) of evaluative language

resources used in retraction notices also shape the stigmatizing force of retraction notices: the more negative evaluative language resources are used in retraction notices, the stronger the stigmatizing force of the retraction notices.

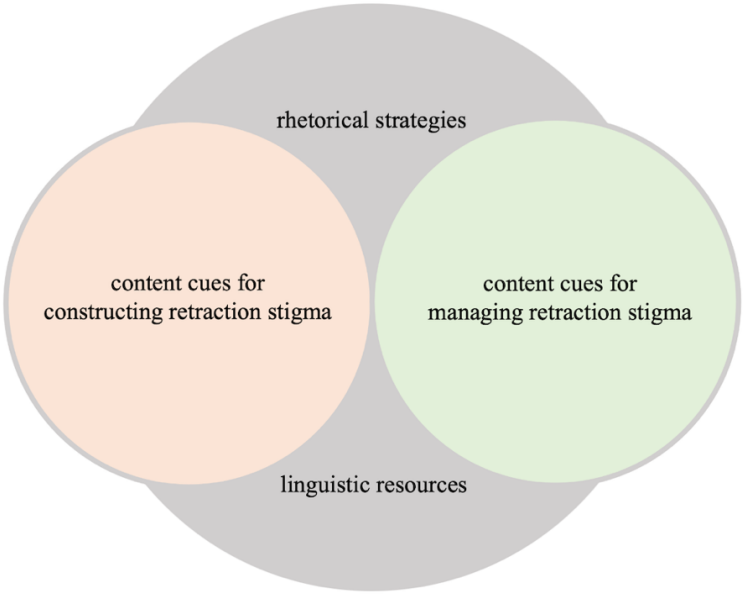

Figure 2.4 *Elements of stigmatizing force of retraction notices*

Perceptions of retraction stigma and the stigmatizing force of retraction notices may be influenced by individuals' proximity to and their attitudes toward retraction. According to Hebl and Dovidio (2005), costs/benefits, motivation, and goals of stigma perceivers may have an impact on stigma communication. Therefore, retraction stakeholders in the inner and middle circles may be more likely than those in the outer circle to stigmatize and stigmatize harder because retraction poses more direct threats to the academic interests of the former than to the interests of the latter. Moreover, retraction stigmatizers' association with and their reactions to retraction stigma targets may have an influence on their attitude toward retraction stigma. Extending Goffman's (1963/1990) classification criteria, Smith (2012) classifies individuals into four categories according to their association with and their reactions to the stigmatized, namely the stigmatized, stigmatizers, active supporters (i.e., those who challenge stigmatization), and passive supporters (i.e., those who are sympathetic to the stigmatized but do not challenge the stigmatization). Considering the dynamic nature of stigma in general (Crocker et al., 1998; Jones et al., 1984; Major & O'Brien, 2005; Pescosolido & Martin, 2015; Schomerus & Angermeyer, 2017) and assuming applicability of the classification criteria to retraction stigma, individuals other than those responsible for retraction can be expected to take one of the other three roles (i.e., stigmatizers, active supporters, and passive supporters) in relation to a specific retraction in a particular context and at a particular time.

Another factor that may influence perceptions of retraction stigma would be the severity of retraction reasons. The severity of retraction reasons would be positively correlated with

perceptions of retraction stigma and the stigmatizing force of retraction notices. There are three grounds for this speculation. First, Franzese's (2015) model of deviance illustrates both the malleability and the vitality of deviant human behaviors and conditions, which suggests the fluidity of stigma. In other words, retraction stigma would be context-specific and vary by the severity of retraction reasons. Second, origin/etiology (i.e., responsibility) is one of the essential elements of both stigma (Bresnahan & Zhuang, 2010; Jones et al., 1984) and stigma communication (Smith, 2007a), as attested to by many empirical studies (e.g., Bresnahan et al., 2013; Major et al., 2018). Third, the scientific community has increasingly recognized the need for various forms of academic misconduct to be handled differentially (Hall & Martin, 2019; Martin, 2016; Yeo-Teh & Tang, 2022). The call for differential handling of research and publication misbehaviors is compatible with the assumption underlying attribution theory that blame and negative reactions to people are positively correlated with their personal accountability for their own conditions (Corrigan et al., 2003; Weiner, 1986, 1995). Figure 2.5 summarizes the relationship between the aforementioned three contextual factors and individuals' perceptions of retraction stigma and stigmatizing force.

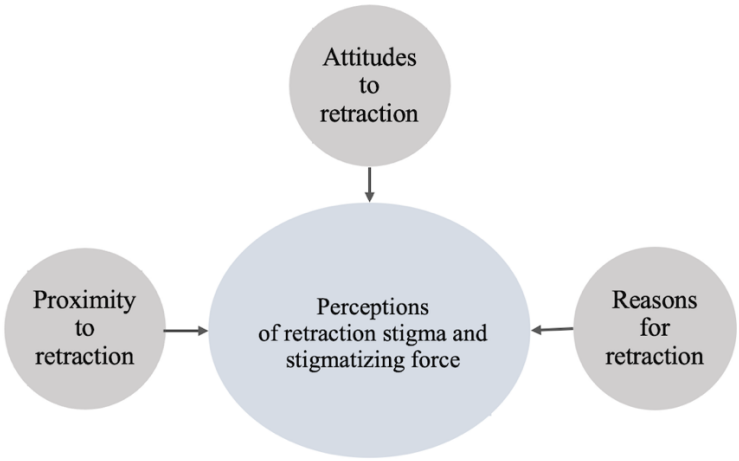

Figure 2.5 *Influences on perceptions of retraction stigma and stigmatizing force*

Although a strong argument can be made for the existence of retraction stigma, this theoretical proposal should be tested systematically with empirical data. To this end, empirical testing can take two different approaches, namely a communication and a perception approach. The communication approach examines to what extent retraction is stigmatized in retraction notices and mass media coverage. The perception approach investigates to what extent retraction is perceived as stigmatizing by people with experience in or knowledge about retraction. No research on retraction has taken the perception approach. Three studies (Hu & Xu, 2020; Xu & Hu, 2018, 2021) took a linguistic approach to investigating retraction notices as an emerging high-stakes academic genre and identified two apparently contradictory characteristics of retraction notices, namely retraction notices' image-tarnishing nature and

retraction notice authors' effort to repair image. Although the three studies did not theoretically frame retraction as a stigma, that there is perceived retraction stigma can be inferred from the two identified contradictory characteristics of retraction notices. Notably, it is possible that retraction is perceived to be stigmatizing but actually not communicated as such in retraction notices or that retraction appears less stigmatizing in retraction notices than are actually perceived by various retraction stakeholders. In other words, the stigmatizing force of retraction notices identified through a communication approach may differ from that perceived by retraction notice readers. Therefore, both communication and perception studies are needed to develop a comprehensive understanding of retraction stigma.

2.1.7 Use of retraction stigma power via retraction notices

As noted earlier, stigmatization is "a power-laden process" (Link & Phelan, 2001, p. 371), and stigma power can enhance group or personal interests (Link & Phelan, 2014). Strictly speaking, stigma does not have inherent power; it is those capable of invoking or inflicting a stigma on others that are vested with power. In the context of retraction stigma communication, retraction stigma power is defined as the capacity possessed and the choice made by producers of retraction-related publications to stigmatize specific cases of retraction, entities responsible for retraction, and/or the phenomenon of retraction in general. Possessors and users of retraction stigma power (i.e., producers of retraction-related publications) mainly consist of retraction notice authors, researchers/scholars of retraction, and reporters/commentators/discussants of retraction covered in non-academic media. Due to the scope of this study, the focus of the discussion hereafter is on retraction notice authors, who may be journal authorities, authors of retracted publications or both parties (Xu & Hu, 2018) [16].

Theoretically, retraction stigma power is exclusively possessed by retraction notice authors who are not involved in the retraction-engendering acts; in other words, in cases of retraction due to fault by authors of retracted publications, only journal authorities and, innocent authors of retracted publications, if any, possess stigma power when penning retraction notice independently or jointly. In practice, however, retraction stigma power is also in the hand of individuals responsible for retraction when they have the opportunity to produce retraction notices for their own retraction-engendering behaviors. Use of stigma power involves motivation/goal and interest/profit (Hatzenbuehler et al., 2013; Link & Phelan, 2014;

[16] This part of the thesis was published as Xu and Hu (2022b). As the same reviewer noted, "stigma is a socially constructed attribute", which requires attention to those who try to stigmatize and those who react to the stigmatization. However, because our interest is in how retraction notices, the main retraction mechanism, are deployed strategically for communicating retraction stigma and exercising stigma power, we focus only on retraction notice authors, who may be journal authorities, authors of retracted publications, or both parties. We recognize the need for future theoretical discussions to give attention to those who are in a position to react to the stigmatization through retraction notices.

Paton, 2018). Since retraction notices reflect the interests of various retraction stakeholders (Hesselmann et al., 2017), retraction notice authors may wield retraction stigma power selectively and discreetly by issuing retraction notices whose linguistic and rhetorical realisation must be a result of purposeful choice and design. Table 2.1 summarizes factors that may influence how retraction stigma power may be exercised by four major types of retraction notice authors: journal authorities (JAs), innocent authors (IAs), guilty authors (GAs) of retracted publications, and joint authors (i.e., JAs and IAs and/or GAs).

Table 2.1 Influences on the use of retraction stigma in retraction notices

	Retraction notice authors			
Influencing factors	JAs	IAs	GAs	Joint authors
Duty as gatekeeper of academic integrity	✓			✓
Difficulty in confirming the allegation	✓			✓
Priority to correct the literature	✓	✓	✓	✓
Need to avoid courtesy retraction stigma	✓	✓		✓
Fear of a spill-over effect of retraction stigma	✓			✓
Sociocultural contexts of retraction	✓			✓
Need to maintain in-group solidarity		✓		✓
Being overcome by shame to issue a retraction notice			✓	✓
Use of the retraction notice to self-destigmatize			✓	✓

By stigmatizing their guilty co-authors, innocent authors of retracted publications can disassociate themselves from retraction and defend themselves against potential courtesy retraction stigma, which is in their personal interest of face protection. However, it is also possible that innocent authors of retracted publications may choose to stay in solidarity with their guilty co-authors by not using retraction stigma power or indiscriminately stigmatizing themselves and their guilty co-authors when they value their one-time personal need for image repair less than in-group solidarity, which is crucial for future research collaborations. Guilty authors of retracted publications may feel too embarrassed or humiliated by their retraction-engendering behaviors to issue retraction notices, even when they are expected or asked to do so by journal authorities or their innocent co-authors. In this case, they relinquish their retraction stigma power to protect their face by distancing themselves from retraction. However, guilty authors of retracted publications may choose to exercise their given retraction stigma power by taking the initiative to issue retraction notices, which can serve their need for image repair for two reasons. First, when allowed to issue retraction notices for their own retraction-engendering behaviors, guilty authors of retracted publications have the opportunity to determine to their own advantage what information to disclose in retraction notices and how to communicate the information. Second, when they choose to stigmatize themselves by unreservedly exposing their retraction-engendering behaviors in retraction notices, guilty

authors of retracted publications can project a positive image of voluntarily assuming responsibility for retraction and showcasing their effort to correct the literature, which is actually destigmatizing, especially when in comparison with their counterparts who leave the job of issuing retraction notices to journal authorities and/or their innocent co-authors. In other words, voluntary self-stigmatization can be adopted as a laudable strategy for managing retraction stigma, if not recognized as another type of "heroic act" in Vuong's (2019b, p. 5) words. Notably, to fulfil the priority to correct the literature, both innocent and guilty authors of retracted publications may elect to disclose information necessary for that purpose, which may increase or decrease the stigmatizing force of their retraction notices.

Different from both guilty and innocent authors of retracted publications, journal authorities possess stigma power in every case of retraction because they almost always have the final say in deciding on what kind of retraction notices can be published. They may exercise their retraction stigma power fully to present themselves as angry stern gatekeepers of academic integrity who devote themselves to correcting the literature and deterring potential offenders. On the other hand, journal authorities may use their stigma power more prudently and in a more restrained manner. Thus, journal authorities may allow retraction notices to appear more neutral, if not lenient or tolerant, in the communication of retraction-engendering acts for at least five reasons.

First, journal authorities' use of retraction stigma power is constrained by the difficulty in confirming allegations of retraction-engendering misconduct and, consequently, the risk of litigation against them by authors of retracted publications. Journal authorities do not have "the legal powers to seize or peruse lab notes or any other raw date that is not voluntarily submitted by the authors'' (Williams & Wager, 2013, p. 8) and thus in most cases have to rely on authors' and their home institutions' cooperation in verifying retraction-engendering allegations (COPE Council, 2019; Wager et al., 2009). In the absence of hard evidence for retraction-engendering misconduct, journal authorities' retraction stigma power is undermined. Consequently, they may have to tone down stigmatizing messages in retraction notices or permit the negotiation of retraction notice wording with authors of retracted publications, as indicated in the COPE retraction guidelines (COPE Council, 2019; Wager et al., 2009). Second, journal authorities may allow retraction notices to mitigate, if not to avoid, retraction stigma to better serve the main purpose of retraction. If retraction is stigmatized too harshly in retraction notices, a shaming environment (Teixeira da Silva & Al-Khatib, 2019) would likely be created and consequently deter proactive self-correction and self-retraction of the problematic literature (Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). Such a shaming environment goes

against the main purpose of retraction, that is, to correct the literature rather than punish those responsible for retraction (COPE Council, 2019; Wager et al., 2009).

Third, avoiding harsh use of retraction stigma power can protect journal authorities' reputation. Retraction stigma is like a double-edged sword that can cut not only authors of retracted publications but also journal authorities themselves because of their role as gatekeepers of academic integrity. To avoid falling victim to courtesy retraction stigma [17], journal authorities can be expected to wield retraction stigma power with discretion and to a self-serving extent. This speculation is supported by research on both retraction and other forms of stigma. Hu and Xu (2020) found that journal authorities were less likely to identify agents of retraction-engendering acts and assigned less responsibility for retraction than authors of retracted publications were. Research into stigma on other social domains showed that stigma concealment (Birenbaum, 1970; Blum, 1991; Dako-Gyeke, 2018; Goffman, 1963/1990; Gramling & Forsyth, 1987; Jones et al., 1984; Turner et al., 2007) and control of stigma-related information (Conrad, 1991; Gray, 1993; MacRae, 2008; Scambler & Hopkins, 1988) were adopted as strategies for coping with courtesy stigma. In the context of retraction, "silent or stealth retraction" (Jaime A. Teixeira da Silva, 2015, p. 5) conceals retraction stigma, and issuing opaque and uninformative retraction notices (Marcus & Oransky, 2014) may result from journal authorities' intentional control of retraction-related information, as evidenced by an academic society's public apology for its journal issuing a retraction notice of this kind (Oransky, 2013).

Fourth, if retraction notices stigmatize retraction too harshly and too often, retraction stigma is very likely to rock the academic community and reach the general public through mass media (Ben-Yehuda & Oliver-Lumerman, 2017). Retraction notices' relentless exposure of the dark side of science (e.g., retraction-engendering acts) to society can lead to the erosion of public trust in and support for science (Byrne, 2019). Furthermore, frequent public exposure of high-profile cases of retraction may cause potential moral panics (Goode & Ben-Yehuda, 2009) and exert pressure on research organizations to "create and impose control mechanisms that may stifle the creativity and initiative of researchers" (Ben-Yehuda & Oliver-Lumerman, 2017, p. 193). Such developments would "eventually pave the road for a dual process to unfold"; that is, "a diminishing trust in research and researchers, and … an increasing number of rules, regulations, control mechanisms, and bureaucratic organizations or units whose main function will be to monitor research for potential fraud" (Ben-Yehuda & Oliver-Lumerman, 2017, p. 194). Such control can lead to undesirable governmental interventions in academic

[17] In the wake of high-profile retractions, journal editors may resign (e.g., McCook, 2017a; Oransky, 2012b), which shows the negative consequence of courtesy retraction stigma.

activities, which will undermine the academic community's self-governance over research behaviors, protection of academic freedom, and innovative scientific research (Resnik, 2019). Should this state of affairs be ushered in, retraction stigma would be institutionalised to the detriment of the autonomy and advancement of the whole academic community. In other words, journal authorities' overreaction to retraction may, in the long run, victimise researchers who observe codes of ethics in their research and publishing activities. Such an undesirable spill-over effect of an unrestricted use of retraction stigma power would be the last thing that both journal authorities and researchers in general would like to see.

Fifth, journal authorities may have learned lessons from various social stigmas and thus may choose not to put retraction stigma power into use at all. Although the stigmatization of retraction is assumed by some scholars (e.g., Cox et al., 2018; Xu & Hu, 2021) to be able to deter potential offenders, stigma as a tool for social control has been found to be ineffective in many social domains. For instance, campaigns against the national health crisis of obesity in the USA (Turner et al., 2020) often employ stigmatizing strategies, which have given rise to the public perceptions that obese people are responsible for their weight and that weight stigma could motivate them to adopt a healthier lifestyle (Puhl & Heuer, 2010). However, obesity campaigns utilising stigmatizing advertisements are found no more likely than those using non-stigmatizing messages to instil such a motivation among over-weight participants (Puhl et al., 2013). Even worse, weight stigma can weaken exercise intentions and increase excessive eating (Vartanian & Shaprow, 2008). Despite its negative impacts (Foster et al., 2003), such as perpetuating stereotypical views (Bresnahan et al., 2017; Pearl et al., 2012), the tactic of stigmatizing messaging is widely used as a tactic, particularly in medical contexts (Heuer et al., 2011) and health campaigns (Smith, 2007b), and causes a huge waste of social resources.

Last but not least, the sociocultural context of retraction may have an impact on whether and to what extent retraction is stigmatized and retraction stigma power is utilised. According to Dijker and Koomen's (2007) theory of deviance, there are different response options for a deviant condition. Adopting an evolutionary psychological approach, Dijker and Koomen (2007) define deviance as "features and behaviors of individuals that are undesirable because, under ancestral conditions of living, they threaten the inclusive fitness of a group of individuals" (as cited in Dijker, 2013, p. 27). Drawing on previous work (e.g., Goode, 2003; Horwitz, 1990; Roberts, 1979), Dijker and Koomen (2007) point out that responses to deviance "may vary from relatively harsh punishment, to 'softer' treatment such as forgiveness or nurturance, healing, or therapy, to doing nothing about it or tolerance" (as cited in Dijker, 2013, p. 22). Accordingly, they identify three types of responses to control deviance socially, namely stigmatization, tolerance, and repair. They also identify cultural and historical influences on

the employment of three types of social control (i.e., stigmatization, repair, and tolerance with unintended stigmatization). They suggest that stigmatization is more likely to be adopted in hierarchical, collectivistic, moderately complex societies (e.g., European Middle Ages and current developing countries); in contrast, repair and tolerance (with unintended stigmatization) are more likely to take place in egalitarian, collectivistic, and simple societies (e.g., small groups of egalitarian hunter-gatherers) and egalitarian, individualistic, and highly complex societies (e.g., modern Western societies), respectively. Whether Dijker and Koomen's postulation of the relationship between the nature of a society concerned and the preferred response types is applicable to the stigmatization of retraction is a hypothesis that warrants research in the future. It would be interesting to see if journal authorities based and operating in Western societies would respond to retraction-engendering behaviors in research and publication differently from their counterparts in Eastern societies.

When journal authorities and authors of retracted publications co-author retraction notices (Xu & Hu, 2018), all the factors discussed above may influence their use of retraction stigma power. To avoid conflict and serve common interests, negotiation of the use of their retraction stigma power is possible, which is suggested by COPE's advocacy that the negotiation of the wording of retraction notices should be allowed between journal authorities and authors of retracted publications (COPE Council, 2019; Wager et al., 2009). One explanation for this practice of negotiation of the use of retraction stigma power is that the main purpose of retraction is to correct the literature rather than punish misbehaving authors of retracted publications (COPE Council, 2019; Wager et al., 2009). Another possible explanation for the "cooperation" in exercising retraction stigma through producing retraction notices could be the need for authors of retracted publications to reduce their retraction stigma and for journal authorities to mitigate their courtesy retraction stigma through manipulating the linguistic and rhetorical realisation of retraction notices, such as obscuring the agents of retraction-engendering acts (Hu & Xu, 2020) and/or downplaying the negative influence of the retracted research (Xu & Hu, 2021).

2.2 Frameworks for Analysing Retraction Stigma

Retraction stigma is communicated primarily through retraction notices. Therefore, this section proposes four frameworks for analysing four dimensions of retraction stigma communication via retraction notices. Informed by Smith's (2007a) model of stigma communication, retraction stigma is seen as being constructed with various stigmatizing content cues. Stigma can be managed both verbally and non-verbally (Meisenbach, 2010), and verbal management of stigma can be achieved through rhetorical strategies and/or language use. The importance of language use in stigma construction and management has been highlighted in many stigma

studies (e.g., Grant, 2016; Heuer et al., 2011; Kyle & Puhl, 2014; Puhl et al., 2013), and various rhetorical strategies for managing stigma are inventoried by Meisenbach's (2010) typology of stigma management communication strategies. Drawing on previous work on stigma communication in general and informed by relevant research on retraction notices, four frameworks (i.e., construction of retraction stigma, management of retraction stigma, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction) are proposed in this section for analyzing retraction stigma communication via retraction notices.

2.2.1 Strategies for constructing retraction stigma

According to Smith's (2007a) model of stigma communication, stigma is constructed through message choices, which involve four types of content cues (i.e., rhetorical strategies), namely marks, labels, etiology, and peril. In other words, the existence of a form of stigma can be verified through the identification of these four types of rhetorical strategies. In the context of retraction stigma, marks are visual and linguistic cues that distinguish the stigmatized (i.e., entities which are held responsible for the retraction). Labels are rhetorical strategies that categorize the stigmatized as a separate discredited social group. Responsibility (also known as *etiology*) cues disclose whether the stigmatized are accountable for the retraction and exercise control over the negative consequence of the RP. Peril cues indicate the extent to which the retracted publication poses a threat or causes a damage to academic communication and scientific advancements. To analyze how retraction stigma is constructed in retraction notices, the four types of rhetorical strategies proposed by Smith's (2007a) model of stigma communication should be retraction-specific. For this purpose, an analytical framework based on Xu and Hu's (2021) move analysis of retraction notices is proposed below for identifying the four types of rhetorical strategies for constructing retraction stigma.

- *Creating marks*: Identifying the stigmatized (i.e., authors of retracted publications) and the cause of stigmatization (i.e., retracted publications) to increase their visibility.
- *Making labels*: Referring to retracted publications and all or any of the (accountable) authors of retracted publications negatively to distinguish them from the legitimate literature and their innocent co-authors and researchers without a record of retractions, respectively.
- *Assigning responsibility:* Indicating that authors of retracted publications are held accountable for the retraction, and that they do not make (adequate) efforts to mitigate the negative consequences of their retracted research or publications.

- *Exposing Peril*: Revealing adverse consequences caused by the retracted publications or research to retraction stakeholders other than to the (accountable) authors of the retracted publications.

2.2.2 Strategies for managing retraction stigma

While construction of retraction stigma creates or reinforces retraction stigma, management of retraction stigma seeks to mitigate or erase it. In other words, construction and management of retraction stigma are conceptualised as two opposing forces working on retraction notices. From this perspective, strategies adopted in retraction notices to manage retraction stigma are expected to obscure or suppress the four types of rhetorical strategies for constructing retraction stigma discussed above. In addition, the stigma communication strategies proposed by Meisenbach (2010) include accepting stigma (e.g., apologising, blaming stigma for negative outcomes, and isolating oneself), avoiding stigma (e.g., hiding/denying a stigma attribute, avoiding stigma situations, and distancing oneself from stigma), evading responsibility, reducing offensiveness, denying stigma, and ignoring/displaying stigma. The move analysis of retraction notices conducted by Xu and Hu (2021) has revealed that some moves can serve as strategies for managing retraction stigma. Accordingly, based on the stigma communication strategies proposed by Meisenbach (2010) and the moves of retraction notices identified by Xu and Hu (2021), an analytical framework for identifying management strategies of retraction stigma is proposed as follows.

- *Concealing stigma visibility*: Decreasing the visibility of the retracted publication and its (accountable) authors.
- *Refraining from labelling*: Not referring to the retracted publication or any of its authors of retracted publications negatively.
- *Manipulating responsibility assignment*: Making efforts to reduce responsibility that could be assigned to the (accountable) authors of retracted publications or to offset or mitigate offensiveness of their retraction-engendering behaviors.
- *Offering correction and remediation*: Emphasizing what have been or will be done to correct the problems with the retracted publication or reduce its adverse consequences.

2.2.3 Grammatical assignment of agency/responsibility

As discussed earlier, Smith's (2007a) model of stigma communication identifies responsibility cues as one type of rhetorical strategies for constructing stigma. Such cues indicate that the magnitude of stigma is positively correlated with the extent to which stigma messages assign responsibility for the stigmatizing conditions to the targets of stigma. In other words, the more responsibility a stigma message assigns to a target of stigma, the more stigmatizing the message

is for that target. Thus, one of the stigma management strategies in Meisenbach's (2010) typology of stigma management strategies is to evade responsibility. Despite the importance of responsibility assignment in the construction and management of stigma, neither Smith's model of stigma communication nor Meisenbach's typology of stigma strategies addresses how responsibility can be represented in messages to construct and manage stigma.

Drawing on the grammatical voice system and nominalization in the English language, Hu and Xu (2020) have developed an analytical framework (see Table 2.2 for a revised version) for identifying agency in retraction-engendering acts. Agent as a linguistic term is defined by Halliday and Matthiessen (2004) as the entity that brings about a process. In the context of retraction, an agent refers to the human entity that has committed the retraction-engendering act and thus is held responsible for the retraction. Given the close association between agency and responsibility (Lamb, 1991; Lamb & Keon, 1995; Marcel, 2003), the analytical framework is operationalized by a 7-point ordinal scale which yields Agency/Responsibility Scores (ARSs) to measure the relative magnitude of agency/responsibility conveyed by seven grammatical means. As indicated in Table 2.2, the Agent + Active Voice construction identifies the agent of a retraction-engendering act and assigns the highest-level agency/responsibility to the agent, whereas the Nominalization without an Agent Marker construction obscures the agent and assigns the lowest-level agency/responsibility to the obscured agent. In addition, the seven grammatical means constitute binary categories (agent-identified vs. agent-obscured) in terms of agent visibility. The binary metric is meant to determine agent identification in retraction notices; however, further variations in observed agent visibility can be better captured by ARSs (Hu & Xu, 2020). More detailed information about the analytical framework for identifying agency/responsibility for retraction-engendering acts can be found in Section 4.4.

Table 2.2 Cline of agency identification and responsibility assignment

Agency/responsibility	Grammatical devices	Agent identified
Highest level	Agent + Active Voice	Yes
	Passive Voice + Agent	Yes
	Nominalization with an Agent Marker	Yes
	Passive Agentless Construction	No
	Active Agentless Ergative Construction	No
	Active Verb with an Inanimate Subject	No
Lowest level	Nominalization without an Agent Marker	No

2.2.4 Attitudinal evaluation of retraction

Retraction notices as a high-stakes academic genre may involve the evaluation of at least

retraction-engendering acts and their negative impacts on academic communication and scientific research. Retraction-related evaluation could be utilised as a strategy to manipulate (increase or decrease) the stigmatizing force of retraction stigma. This proposition is supported in part by Marcus and Oransky's (2013, 2015) anecdotal evidence of the prevalent use of euphemisms in retraction notices. As expected, there is also evidence of negative evaluation used in retraction notices' disclosure of retraction reasons, as illustrated in "the article was found to involve blameworthy inaccuracies in the way the research was carried out" (Anonymous, 2014a, p. 236). Moreover, the need to examine evaluative resources employed in retraction notices is also indirectly supported by Markowitz and Hancock's (2014, 2016) finding that publications retracted due to fraud tend to use fewer positive emotion expressions than normal publications do. Therefore, this study adopts appraisal theory (Martin & White, 2005) as an analytical framework to investigate evaluative language resources deployed in retraction notices. Appraisal theory focuses mainly on lexico-grammatical resources that are used to construe interpersonal meanings. Such lexico-grammatical resources can mark "the subjective presence of writers/speakers in text as they adopt stances towards both the material they present and those with whom they communicate" (Martin & White, 2005, p. 1). Appraisal theory categorizes evaluative language resources into three semantic systems: 1) ATTITUDE, which attends to "emotional reactions, judgements of behavior and evaluation of things"; 2) ENGAGEMENT, which is concerned with "sourcing attitudes and the play of voices around opinions in discourse"; and 3) GRADUATION, which deals with "grading phenomena whereby feelings are amplified and categories blurred" (Martin & White, 2005, p. 35).

Considering that the process of stigmatization involves cognitive and affective responses (Dovidio et al., 2000; Pescosolido & Martin, 2015; Smith, 2007a) and that the stigmatizing nature of retraction can be manifested through negative evaluation of retraction-engendering acts and their consequences, this study focuses on the ATTITUDE system of appraisal theory. According to Martin and White (2005), the ATTITUDE system compromises three sub-systems: 1) *affect*, which attends to "resources for construing emotional reactions"; 2) *judgement*, which deals with "resources for assessing behavior according to various normative principles" (p. 35); 3) *appreciation*, which is concerned with "resources for construing the value of things, including natural phenomena and semiosis" (p. 36). All the three types of attitude can be polarized as positive and negative. In terms of the way they are encoded, *attitudes* can be further divided into *inscribed* attitudes, which are communicated explicitly and directly, and *invoked* attitudes, which is encoded implicitly and indirectly.

The use of the language of evaluation is reflective of retraction notice authors' attitudes to retraction and influence the construction and management of retraction stigma. In other

words, the subsystem of ATTITUDE in appraisal theory can be adopted to investigate how retraction stigma is communicated cognitively and affectively through retraction notices. To identify attitudinal evaluation in retraction notices, the following analytical framework is borrowed from (Martin & White, 2005).

- *Affect* refers to emotional stances on the people, things, states of affairs, or happenings related to specific retraction events. Affectual positioning in retraction notices may involve *un/happiness* (misery, antipathy, cheer, and affection), *dis/satisfaction* (ennui, displeasure, interest, and pleasure), *in/security* (disquiet, surprise, confidence, and trust), or *dis/inclination* (fear and desire), which may be indicated through verbs of emotion, adverbs, adjectives of emotion, or nominalizations. For example, "regretfully, the authors decided to retract the article" is an instance of *Affect: unhappiness*.
- *Judgement* refers to normative assessment of authors' research and publishing behaviors by reference to prevailing academic and social conventions. Judgemental positioning in retraction notices may involve *normality* (evaluation of compliance with or departure from normative patterns of social behaviors), *capacity* (evaluation of human competence in performing certain activities), *tenacity* (evaluation of human resolution or weakness), *veracity* (evaluation of honesty and truthfulness), and *propriety* (evaluation of morality and legality of human behaviors). For example, "the author made the mistake" is an instance of *Judgement: capacity*, and "the first author, then a PhD student in the laboratory where the research was conducted, fabricated the data" is an instance of *Judgement: propriety*.
- *Appreciation* refers to assessment of the physical appearance and composition, quality, and significance of the products of authors' research and publishing behaviors (e.g., data, research findings, and retracted publications) by reference to prevailing academic and social systems of value. An instance of appreciation in retraction notices may involve *reaction* (evaluation of emotion-triggering aesthetic properties of things), *composition* (evaluation of the make-up of a phenomenon or an entity), or *valuation* (evaluation of the usefulness and social value of a phenomenon or an entity). For example, "the article is found not up to the ethical standard of our journal" is an instance of *Appreciation: valuation*.
- *Polarity of attitudinal evaluation*: All the three types of attitudinal evaluation can be polarized, and a specific instance of attitudinal evaluation is polarized as either positive or negative. For instance, "reliable data, replicable research finding", and "ethical data collection" are positive evaluations (*Appreciation: valuation* and *Judgement:* propriety, respectively), whereas "data fabrication/falsification and plagiarism" are negative evaluations (*Judgement: propriety*).

- *Explicitness of attitudinal evaluation*: Attitudinal evaluation can be projected either explicitly or implicitly. Explicit (i.e., inscribed) attitudinal evaluation is articulated directly through lexis. In contrast, implicit (i.e., invoked) attitudinal evaluation is realized through inferences, associations, implications framed in specific contexts, and conventions. For instance, "This article is retracted because of plagiarism" is an instance of explicit judgement of negative propriety. It should be noted that this study only focuses on inscribed evaluation because invoked evaluation is determined through inference, depends on the specific position taken by the analyst/reader and, consequently, is subjective in its identification.

2.3 Summary of the Chapter

This chapter presented the theoretical and analytical frameworks for this study. Specifically, drawing upon stigma theories and retraction research, the first half of the chapter proposed retraction stigma as a core theoretical concept and developed a theoretical framework pivoting on the concept for the present study. To theorize retraction stigma, the chapter discussed the stigmatizing nature of retraction, presented the seven core dimensions of retraction stigma, and presented its functional justifications. In addition, it identified the targets and stakeholders of retraction stigma, explained the mechanism of retraction stigma communication, made theoretical propositions concerning stakeholders' attitudes towards communicating retraction stigma via retraction notices. The second half of the chapter proposed four language-based analytical frameworks for examining retraction stigma construction strategies, retraction stigma management strategies, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction.

CHAPTER III: LITERATURE REVIEW

This chapter presents a focused survey of the literature on retraction. Each of the first three sections of the chapter reviews one distinct line of research on the phenomenon of retraction. Specifically, the first section focuses on studies which take a scientometric approach to retraction, while the second and third sections review the small number of extant studies adopting a linguistic approach and a sociological approach, respectively. In the fourth section, research gaps are identified for the present study, and specific research questions are then formulated to flesh out the two overarching research questions presented in Chapter 1.

3.1 The Scientometric Approach to Retraction

Since the late 1990s, increasing scholarly attention has been paid to the multi-faceted phenomenon of retraction, and a wealth of research has been conducted to investigate its various aspects. The extant studies on the phenomenon of retraction fall into three main categories. The first line of research takes a scientometric approach to uncovering a variety of characteristics of retraction quantitatively. Specifically, this line of research investigates associations of retraction with such contextual factors as disciplines, geographic locations, and journal impact, repeat offenders in retraction, and authorial collaboration in retracted publications, in addition to what has been introduced in Sections 1.2.1, 1.2.4, and 1.2.5.

3.1.1 Disciplinary characteristics of retraction

The majority of the extant studies on retraction focused on hard disciplines, such as chemistry (Coudert, 2019), engineering (Rubbo et al., 2019a; Rubbo et al., 2019b), computer science (Al-Hidabi & Teh, 2019), library and information science (Ajiferuke & Adekannbi, 2020), and especially life sciences and biomedicine (Azoulay et al., 2015; Fang et al., 2012), which include but are not limited to orthopaedics (Yan et al., 2016), neurosurgical science (Wang et al., 2017), drug (Samp et al., 2012), radiology (Wasiak et al., 2018), dentistry (Nogueira et al., 2017; Rapani et al., 2020), oncology (Hamilton, 2019; Pantziarka & Meheus, 2019), obstetrics and gynaecology (Chambers et al., 2019), emergency medicine (Chauvin et al., 2019), general and internal medicine (de Almeida et al., 2016a), mental disorders (Balhara & Mishra, 2015), urology (Mena et al., 2019), nursing and midwifery (Al-Ghareeb et al., 2018), and surgery (Cassao et al., 2018). In contrast, a much smaller number of studies have investigated retraction in social sciences, such as psychology (Craiga et al., 2020; Stricker & Günther, 2019), tourism and hospitality (Alrawadieh & Zareer, 2019), economics (Cox et al., 2018), business and management (Karabag & Berggren, 2012; Tourish & Craig, 2020), and leadership (Atwater et al., 2014). Studies have also explored the phenomenon of retraction in arts and humanities (Halevi, 2020) and across disciplines (Grieneisen & Zhang, 2012; Vuong, 2019b, 2019c).

Disciplinary variations exist in retraction. Medicine, Chemistry, Life Sciences and Multidisciplinary Studies are found more prone to retraction than other WoS-indexed disciplines (Grieneisen & Zhang, 2012; T. He, 2012; van Leeuwen & Luwel, 2014; Zhang & Grieneisen, 2013). Retraction was reported to be more common in applied sciences such as medicine and life sciences (Grieneisen & Zhang, 2012; Hesselmann et al., 2017; Lu et al., 2013; Shuai et al., 2017). Retraction rates due to misconduct varied from 0.22 per 100,000 publications in the Humanities to 7.58 in Medicine and 7.69 in Chemistry (Zhang & Grieneisen, 2013). Subfields were found to have no influence on retraction rates (Furman et al., 2012; Steen & Hamer, 2014; Trikalinos et al., 2008). A majority (63 %) of some 1,600 retractions covered in the Retraction Watch blog came from the biomedical, medical and clinical sciences (Ribeiro & Vasconcelos, 2018). In contrast, social sciences (Karabag & Berggren, 2012) and arts and humanities (Halevi, 2020) saw much fewer retractions. There are two possible explanations for the observed disciplinary differences in retraction. First, the issue of problematic publications, as indicated by the absolute number of retractions, has been more prominent in hard disciplines and, consequently, may have drawn more scholarly attention to and research interest in the phenomenon of retraction in hard disciplines (mostly natural sciences, especially life/health) and medical sciences, than in soft disciplines (mostly social sciences and arts & humanities). According to the RWDB, as of 31 December 2019, a total of 22,729 publications were retracted, and approximately 30.5% (n = 6,925) of them came from health sciences. Second, the different natures of scientific inquiry into hard and soft disciplines may make it easier to confirm retraction-engendering allegations in the former than in the latter. For example, replication, which is a major means of sifting out problematic research, does not work well in all disciplines. Research in hard disciplines, whose subject is the invariable natural world, is replicable (Popper, 2005), whereas studies in soft disciplines, which involve human behaviors, can hardly be replicated (Lincoln, 1985).

3.1.2 Geographic characteristics of retraction

Retraction is like a pandemic sweeping across the international industry of academic publishing, and its severity varies by geographic location. According to the RWDB, researchers from 139 countries and regions across the world authored 22,729 retracted publications as of 31 December 2019. China and the United States of America (USA) were the two most productive contributors of retractions worldwide. Studies published between 2012 and 2014 (Amos, 2014; Casadevall et al., 2014; Grieneisen & Zhang, 2012; T. He, 2012; van Leeuwen & Luwel, 2014; Zhang & Grieneisen, 2013) reported that the USA contributed the largest number of retractions. Based on the 4,449 publications retracted worldwide between 1980 and 2010 and indexed in WoS, the largest geographic source of retractions was the USA, followed by EU-27, China,

India, Japan and South Korea (Grieneisen & Zhang, 2012). However, according to the data mainly from the Retraction Watch blog, as of February 2019, China contributed 8,612 retracted publications and became the number one source of retractions, followed by the USA (3,179), India (934), Japan (874), Germany (623), the United Kingdom (593), Iran (582), South Korea (520), Italy (434), and Canada (307) (Vuong, 2019c). Eighty-five percent of the retractions covered by the Retraction Watch blog from 2013 to 2015 came from 15 countries, with the USA and China being the two largest contributors, accounting for 41% of the retractions (Ribeiro & Vasconcelos, 2018). According to more recent data from the RWDB, as of 2018, the top 10 countries with the highest retraction rates (i.e., number of retracted publications per 10,000 publications) were Iran (14), Romania (10.4), Singapore (7.8), India (7.5), Malaysia (6.8), South Korea (6), China (5), Turkey (4.6), South Africa (4.5), and the Netherlands (4.4) (Brainard et al., 2018; Oransky, 2018). However, earlier data from Scopus showed that as of 2016 China's retraction rate was higher than all other countries by an incredibly huge margin, almost 25 times as high as that of Iran (the second-highest) and almost 194 times as high as that of the USA (the twelfth highest) (Ataie-Ashtiani, 2017). Differently, data from WoS showed that as of January 2014 India (2.1 retracted publications per 10,000 publications) topped the list of retraction rates, followed by Japan (1.8), China (1.4), Germany (1.3), the Netherlands (1.2), South Korea (1.1), and the USA (1.1) (van Leeuwen & Luwel, 2014). Those somewhat contradictory data suggest that the phenomenon of retraction is dynamic and varies by geographic location.

China, EU-27, the USA, and India were found to be the top four sources of retractions due to misconduct (Zhang & Grieneisen, 2013). China outnumbered all other countries in the absolute number of retractions due to plagiarism and duplicate publication, but Italy and Finland had the highest rates of retraction due to plagiarism and duplicate publication, respectively (Amos, 2014). Countries that had policies on handling research misconduct and institutions to enforce them were found less prone to retraction (Fanelli et al., 2015). Developing countries tend to be less active in retracting publication despite apparent evidence of misconduct (Joob & Wiwanitkit, 2017). Both lower-income countries and non-English speaking countries are more prone to retraction due to plagiarism (Stretton et al., 2012). Similarly, Balhara and Mishra (2015) found that low- and middle-income countries contributed far more retractions than high-income countries did, and Asian countries were more prolific in retraction than non-Asian countries were. Countries with lower scientific impact have a higher incidence of retraction due to plagiarism/duplication (de Almeida et al., 2016a). Notably, in addition to the comparative research involving multiple geographic locations, more and more studies on retraction have focused on individual countries and regions, such as China (Lei &

Zhang, 2018; Liu & Chen, 2018), India (Bhargava et al., 2019; Elango et al., 2019), Iran (Moradi & Janavi, 2018), Malaysia (Aspura et al., 2018), Arab (AlRyalat et al., 2020), North Korea (Jeong & Huh, 2018), Middle East (Liu & Lei, 2021), and Latin America and the Caribbean (de Almeida et al., 2016b). The observed geographic differences in retraction can be attributed to lack of policies on research and publication ethics and their enforcement, non-English-speaking researchers' difficulty with English as a language for research and publication purposes (in the case of plagiarism, as evidenced by Desa, 2008), publish-or-perish pressures, institutional metrics-oriented evaluation of research output, the reward system adopted to incentivise research output, among others.

3.1.3 Journal impact on retraction

Consistent with a model developed by Lacetera and Zirulia (2011) to predict the occurrence of misconduct, some studies found retractions more likely to occur in higher-impact journals (Fang & Casadevall, 2011; Fang et al., 2012; Gasparyan et al., 2014) and with highly cited articles (Furman et al., 2012). Several studies (Cokol et al., 2007; Fang et al., 2013; Fang & Casadevall, 2011; Fang et al., 2012; Grieneisen & Zhang, 2012; Steen, 2011b) reported that retractions due to misconduct were positively associated with journal impact factors. T. He (2012) also found that journal impact factor was strongly correlated with the number of retractions. Journals with higher impact factors were also reported to have higher retraction rates (Cokol et al., 2007; Fang & Casadevall, 2011; Nath et al., 2006; Resnik et al., 2015c; Thielen, 2018). Moreover, one study (Steen et al., 2013) found the publication-to-retraction time lags of higher-impact journals significantly shorter, but only 1% of the variance in publication-to-retraction time lag could be explained by increased scrutiny. Steen (2012) reported that retracted publications in higher-impact journals were cited more often than those in lower-impact ones. The associations between journal impact factors and retraction prevalence identified by these studies can be attributed to three factors. First, high-impact journals tend to have established policies on handling retraction and are likely to be proactive in retracting questionable publications (even without consent from their authors) rather than correcting them (Resnik et al., 2015c; Wager & Williams, 2011) probably because of their need to act as a model gatekeeper of academic integrity and their possession of more resources to satisfy such a need. Second, due to their higher visibility, higher-impact journals may attract closer scrutiny by journal readers and thus increase the possibility of flawed publications being detected and retracted (Cokol et al., 2007; Fanelli, 2013; Fang et al., 2012; Nath et al., 2006; Thielen, 2018). Third, for researchers seeking short-term personal gains, the anticipated benefits of publishing retractable research in higher-impact journals seem to outweigh the risk

of getting caught (Cokol et al., 2007; Fang et al., 2012; Nath et al., 2006; Resnik et al., 2015c; Thielen, 2018).

Other studies (Singh et al., 2014; Vuong, 2019c), however, failed to find any significant correlations between journal impact factors and the number of retractions. T. He (2012) did not find a statistically significant correlation between impact factor and retraction rate, though such a correlation was found between impact factor and number of retractions. One study (Al-Ghareeb et al., 2018) even found a negative correlation between journal impact factors and their retraction rates. Consist with this finding, Wang et al. (2019) reported that a majority of retracted publications from China, India, Iran, and the USA were published in journals with lower impact factors. Another two studies (Campos-Varela et al., 2020; Nogueira et al., 2017) reported that retractions due to misconduct were more frequent in lower-impact journals. Similarly, Lei and Zhang (2018) found that publications by Chinese researchers retracted because of misconduct were more often found in lower-impact journals than in higher-impact ones.

To sum up, the associations between retraction and journal impact factors are inconclusive and, consequently, the identified associations, positive and negative, should be interpreted with caution. Possible factors leading to the inconsistent findings reviewed above include different sampling methods related to time periods of data coverage, authors of retracted publications of particular national affiliations, disciplines, retraction reasons, repeat offenders, and measurement-related factors (e.g., impact factor, number of retractions vs. retraction rate, and citation). In particular, since journal impact factors vary widely by discipline and even by subject area within a discipline, journal quartile ranks are better indicators of journal prominence and thus should have been used in identifying associations between journal prominence and retraction, especially when interdisciplinary journals are involved.

3.1.4 Repeat offenders in retraction

A repeat offender has authored more than one retracted publication, and an individual who has authored only one retracted publication is referred to as a one-time offender. Repeat offenders constitute only a small proportion of authors of retracted publications, but their impact can be disproportionately great. Only 3% of 1,093 authors of retracted publications in the fields of chemistry, materials science, and chemical engineering indexed between 2017 and 2018 authored at least three retracted publications, whereas 92% of the authors were one-time offenders (Coudert, 2019). According to data archived by the RWDB, as of 2018, 100 authors contributed at least 13 retracted publications each, most of which resulted from misconduct, and the top 10 most prolific repeat offenders were Yoshitaka Fujii (Japan, 169 retractions),

Joachim Boldt (Germany, 96 retractions), Diederik Stapel (the Netherlands, 58 retractions), Chen-yuan Peter Chen (Taiwan, 43 retractions), Yoshihiro Sato (Japan, 43 retractions), Hua Zhong (China, 41 retractions), Shigeaki Kato (Japan, 39 retractions), James Hunton (the United States, 36 retractions), Hyung-in Moon (South Korea, 35 retractions), and Jan Hendrik Schön (the United States, 32 retractions) (Brainard et al., 2018). In a survey of 4,449 retracted publications indexed in WoS, 13 repeat offenders accounted for 54% of the global total of 725 retractions due to alleged research misconduct, and the large numbers of retractions from these repeat offenders skewed distributions for individual years, countries, disciplines, and journals (Grieneisen & Zhang, 2012). The 10 most prolific repeat offenders contributed approximately 15% (n = 234) of the 1,572 publication indexed in PubMed and retracted between 2000 and 2018 (Pantziarka & Meheus, 2019). By contrast, other studies found that one-time offenders were responsible for the majority of retractions. As many as 89.8% of the 176 retracted publications in obstetrics and gynaecology indexed in PubMed as of June 2018 were authored by one-time offenders (Chambers et al., 2019).

Repeat offenders are more likely to be involved in retractions due to misconduct. Stretton et al. (2012) reported that repeat offenders were responsible for 40.4% of retractions due to misconduct. Mongeon and Larivière (2016) found that 10.6% of the culpable authors accounted for almost 80% of all the retractions due to misconduct. Lei and Zhang (2018) reported that 24 repeat offenders contributed 36.57% of all the retracted publications authored by Chinese researchers and indexed in WoS between 1997–2016, most of which were due to fraud, plagiarism, or faked peer review. Another study (Steen, 2011b) reported that repeat offenders authored roughly 53% of retractions due to misconduct but only 18% of retractions due to error. Two exceptional repeat offenders authored nearly 40% of the 102 retracted publications in the drug studies indexed in PubMed between 2000 and 2011 (Samp et al., 2012). Craiga et al. (2020) found that two exceptionally prolific repeat offenders increased the frequency of retraction due to data fabrication/falsification from 21% to 48% in psychology and from 10% to 33% in business and management. Steen (2012) revealed that retracted publications authored by repeat offenders did not enrol more subjects or treat more patients than retracted publications authored by one-time offenders did, nor did they differ in the number of citations to the retracted publications. Notably, most repeat offenders tried to evade their responsibility by not admitting their retraction-engendering behaviors (Katavic, 2014). Based on a statistical model developed by Kuroki and Ukawa (2018), 3–5% of one-time offenders are likely to author another retracted publication five years after their last retraction, whereas 26–37% of repeat offenders with five retractions are likely to do so. However, the

influence of repeat offenders, as indicated by the proportion of retracted publications authored by them, is declining over time (Steen, 2011b; Steen et al., 2013).

Since repeat offenders have authored a disproportionate proportion of retracted publications, preventing repeat offence is crucial to curbing the phenomenon of retraction. If repeat offenders cannot be identified accurately, the severity of their negative impact on the academic publishing system cannot be fully exposed to serve as a deterrent for one-time and potential offenders. However, the current publishing and indexing systems of academic publications do not disambiguate authors systematically and consistently, despite the increasing use of digital author disambiguating devices such as ORCID, WoS ResearcherID, and Scopus Author ID. Consequently, repeat offenders have to be identified manually, usually using author names, as well as their home institutions and disciplines (e.g., Grieneisen & Zhang, 2012; Lei & Zhang, 2018), and the potential inaccuracy of manual identification of repeat offenders may have undermined the research findings reviewed above, especially when the research data involved multiple disciplines and databases.

3.1.5 Authorial collaboration in retracted publications

Science has become an enterprise that requires more and more collaboration among researchers (Wuchty et al., 2007), and the number of authors per academic publication is on the rise (Larivière et al., 2006). As a result, retracted publications tend to have more than one author. According to the RWDB, as of 2018, a retracted publication had an average of three authors (Brainard et al., 2018). Only 9% of the randomly sampled 312 retracted publications archived in MEDLINE between 1988 and 2008 had one author (Wager & Williams, 2011). All the 92 publications retracted from *Science* between 1983 and 2017 had at least two authors (Wray & Andersen, 2018). Of the 303 PubMed-indexed retracted publications examined in Foo (2011), 93.4% of those retracted publications were co-authored. As reported by Steen (2011b), publications involving misconduct had more authors than those retracted due to error, and it took longer to retract the former than the latter. By contrast, Nath et al. (2006) reported that publications retracted due to honest error were more likely to have multiple authors. However, this finding was disconfirmed by Wray and Andersen (2018), who found that teams of two to four scientists were four times more likely than teams of more than eight members to have retractions due to honest error, probably because larger teams could more effectively scrutinise their research and manuscripts before publication. Notably, a more recent study (Walsh et al., 2019) did not find a significant association between the number of co-authors and the rate of retraction. Retracted publications were found by Trikalinos et al. (2008) to be two times more likely to involve multinational collaboration than non-retracted publications were. Foo and Tan (2014) found that the number of co-authors was not a significant predictor for retraction and

that repeat offenders were more likely to collaborate with different individual researchers on retracted publications than with a few frequent co-authors.

As not all co-authors are involved in all aspects of a retracted publication (Larivière et al., 2016), the retraction of co-authored publications often result from an individual co-author's retraction-engendering act. Authorship carries credit and responsibility (Biagioli, 1998). However, co-authors of retracted publications typically claim credit for their publications in top-tier academic journals but tend to shirk responsibility for their retractions (Anonymous, 2009). Sometimes, not all co-authors of retracted publications agree to retraction, and those who disagree may even jeopardise the reputation of the journals and editors involved (Wager et al., 2009). Accordingly, the COPE retraction guidelines 2009 (Wager et al., 2009) recommend that innocent authors of retracted publications should be distinguished from their guilty co-authors, though most editors hold the view that "authorship entails some degree of joint responsibility" (p. 5) [18]. However, to hold all co-authors accountable for retraction may help deter honorary authorship, as argued by Foo and Tan (2014). Notably, although innocent authors tend to suffer from citation penalty due to their guilty co-authors' fault (Bonetta, 2006; Lu et al., 2013; Mongeon & Larivière, 2016), retractions do not seem to have a clear impact on the collaborative practices of co-authors before and after retractions, regardless of the retraction reasons (Mongeon & Larivière, 2014). On a related note, authorship issues in various forms were found in one study (Sweedler, 2019) to account for one-fifth of retractions. Many scholars (e.g., Markowitz & Hancock, 2016; Moylan & Kowalczuk, 2016; Wager, 2007) maintain that authorship violation should be considered a form of fraud, but the two sets of COPE retraction guidelines (COPE Council, 2019; Wager et al., 2009) do not recommend retraction due to authorship issues on the ground that they do not invalidate research findings.

3.1.6 Identification and classification of retraction reasons

Publications are retracted for a variety of reasons (Azoulay et al., 2015; Budd et al., 2016; Chen et al., 2018; Fanelli et al., 2015; Grieneisen & Zhang, 2012; Lei & Zhang, 2018; Ribeiro & Vasconcelos, 2018; Singh et al., 2014; van Leeuwen & Luwel, 2014). The RWDB has documented over 90 retraction reasons, ranging from error in text and text plagiarism to data fabrication or falsification to being hoax papers (Retraction Watch, n.d.-a). Misconduct is found accountable for most retractions in life science and biomedicine (Azoulay et al., 2015; Fanelli et al., 2015; Fang et al., 2012), engineering (Rubbo et al., 2019a), computer science (Al-Hidabi & Teh, 2019), economics (Cox et al., 2018), business and management (Tourish & Craig, 2020), psychology (Craiga et al., 2020; Stricker & Günther, 2019), and arts and

[18] The latest COPE retraction guidelines 2019 offers the same recommendation.

humanities (Halevi, 2020). In contrast, honest error (i.e., unintentional mistakes or malpractices) has been reported as the major retraction reason in many other studies (e.g., Nath et al., 2006; Singh et al., 2014; Steen, 2011c; Wang et al., 2019; Wray & Andersen, 2018). As mentioned earlier, publications have also been retracted for reasons other than those listed in the COPE retraction criteria 2009, such as authorship issues (Wu et al., 2017), legal issues (Anonymous, 2004; Frontiers in Psychology Editorial Office, 2014), citation manipulation (Anonymous, 2014b; The Scientific World Journal, 2012), unacknowledged sponsorship (Anonymous, 2018), unintended publication (Tian et al., 2017), conflict of interest (Hashimov et al., 2013; Zhu et al., 2018), and even unconfirmed misconduct (e.g., Baines, 2018; G. He, 2012). It should also be noted that retraction reasons are either not disclosed in retraction notices at all or communicated in too vague language to be identifiable (Budd et al., 2016; Fanelli et al., 2015; Grieneisen & Zhang, 2012). In particular, misconduct as a retraction reason may be downplayed or even obscured in retraction notices as a strategy for mitigating retraction stigma. Abritis (2015) reported that only 40.7% of the retraction notices and corrections due to misconduct confirmed through investigations by the U.S. ORI disclosed misconduct truthfully as the reason for the retraction or correction.

Retraction reasons have been not only identified in type but also classified by severity. *Misconduct* and *honest error* were adopted as two major categories in many previous studies (e.g., Fang et al., 2012; Moylan & Kowalczuk, 2016), although such binary classification has been excluded from the COPE retraction criteria 2019 (COPE Council, 2019). The major driving force to distinguish between misconduct and honest error may be the need for fair sanctions on retraction (see below for further discussion). Despite the justifiable need to do so, to classify retraction reasons is methodologically problematic. Firstly, what defines honest error is lack of intention to engage in retraction-engendering behaviors, but it is hard to verify whether or not a retraction-engendering behavior is committed intentionally (Teixeira da Silva & Dobranszki, 2017). Second, despite the well-known definition of research misconduct (i.e., fabrication, falsification, and plagiarism) proposed by the White House's Office of Science and Technology Policy (2000) and enforced by the U.S. federal law, no universal consensus has been reached on what constitutes misconduct (Friedman, 1992; Smith, 2003). Understandings of misconduct as a concept in the context of research and publication ethics vary by journal and publisher (Resnik et al., 2015c; Teixeira da Silva & Dobranszki, 2017), culture (Davis, 2003; Momen & Gollogly, 2007), institution (Resnik et al., 2015a; Teixeira da Silva & Dobranszki, 2017), country (Resnik et al., 2015b), and individual (Liao et al., 2018). In other words, certain behavior may be identified as misconduct in one context but not in another.

To complicate matters further, misconduct can be further classified by severity, for example, minor, significant, and grave misconduct (Keränen, 2006) or blatant misconduct, inappropriate conduct, and questionable conduct (Hall & Martin, 2019). Fine-grained classifications of misconduct can enhance the operationalisation of misconduct for the handling of retraction. However, to my best knowledge, no research has comprehensively classified retraction reasons in a fine-grained manner. Instead, a few studies have classified retraction reasons using different criteria. For instance, Azoulay et al. (2015, p. 1121) categorized retraction reasons into three groups according to their influence on the validity of research findings: 1) "Strong Shoulders", when the validity of research findings is not affected at all; 2) "Shaky Shoulders", when the validity of research findings is undermined or unconfirmed; 3) "Absent Shoulders", when the research findings are invalidated. Differently, Andersen and Wray (2019) classified retraction reasons by what is wrong with the retracted data and whether intentionality is involved in retraction-engendering errors. These two approaches to classifying retraction reasons focus on the validity of research data and findings but ignore violations of publication ethics as retraction reasons. Therefore, to deepen our understanding of retraction and better help curb retraction, an examination of retraction reasons should simultaneously take into account the validity of research data/findings, intentionality of retraction-engendering behaviors, and research and publication ethics.

3.2 The Linguistic Approach to Retraction

Retracted publications and retraction notices, together with publications citing retracted publications, have been used as primary data sources for the vast majority of extant studies on retraction. Some features of retraction can be uncovered through a bibliographic analysis of the three types of retraction-related documents, but other characteristics of retraction, such as retraction reasons and initiators/performers of retraction, cannot be identified without analysing the text of retraction notices. Apparently, what information is disclosed and how it is communicated has a crucial influence on how well retraction notices serve the mechanism of retraction. In other words, language use plays an important role in influencing the effectiveness of retraction notices. The importance of language use in retraction notices is further highlighted by the two sets of COPE retraction guidelines, which propose that retraction notices should "avoid statements that are potentially defamatory or libellous" (Wager et al., 2009, p. 2) and "[b]e objective, factual and avoid inflammatory language" (COPE Council, 2019, p. 3). It is also recommended that negotiation of the wording of retraction notices should be allowed and a consensus on the wording of retraction notices should be achieved among all parties involved (Wager et al., 2009). Scholarly investigations into language use in retraction

notices have also been inspired by the pioneering linguistic research into retracted publications conducted by Markowitz and Hancock (2014, 2016).

3.2.1 Linguistic obfuscation in retracted publications

Markowitz and Hancock (2014) investigated the linguistic patterns of 24 fraudulent and 25 genuine publications first-authored by social psychologist Diederik Stapel, who co-authored 58 retracted publications, as of 7 December 2015, according to the RWDB. Their analysis identified linguistic differences between Stapel's fraudulent and genuine publications on science-related discourse dimensions. Specifically, Stapel's fraudulent papers used more terms pertaining to methods, empirical investigation, certainty, and emotional actions, states and processes but fewer adjectives than his genuine papers did. Those identified linguistic features could differentiate Stapel's fraudulent publications from his genuine ones with above-chance accuracy. A major limitation of the study, however, was that since it focused on a single repeat offender in a single research area, it was unclear whether its findings could be generalised to other authors of retracted publications across disciplines.

In a subsequent study, Markowitz and Hancock (2016) conducted a large-scale analysis of the linguistic features of fraudulent papers across authors and disciplines. Specifically, they examined and compared the linguistic styles of a corpus of 253 publications retracted for fraudulent data, a corpus of 253 normal publications, and a corpus of 62 publications retracted for reasons other than fraud. Linguistic obfuscation was measured by a single index which summed the standardized rates of causal terms (Li, 2008), the abstraction index (Larrimore et al., 2011), and jargon, but subtracted the rate of positive emotion terms (Li, 2008) and the Flesch Reading Ease score (Flesch, 1948). A higher score on this index indicated a higher level of linguistic obfuscation. It was found that fraudulent papers were characterised by significantly higher levels of linguistic obfuscation than normal and nonfraudulent papers were. Moreover, the linguistic obfuscation of publications retracted due to fraudulent data was found to be positively correlated with the number of references per paper, suggesting that fraudulent papers masked deception by making the analysis and evaluation of them more costly.

As admitted by the researchers themselves, however, most of the publications examined in their study were from the biomedical sciences and thus the research findings should not be overgeneralised to fraudulent publications in other disciplines. Also admitted by them was the methodological limitation of their relatively narrow set of cues of linguistic obfuscation. Despite these limitations, the findings of these studies highlight the significance of taking a linguistic approach to investigating retraction-related documents which include not only retracted publications but also retraction notices. Notably, Markowitz and Hancock's (2014,

2016) examination of emotion terms in retracted publications is similar to investigating retraction-related attitudinal evaluation in retraction notices as proposed in the present study.

3.2.2 Inadequate transparency of retraction notices

In terms of language, retraction notices are mostly characterised by uninformativeness, vagueness, use of euphemisms, and ambiguous wording, which are capsulised as inadequate transparency. Retraction notices' inadequate transparency could be attributed to retraction notice authors' effort to avoid embarrassment (van Leeuwen & Luwel, 2014), journal authorities' fear of litigation (COPE Council, 2019; Fanelli, 2013; McLean, 2013; Wager et al., 2009), especially in the absence of consent from all co-authors (Fanelli, 2013), or the need for authors to repair their tarnished image (Cox et al., 2018). The first and last causes mentioned above for the inadequate transparency of retraction notices can be further identified as consequences of retraction stigma. Such inadequate transparency of retraction notices, especially when misconduct is the retraction reason (Banks et al., 2016), makes it methodologically difficult to develop a specialized database for research on retraction (Vuong, 2019b) and works against deterring misconduct in retraction notices (Cox et al., 2018). Paradoxically, it encourages the indiscrete stigmatization of retraction due to honest error (Teixeira da Silva & Al-Khatib, 2019; van Noorden, 2011) and discourages proactive self-retraction (Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b), both of which are detrimental to correcting the literature. Consequently, opaque and uninformative retraction notices are criticised for being useless (Marcus & Oransky, 2014), and an academic society apologized publicly for its journal issuing such a useless retraction notice (Oransky, 2013).

Inadequate transparency in retraction notices has been reported in a wealth of literature (Abritis, 2015; Azoulay et al., 2017; Azoulay et al., 2015; Cox et al., 2018; Craiga et al., 2020; Fang et al., 2012; Hesselmann et al., 2017; Moylan & Kowalczuk, 2016; Neale et al., 2007; Pfeifer & Snodgrass, 1990; Resnik & Dinse, 2013; Steen, 2011b; Steen et al., 2013; Jaime A. Teixeira da Silva, 2015; Vuong, 2019b; Wager & Williams, 2011; Zhang & Grieneisen, 2013). However, the vast majority of previous studies uncovered inadequate transparency of retraction notices as a finding ancillary to their identification of retraction reasons. In contrast, only a few other studies have conducted focused in-depth investigations into language use in retraction notices. In a short piece, Marcus and Oransky (2015) reported their qualitative observation of the pervasive use of euphemisms in retraction notices. More importantly, two studies (Hu & Xu, 2020; Xu & Hu, 2021) took a linguistic approach to investigating retraction notices as a high-stakes academic genre (see the subsequent section for a detailed review). One possible explanation for the inadequate transparency of retraction notices in disclosing sensitive information (e.g., problems with the retracted publications and agents of retraction-

engendering acts) could be that it is utilised as a strategy for managing retraction stigma and/or courtesy retraction stigma.

3.2.3 Image-repairing nature of retraction notices

Author names of retracted publications, which are clearly indicated in by-lines, can be retrieved from citation indexes; in contrast, authorship of retraction notices often cannot be identified. Retraction notice authorship was either overlooked or oversimplified in the literature. For instance, initiators/performers of retraction were sometimes misidentified as retraction notice authors (e.g., Bilbrey et al., 2014; Wager & Williams, 2011). In response, Xu and Hu (2018) developed a set of criteria for identifying retraction notice authorship based on a close textual analysis of retraction notices. Using the criteria, four types of retraction notice authorship were identified. Specifically, retraction notices can be issued by 1) authors of retracted publications, 2) journal authorities, 3) both authors of retracted publications and journal authorities, or 4) entities that cannot be identified unambiguously. It was also found that the identities of authors of retracted publications were missing from most of the retraction notices examined in the study, although they were held responsible for all but a small number of retractions. The observed pervasive evasion of authorial identities suggests that authors of retracted publications tend to obscure their involvement in and responsibility for retraction probably in an attempt to save their face. Admittedly, the linguistic approach to identifying retraction notice authorship has its limitations because the criteria are merely based on a textual analysis of retraction notices rather than drawing on data elicited from *de facto* retraction notice authors (i.e., authors of retracted publications and journal authorities). However, as reported in the article, Xu and Hu (2018) did tentatively reach out to some authors of retracted publications in an attempt to verify the reliability of the authorship identification criteria but failed to collect any useful information due to the highly sensitive nature of retraction. Negotiation of the wording of retraction notices among multiple stakeholders may have happened and resulted in ambiguous or unidentifiable authorship in some of the retraction notices examined.

Given the image-tarnishing nature of and potential tangible punishment for retraction, Xu and Hu (2021) identified retraction notices as a high-stakes academic genre which in general serves multiple communicative purposes depending on retraction notice authors' status and needs. Taking the ESP (English for Specific Purposes) approach to genre analysis, the study identified the generic structure of retraction notices through a move analysis. A total of 18 rhetorical moves were identified. Of them, 11 moves (i.e., announcing a retraction, specifying the retracted article(s), identifying retraction performer(s) and/or initiator(s), revealing the retraction trigger, uncovering the problem(s) with the retracted article, justifying the retraction decision, upholding research finding(s), reporting the status of consent to the

retraction, declaring consequences of the retraction, revealing the availability of the retracted article and/or a supporting document, notifying stakeholders of the retraction, and disclosing publication and/or contact information of the retraction notice) work together to fulfil the primary communicative purpose of retraction notices (i.e., correcting the literature), as proposed by the COPE retraction guidelines (COPE Council, 2019; Wager et al., 2009). Four moves (i.e., exposing a questionable record of the retracted article(s) or article author(s), uncovering the problem(s) with the retracted article, distinguishing between the guilty and innocent article authors, and justifying the retraction decision) serve to deter potential offenders. In light of image repair theory (Benoit, 2015), five moves (i.e., recapping the research reported in the retracted article, upholding research finding(s), distinguishing between the guilty and innocent authors, offering remedies for the retraction, and expressing apologies, regrets and/or gratitude) are employed in retraction notices to repair the tarnished image of authors of retracted publications. Similarly, Lin and Chen's (2022) genre analysis of 200 retraction notices from biomedical journals identified eight moves. Partially consistent with Xu and Hu (2021), three of the eight moves identified (i.e., mitigating the error, showing corrective actions, and expressing the author's emotions) were interpreted as image-repairing, and two image-repairing moves identified by Xu and Hu (i.e., recapping the research reported in the retracted article and distinguishing between the guilty and innocent authors) were not found in Lin and Chen's investigation probably because of the different data coverage of the two studies.

Another study by Hu and Xu (2020) investigated the grammatical representation of accountable authors' agency in retraction-engendering acts and gauged the visibility of such agency. Drawing on Systemic Functional Linguistics (Halliday & Matthiessen, 2004), seven grammatical constructions based on the grammatical voice system and nominalization in the English language were incorporated into a seven-point cline of agency/responsibility to identify the agents of retraction-engendering acts and measure the degree of their visibility. The study found that the agent-obscuring grammatical constructions (i.e., Passive Agentless Construction, Active Agentless Ergative Construction, Active Verb with an Inanimate Subject, Nominalization without an Agent Marker) were deployed 3.35 times more frequently than the agent-identifying ones (i.e., Agent + Active Voice, Passive Voice + Agent, Nominalization with an Agent Marker). Agents were identified only in a minority (44.4%) of the 250 retraction notices examined. The overall average agency/responsibility score of the retraction notices was 2.73 out of a maximum of 7.0. Taken together, those findings indicated that the retraction notices examined tended to obscure accountable authors' agency in retraction-engendering acts to alleviate the damage to their image. The severity of image damage appeared to depend on the responsibility for the wrongdoing committed (Benoit, 2015) or the agency in the

wrongdoing (Lamb, 1991; Lamb & Keon, 1995; Marcel, 2003). In other words, the grammatical resources identified in the retraction notices were more often used to repair than aggravate the damage to the image of authors of retracted publications.

Lin and Chen's (2022) investigation revealed that the retraction notices published between 2016 and 2020 were more likely than those published between 1966 and 1996 to deploy the three image-repairing moves (i.e., mitigating the error, showing corrective actions, and expressing the author's emotions) and another three moves (i.e., stating the error, noting the claimant, and stating the author's decision). Apart from variation over time, the three studies by Xu and Hu also examined retraction notices' cross-disciplinary and author-based variations in various respects (i.e., authorial identification in retraction notices, generic structure of retraction notices, and grammatical assignment of accountable authors' agency in and responsibility for retraction). It was found that the retraction notices in the hard discipline of Cell Biology were more likely than those in the soft disciplines of Business, Finance, and Management to evade the identification of retraction notice authorship, adopt move types disclosing sensitive or image-tarnishing information, obscure agents of retraction-engendering acts, and grammatically assign to them less responsibility for retraction.

Notably, all the four studies reviewed above except (Xu & Hu, 2021) adopted image repair theory (Benoit, 2015) to interpret those findings and explain the identified cross-disciplinary and authorship-based variations. The theory-informed interpretation of those research findings prevented the studies from being as purely descriptive (like the scientometric line of research on retraction) and helped deepen our understanding of the phenomenon of retraction.

3.3 The Sociological Approach to Retraction

Since misconduct accounts for the majority of retractions (Fang et al., 2012; Grieneisen & Zhang, 2012; van Leeuwen & Luwel, 2014; Xu & Hu, in press), retraction has become "the most relevant institution of making sense of scientific misconduct" (Hesselmann et al., 2017, p. 1). Sociology of science as a field "deals with the social conditions and effects of science, and with the social structures and processes of scientific activity" (Ben-David & Sullivan, 1975, p. 203). Investigations into the phenomenon of retraction from a sociological perspective can facilitate our in-depth understanding of retraction. However, there is a paucity of research that has adopted a sociological approach to exploring the phenomenon of retraction.

3.3.1 Visibility of scientific misconduct

Through a comprehensive survey of the literature on how retractions and misconduct are handled in publishing and organizations, Hesselmann et al. (2017) found that retraction renders

two aspects of scientific misconduct visible, namely individual cases of retracted research and the fact "that someone is issuing retractions and is justifying that act" (p. 22). By interpreting their findings in light of the sociology of deviance, specifically Brighenti's (2007) three-type visibility scheme (i.e., the social-type, the media-type, and the control-type), Hesselmann et al. (2017) concluded that "retractions produce highly fragmented patterns of visibility" (p. 3). As "a fundamentally enabling resource, linked to recognition" and involving face-to-face interaction (Brighenti, 2007, p. 339), the social-type of visibility is not applicable to the context of retraction. The media-type of visibility, which may intersect with the social-type, usually functions "according to a flash-halo mechanism", isolating subjects "from their original context" and projecting them "into a different one endowed with its own logic and rules" (Brighenti, 2007, p. 339). Accordingly, "individual cases of misconduct and general policies for preventing misconduct" were identified by Hesselmann et al. (2017, p. 3) as the media-type visibility of retraction, which was highlighted. Since the control-type of visibility "transforms visibility into a strategic resource for regulation … or selectivity and stratification …, or both …." (Brighenti, 2007, p. 339), Hesselmann et al. (2017) identified the disclosure of retraction executors and processes as the control-type visibility of retraction, which was obscured. Following Brighenti (2007), Hesselmann et al. (2017) suggested that the identified control-type invisibility (i.e., inadequate visibility) of retraction is intended to, or can help, naturalise retraction as an institution exercising control over scientific misconduct.

Hesselmann et al.'s review and interpretation of the retraction-related literature have gone beyond previous descriptive research on retraction and deepened our understanding of the phenomenon of retraction. In particular, visibility as a concept adopted in the study provides a theoretical lens through which we can better see how retraction functions as an institution battling research and publishing misconduct. More importantly, their findings and discussions about the visibility of retraction have confirmed the existence of one of the seven core dimensions of retraction stigma (i.e., concealability) proposed in the present study. Despite its theoretical merits, the study had some methodological flaws that undermined the validity of its conclusion. The study, together with its conclusions, was based on a literature review (at a macro level) rather than an empirical investigation into the content of retraction notices (at a micro level). It can be argued that the media-type visibility of retraction is undermined by the inadequate transparency and uninformativeness of retraction notices, as reported in numerous studies (e.g., Azoulay et al., 2017; Cox et al., 2018; Craiga et al., 2020; Moylan & Kowalczuk, 2016; Steen et al., 2013; Jaime A. Teixeira da Silva, 2015; Vuong, 2019b). Inconsistent with Hesselmann et al.'s conclusion about inadequate control-type visibility of retraction, Xu and Hu (2021) found that this type of visibility was actually fairly high in retraction notices, when

processes of investigating retraction-engendering allegations were disclosed, retraction initiators, requesters, and performers were identified, and/or policies on retraction were cited or quoted. A lesson learned from such discrepancies is that researchers would fare better to rely on primary rather than secondary data when applying theories to analyze the phenomenon of retraction. More importantly, such discrepancies suggests that the use of retraction stigma power through and in retraction notices can be explicit or implicit.

3.3.2 Organizational context of scientific misconduct

In their book *Fraud and Misconduct in Research: Detection, Investigation, and Organizational Response*, Ben-Yehuda and Oliver-Lumerman (2017) examined 748 cases of research misconduct world-wide that were publicised in English between 1880 and 2010. They identified research fraud as the most serious form of research misconduct and labelled it as deviance in science. Their investigation into research fraud went beyond "just revealing the nature, practice, type, and patterns of such behavior and then unpacking its interpretations" (p. 192) and drew upon theories of deviance and control to "examine and understand the social, organizational, and moral context" (p. 192) of research fraud. Although its focus was not on the phenomenon of retraction, their theory-informed investigation into research fraud pointed to new avenues of inquiry and had implications for research on retraction. Their characterisation of research fraud as deviance in science provided supports for the conceptualisation of retraction stigma. Moreover, Ben-Yehuda and Oliver-Lumerman (2017) observed that investigations into research fraud could not be conducted without taking "relevant organizations and stakeholders" into consideration because research fraud "almost always takes place within an organizational structure" (p. x). Their analysis of the organizational context and stakeholders of research fraud, which is briefly reviewed below, can facilitate our understanding of some of the academic community's responses to retraction, such as journal authorities' reluctance to retract problematic publications, research institutions' lack of proactiveness and cooperation in investigating allegations of retraction-engendering behaviors, and retraction notices' nontransparent disclosure of retraction-related information.

Based on institutional theories of organization (DiMaggio & Powell, 1983; Meyer et al., 1987), Ben-Yehuda and Oliver-Lumerman (2017) argued that research-related institutions are pressured by the environment in which they operate "to conform to the external norm of treating seriously issues related to research integrity" (p. 64) and that by being perceived as serious about the issues they are rewarded with social recognition and undoubted legitimacy. They further argued that both organizational contexts and stakeholders are crucial for understanding and analysing research fraud. Organizations "impact the integrity of the research they sponsor and the commitment of scientists to ethical conduct of research" (Ben-Yehuda &

Oliver-Lumerman, 2017, p. 74). A review conducted by Leahey and Montgomery (2011) on the nature of professional autonomy of scientists and research regulations revealed that the current scientific environment is shaped through a renewed emphasis on both oversight-free trustworthiness and external regulation. Research fraud involves a wide range of stakeholders both on the organizational level (e.g., journals, universities, research funding agencies, research centres, and hospitals) and on the individual level (e.g., editors, reviewers, scientists, scientific committee members, research team leaders, and research physicians), all of whom contribute to the norms that facilitate the prevention of research fraud and may be interested in curbing or sanctioning research fraud (Ben-Yehuda & Oliver-Lumerman, 2017).

Organizational misconduct is defined by Greve et al. (2010) as "behavior in or by an organization that a social-control agent judges to transgress a line separating right from wrong; where such a line can separate legal, ethical, and socially responsible behavior from their antitheses" (p. 65). Following this definition, research fraud, which is committed by individual researchers, is organizational misconduct. Research institutions themselves as social-control agents may even be involved in organizational deviance/wrongdoing when they are in competition for scarce resources (Vaughan, 1999). Notably, the definition of organizational misconduct is determined by a social-control agent's judgement (Greve et al., 2010), and a social-control agent is "an actor that represents a collectivity and that can impose sanctions on that collectivity's behalf" (p. 56). As argued by Ben-Yehuda and Oliver-Lumerman (2017), social-control agents "also act as moral entrepreneurs in their own self-interest", and their investment of "various personal and economic interests in the revised regulatory systems" (pp. 65-66) may impede the reforming of ethics regulation. Ideally, scientific journals take two measures against research fraud, namely promoting scientific integrity by "publicizing clear policies and instruction to contributors" (Ben-Yehuda & Oliver-Lumerman, 2017, p. 88) and retracting publications "associated with some form of research fraud" (p. 85). Unfortunately, organizational wrongdoing can be aggravated by the culture of an organization which may endorse wrongdoing and attribute it to exonerating circumstances (Palmer, 2012), and can be influenced by the organization's competition for scarce resources and occasionally by its regulatory environment (Vaughan, 1999).

3.4 Research Gaps and Research Questions

The literature reviewed above shows research gaps in four areas, namely the nature of studies on retraction, rhetorical strategies and linguistic resources that may be employed in retraction notices to construct and manage retraction stigma, contextual factors that may influence the employment of those rhetorical strategies and linguistic resources, and research methods.

The extant studies on retraction, as pointed out by Hesselmann et al. (2017), tend to be descriptive rather than explanatory, and their interpretations of the empirical data are usually "more commonsensical than theoretically and empirically supported" (p. 12). These limitations are particularly true of the scientometric line of research on retraction. For this reason, Hesselmann et al. (2017) called for "more theoretical and explanatory work to be done in this area" (p. 12) to deepen our current understanding of the phenomenon of retraction. However, only a few studies have responded to the call. Specifically, one literature review (i.e., Hesselmann et al., 2017) examined the visibility of retraction from a sociological perspective, and another three empirical studies (Hu & Xu, 2020; Lin & Chen, 2022; Xu & Hu, 2021) drew on image repair theory (Benoit, 2015) to interpret their findings about the rhetorical and linguistic realizations of retraction notices.

The four previous studies (Hu & Xu, 2020; Lin & Chen, 2022; Xu & Hu, 2018, 2021) that took a linguistic approach to investigating retraction notices focused on three linguistic dimensions (i.e., authorial identification, generic structure, and grammatical assignment of agency/responsibility for retraction-engendering acts), leaving unexplored the use of other linguistic resources, such as evaluative language for expressing retraction-related attitudes. Theoretically, stigma arouses affective and cognitive responses (Dovidio et al., 2000; Pescosolido & Martin, 2015; Smith, 2007a); therefore, there is good reason to expect evaluative language resources to be exploited in retraction notices to serve the interests of various stakeholders. The findings of the four above-mentioned linguistic studies on retraction notices suggest that retraction notices tend to be made rhetorically and linguistically less image-tarnishing than expected mainly by obscuring human association with and responsibility for retraction. In view of these findings, evaluative language can be expected to be used in such a way that it will reinforce or mitigate the stigmatizing nature of retraction strategically.

Since stigma is socially constructed and context-specific (Hebl & Dovidio, 2005; Jones et al., 1984; Major & O'Brien, 2005; Stafford & Scott, 1986), there is good reason to expect that language use in retraction stigma communication via retraction notices will vary by academic discipline. As reviewed in Section 3.1.1, disciplinary variations were found in various respects of retraction, such as number of retractions (Grieneisen & Zhang, 2012; T. He, 2012; van Leeuwen & Luwel, 2014), retraction rate (Zhang & Grieneisen, 2013), and retraction reasons (Xu & Hu, in press). More related to this study, disciplinary variations were identified in all the three aforementioned studies (Hu & Xu, 2020; Xu & Hu, 2018, 2021) that adopted a linguistic approach to investigating retraction notices. The identified disciplinary variations identified were attributed to three major factors, namely different levels of ignominy resulting from the occurrence of retraction, different methods of scientific inquiry and research objects

between hard and soft disciplines, and varying prevalence of repeat offenders. Furthermore, a large-scale survey study (N = 1,073) conducted by Haven et al. (2019) revealed that researchers from natural sciences, social sciences, and humanities hold different perceptions of research integrity climate.

There is also a need to examine retraction stigma from a diachronic perspective. This need arises from the possible impact of the two sets of widely circulated COPE retraction guidelines (issued in 2009 and 2019, respectively) on how retraction stigma is constructed and managed through language in retraction notices, since the COPE retraction guidelines have been intended as working criteria for identifying retraction-warranting violations of research and publication norms. This need for a diachronic perspective also stems from the nature of stigma as a dynamic and changing social phenomenon (Blair, 2002; Crocker et al., 1998; Jones et al., 1984; Magee & Galinsky, 2008; Schomerus & Angermeyer, 2017). For this reason, Pescosolido and Martin (2015) have called for more longitudinal research on stigma to further our understanding of the dynamics of stigma since only a few longitudinal studies have been conducted (e.g., Link et al., 2008; Livingston & Boyd, 2010; Lysaker et al., 2007; Pescosolido et al., 2010).

The severity of retraction-engendering acts could also be a crucial factor influencing retraction stigma communication via retraction notices. As Ben-Yehuda and Oliver-Lumerman (2017) pointed out, reactions to fraud in research are expected to "be proportional to the severity of the case" (p. 195). They run the gamut of "incarceration and heavy monetary penalties" at one end and "shaming, reprimanding, probation, and warnings" (p. 195) at the other end. This expectation also follows from the proposition that origin/etiology (i.e., responsibility) is one of the essential elements of both stigma (Bresnahan & Zhuang, 2010; Crocker et al., 1998; Deaux et al., 1995; Frable, 1993; Jones et al., 1984; Lamont, 2018) and stigma communication (Smith, 2007a), as attested by the findings of many empirical studies (e.g., Black et al., 2014; Bresnahan et al., 2013; Elliott et al., 2012; Major et al., 2018; Penner et al., 2018; Zhuang & Bresnahan, 2012). Furthermore, it is also compatible with the assumption underlying attribution theory that blame and negative reactions to people are positively correlated with their personal accountability for their own conditions (Corrigan et al., 2003; Weiner, 1995; Weiner et al., 1988). Thus, it can be hypothesised that the more serious retraction reasons are, the more those accountable for retraction would be stigmatized.

Methodologically, the extant studies on retraction left much to desire in at least two respects. First, previous studies on retraction drew on various databases (e.g., PubMed, WoS, Scopus, and Google Scholar) to retrieve meta-bibliographic data on retracted publications and retraction notices. However, the retroactive nature of retraction and the varying practices

adopted by the databases in annotating and indexing retraction-related documents (Schmidt, 2018), together with the use of different search query terms, are very likely to have contributed in part to the inconsistent research findings, especially quantitative ones, of those retraction studies. Second, the sample sizes of those studies were often rather small, and their data typically covered only a limited number of disciplines. Specifically, the series of three linguistic studies (Hu & Xu, 2020; Xu & Hu, 2018, 2021) drew on a master dataset of 370 retraction notices published in Cell Biology (selected to represent hard disciplines), Business, Management, and Economics (chosen to represent soft disciplines). The two studies by Hesselmann alone (2019) and with her colleagues (2019) drew on the same dataset of only 127 retraction notices indexed in three different databases. Consequently, the generalizability of the research findings of those studies is restricted.

The present study is designed to investigate how retraction stigma is communicated rhetorically and linguistically in retraction notices. The investigation focuses on retraction notices published to retract publications due to their authors' fault alone for two considerations. First, since authors of retracted publications are held accountable for the vast majority of retractions (Grieneisen & Zhang, 2012; van Leeuwen & Luwel, 2014; Xu & Hu, in press), retraction notices centrally involving authors of retracted publications deserve focused and prioritized attention. Second, an empirical investigation focused on those retraction notices can help the academic community better understand the phenomenon of retraction and curb it more effectively. To address the research gaps identified above, four sets of specific research questions are formulated to flesh out the overarching research questions that were presented in Chapter 1 to guide the present study:

1.1 What rhetorical strategies are used in retraction notices to construct retraction stigma?
1.2 Does the use of these rhetorical strategies vary by retraction period, academic discipline, retraction notice authorship, and retraction reason?
2.1 What rhetorical strategies are employed in retraction notices to manage retraction stigma?
2.2 Does the use of these rhetorical strategies vary by retraction period, academic discipline, retraction notice authorship, and retraction reason?
3.1 What grammatical means are adopted in retraction notices to identify agents of retraction-engendering acts and assign agency/responsibility to them?
3.2 Do the agent identification and agency/responsibility assignment vary by retraction period, academic discipline, retraction notice authorship, and retraction reason?
4.1 What types of explicit attitudinal evaluation resources are deployed in retraction notices?
4.2 Does the deployment of each type of explicit attitudinal evaluation resource vary by retraction period, academic discipline, retraction notice authorship, and retraction reason?

3.5 Summary of the Chapter

This chapter reviewed the relevant literature on retraction and retraction notices. Its first three sections each covered one distinct approach to research on retraction. Drawing on bibliographic information of retraction-related documents, the scientometric approach focuses on uncovering various scientometric features of retracted publications and retraction notices and consequently is largely descriptive. In contrast, the linguistic and the sociological approach, much less widely adopted than the scientometric approach, are guided by different theories and aim to provide in-depth theory-informed interpretations of the phenomenon of retraction. Based on the literature review, as well as the theoretical and analytical frameworks proposed in Chapter 2, several research gaps were identified, and specific research questions were formulated in the last section of the chapter.

CHAPTER IV: METHODOLOGY

This chapter delineates and explains the methodology adopted in this study to address the research questions raised in the preceding chapter. This chapter starts with an introduction to the overall research design developed for this study. It then gives a detailed account of how research data (i.e., retraction notices) were collected, classified, labelled, selected, sampled, and cleaned to construct a corpus and specific sub-corpora for the four sets of research questions of the study. The chapter concludes with a description of data coding and analysis.

4.1 The Research Design

A research design is an overall strategy for conducting a study in a logical and coherent manner to ensure that its collection and analysis of data serve well the purpose of addressing its research questions (Creswell, 2018; Yin, 2014). To address the research questions guiding this study, an observational parallel convergent design was adopted to explore how retraction stigma is communicated rhetorically and linguistically in retraction notices. Specifically, as indicated in Figure 4.1, the research design of the study consisted of two components, namely a quantitative investigation and a holistic qualitative analysis, which took place essentially at the same time and were meant to complement and triangulate each other.

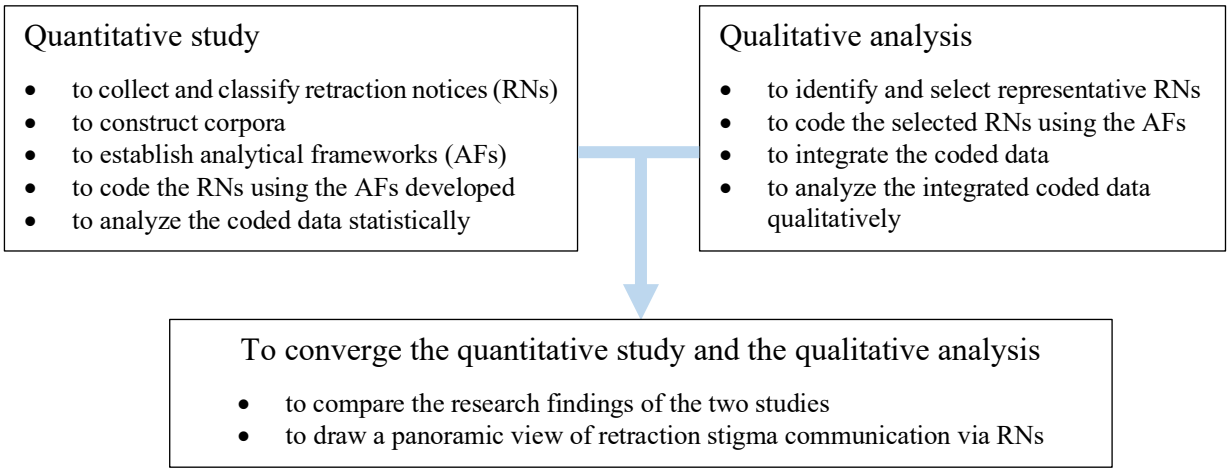

Figure 4.1 *The research design of the study*

The collected retraction notices were classified according to four contextual factors (i.e., retraction period, academic discipline, retraction notice authorship, and retraction reason), and a primary corpus was constructed with retraction notices that covered all the four contextual factors. The primary corpus was intended for the quantitative study whereas only a small number of retraction notices representative of the four contextual factors were selected for the holistic qualitative analysis. Informed by previous research on stigma communication (Meisenbach, 2010; Smith, 2007a) and on retraction notices as a high-stakes academic genre (Xu & Hu, 2021), two analytical frameworks were developed to identify rhetorical strategies

used for constructing and managing retraction stigma. Hu and Xu's (2020) framework and Martin and White's (2005) appraisal theory were adopted to identify grammatical means for assigning agency/responsibility for retraction and explicit attitudinal evaluation of retraction. The four analytical frameworks were used in both the quantitative study and the holistic qualitative analysis. In the quantitative study, the coded data were quantified through descriptive and inferential statistics to identify four aspects of retraction stigma communication (i.e., retraction stigma construction strategies, retraction stigma management strategies, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction) and to determine variations in the four dimensions of retraction stigma communication induced by four contextual factors separately. Differently, in the holistic qualitative analysis, the selected representative retraction notices were coded holistically, and the coded data were integrated to present a panoramic view of how various linguistic and rhetorical resources were mobilized to communicate retraction stigma.

4.2 Data Collection

The study required a sizeable dataset of retraction notices, which were collected through institution-subscribed databases. Since the study drew on retraction notices that were publicly available and did not involve any human or animal subjects, there was no need to apply for and obtain an institutional review board approval for conducting the research project.

Given its world-wide recognition and influence as a reputed third-party interdisciplinary publication-indexing and citation-tracking database, WoS was chosen as the only data source for this study, following many previous studies (e.g., Jin et al., 2019; Lei & Zhang, 2018; Lu et al., 2013; Shuai et al., 2017). Informed by the literature (Schmidt, 2018; Xu & Hu, 2018) and based on a pilot data collection project, a procedure of four major steps was worked out and followed to collect valid unique retraction notices. Specifically, using bibliographic information retrieved from the WoS Core Collection, a master dataset of 7,650 retraction notices were collected for the study, with the earliest and latest retraction notices being published in 1927 and 2019, respectively. The four major steps are presented below.

1. Conducting search queries, using the following query specifications [19]:
    - Titles: retract* OR withdraw* [20]

[19] The query specifications of timespans, language, and document types were realized through the Refine Results function in WoS.

[20] The asterisk (*) is a wildcard character used to broaden a search by finding any words that start with the same letters. OR is a Boolean operator used to broaden a search by targeting data that satisfy any of the conditions linked by it.

- Timespans: 1900 – 1978 OR 2018; 1979 – 2017; 2019 [21]
- Databases: Science Citation Index–Expanded (SCIE); Social Science Citation Index (SSCI); Arts & Humanities Citation Index (A&HCI) [22]
- Language: English [23]
- Document types: Correction OR Correction Addition OR Editorial Material OR Letter OR Note OR Retraction [24]

2. Collecting bibliographic data entries of potential retraction notices:
   - The search queries returned bibliographic data entries with a wealth of information, including titles of publications, names of authors, titles of journals, and publishers of journals, years of publication, volume numbers, issue numbers, article numbers, page ranges, DOIs, accession numbers, and other information.
   - All the returned bibliographic data entries were exported from WoS and converted into Microsoft Office Excel worksheets, which were then combined into a master list in one worksheet. Each data entry in the master list was labelled systematically and uniquely.
   - Searches and Alerts were set up to receive potential monthly updates on the results of the search queries, which yielded 17 additional bibliographic data entries [25].
3. Retrieving potential retraction notices, using the collected bibliographic information:
   - All the collected bibliographic data entries were examined for annotation patterns of their titles. Following the annotation patterns identified and the data entry titles, 11,995 data entries signalling potential retraction notices were compiled.
   - Using the bibliographic information included in the selected data entries, physical potential retraction notices were collected in the PDF format from WoS [26]. A total of 101 (about 0.84%) potential retraction notices could not be obtained due to their inherent unavailability or my restricted access to the target data.

[21] Due to the constraint on my authorised access to WoS, data were collected from SCIE and SSCI at three different points of time, namely November 2018, February 2019, and June 2020. Data from A&HCI were collected separately in one ago in July 2020. Notably, data coverages of SCIE and SSCI started in 1900 while the data coverage of A&HCI started in 1975.

[22] Search queries were conducted in SCIE, SSCI, and A&HCI separately because collected retraction notices must be classified later by disciplinary groupings to address the relevant research questions.

[23] Only English was specified as the language of publication because it is the dominant language in international academic publishing (Mongeon & Paul-Hus, 2016). More importantly, WoS data coverage in languages other than English was selective and limited. Consequently, the inclusion of data in additional languages could introduce confounding variables and would not allow reliable cross-language comparisons.

[24] Data entries whose document type was indexed as Retracted Publication in WoS were also collected as potential data sources for verifying bibliographic information of retraction notices.

[25] The updates on the search queries were collected on 24 July 2019. The search queries executed in June and July 2020 were not set to receive potential updates because the target data of those two search queries were published in 2019 and believed to have been fully indexed and annotated by June 2020.

[26] Those documents available in a format other than PDF were downloaded and converted into PDF files. Documents that could not be downloaded directly from WoS were retrieved from their journal websites or third-party databases such as JSTOR and PubMed.

4. Identifying valid unique retraction notices, using the following inclusion/exclusion criteria [27]:
    - All the collected potential retraction notices were analyzed for their communicative purposes, and only those intended to retract at least one publication in full were identified as genuine retraction notices.
    - When a retraction notice retracted more than one publication from a journal in one go and was indexed repeatedly in WoS to indicate the retraction of each RP, a set of the same retraction notices was collected but only one copy in the set was included in the corpus of genuine retraction notices, but all the remaining copies (n = 471) were excluded.
    - When a retraction notice retracted more than one publication in one go and was indexed separately in WoS using the title of each retracted publication, a set of retraction notices being different bibliographically but identical in content was collected, and only one copy in each set was included but the remaining versions (n = 5) were excluded.
    - When a set of retraction notices retracted the same publications from the same journals or a cross-database retraction notice was repeatedly collected due to the method of the data collection, only one copy in the set of duplicate retraction notices was included, and all the remaining copies (n = 557) were excluded.
    - When a retraction notice announced not only a case of retraction but also the existence of another retraction notice that was not annotated in WoS but more informative than the former, the latter (n = 27) was included, but the former (n = 27) was excluded.
    - When a set of retraction notices was issued by different entities to retract the same publication(s) but was indexed separately in WoS, all the retraction notices in the set (n = 16) were included because they were worded differently.
    - When a retraction notice was superseded or supplemented by another retraction notice with follow-up information on the retraction in question, the latter (n = 11) was included, but the former (n = 10) was excluded.
    - When a retraction notice was erroneously indexed in WoS to indicate the retraction status of a valid publication, it (n = 7) was excluded.
    - When a retraction notice was corrected by one or more new retraction notices to retract the same publication(s), the latter (n = 6) was included, but the former (n = 6) was excluded.

[27] A single retraction notice may meet more than one of the inclusion/exclusion criteria.

- When a retraction notice was retracted by another retraction notice, the retracting retraction notice (n = 2) was included, but the retracted retraction notice (n = 2) was excluded.
- When a retraction notice had a title in English but the body text in another language, it (n = 1) was excluded.

4.3 Corpus Construction

A corpus of retraction notices and its sub-corpora needed for the present study were constructed by following the three steps detailed below.

4.3.1 Data classification

All the 7,650 retraction notices in the master dataset were classified and labelled separately on five dimensions, namely entities responsible for retraction, disciplinary groupings, retraction reason, retraction period, and retraction notice authorship. The classification and labelling criteria are delineated and explained as follows.

Following the identification criteria developed by Xu and Hu (in press) (see Appendix A), six types of entities responsible for retraction were identified in the retraction notices in the master dataset: authors of retracted publications (n = 6,861), journal authorities (n = 284), dual entities (i.e., authors of retracted publications and journal authorities, n = 22), third parties (n = 28), the uncategorizable (n = 123) (in cases where accountable entities could not be ascertained due to uninformativeness of the retraction notices), and exonerated entities (n = 332) (in cases where out-dated Cochrane reviews were withdrawn to be updated or valid reviews were re-represented in different ways).

All the retraction notices indexed only in SCIE were classified as retraction notices from hard disciplines (HD-RNs) (n = 7,162), and all those covered in SSCI and A&HCI but not in SCIE were classified as retraction notices from the soft disciplines (SD-RNs) (n = 315). All the retraction notices covered not only in SCIE but also in SSCI and/or A&HCI were classified as cross-disciplinary retraction notices (CD-RNs) (n = 173). This disciplinary classification of the retraction notices was based on the categorization of publications in WoS (2020a, 2020b). Specifically, every record in the WoS Core Collection is assigned to at least one of its 254 subject categories, and every subject category is assigned to one of 153 research areas, which are classified into five broad categories, namely Arts & Humanities, Social Sciences, Life Sciences & Biomedicine, Physical Sciences, and Technology. Following the scholarly groupings proposed by Becher and Trowler (2001) and Moed (2005), the five research areas in WoS were further grouped into soft disciplines (i.e., Arts & Humanities and

Social Sciences) and hard disciplines (i.e., Life Sciences & Biomedicine, Physical Sciences, and Technology).

Following the classification criteria developed by Xu and Hu (in press), authors' retraction reasons (see Appendix B for definitions) were classified into four distinct categories, namely blatant misconduct (BM; i.e., compromised peer review, conflict of interest, data fabrication/falsification, legal issues, misappropriation of data, and plagiarism/self-plagiarism), inappropriate conduct (IC; i.e., authorship issues, ethical issues, misdocumentation of original data, and unauthorized use of data), questionable conduct (QC; i.e., acknowledgement issues, citation manipulation, and unintended publication), and honest error (HE). This categorization indicated the relative severity of retraction reasons in a descending order (i.e., BM > IC > QC > HE). The uncategorizable (UC; i.e., unspecified retraction reason, unspecified misconduct, and unreliable data or findings) referred to all the retraction notices in which retraction reasons were not specified and/or could not be unambiguously categorized by severity. All the retraction notices were classified according to the most serious retraction reasons that were identified in them. Thus, when both BM and IC were disclosed in a retraction notice, it was classified as a BM-RN. When none of the four categories of retraction reasons (i.e., BM, IC, QC, and HE) was disclosed in a retraction notice, it was classified as a UC-RN. The application of these classification criteria led to the identification of 4,187 BM-RNs, 428 IC-RNs, 40 QC-RNs, 317 HE-RNs, and 1,889 UC-RNs.

Since the publication of retraction notices performs retraction, years of publication of retraction notices can be identified as years of retraction. The years of publication for all the retraction notices, which were readily available as bibliographic information retrieved from WoS, were classified into two distinct retraction periods (RPs), namely before 1 January 2010 (RP1) and from 1 January 2010 to 31 December 2019 (RP2) [28]. The dividing line (i.e., 1 January 2010) was based on the date when the first set of COPE retraction guidelines were issued. The first set of COPE retraction guidelines were publicised on 30 November 2009. Considering that it would take time for the guidelines to be adopted, 1 January 2010 was set as the dividing line, which also made it easier to classify the data. More importantly, the choice of the dividing line was motivated by the increasing influence of the first set of COPE retraction guidelines on retraction handling within the scientific community before the debut of the second set of COPE retraction guidelines in early December of 2019. Accordingly, all the

[28] The publication years of some retraction notices in the preliminary corpus were not indexed in WoS. Consequently, the relevant information was retrieved manually from the journal websites. A total of 21 retraction notices in the preliminary corpus were published online before 2020, but their year of publication was indexed in WoS as in 2020.

retraction notices were classified by year of publication as either RP1-RNs (n = 1,233) or RP2-RNs (n = 6,417).

Following Xu and Hu (2018), all the retraction notices in the master dataset were analyzed to ascertain their authorship. The adoption of Xu and Hu's criteria to classify the master dataset resulted in the exclusion of one criterion (which drew on information beyond retraction notices under examination) and update of another one for identifying retraction notices by authors of retracted publications, as well as seven additional ones for identifying retraction notices by journal authorities (because the master dataset was far larger than the one from which Xu and Hu's criteria had been developed). In addition to the four types of authorship reported by Xu and Hu (2018), a new type of retraction notice authorship was identified; that is, a few retraction notices could be ascribed to research performing organizations and research integrity-governing bodies. Furthermore, the textual analysis resulted in more detailed classification of retraction notices jointly authored by different entities. All the criteria for identifying retraction notices, including those developed by Xu and Hu (2018), are presented in detail in Appendix C. Based on those criteria, 4,528 retraction notices were identified as authored by journal authorities (labelled as JA-RNs), 875 retraction notices penned by authors of retracted publications (ARP-RNs), 3 authored by research performing organizations or research integrity-governing bodies, 90 written issued by joint entities, and 2,154 produced by unidentifiable entities.

4.3.2 Corpus construction

Given the research questions formulated for this study, a primary corpus was constructed in accordance with the following data inclusion/exclusion criteria:

- Only the retraction notices in which authors of retracted publications were identified as sole entities accountable for the retraction were included, and all other retraction notices were excluded since authors of retracted publications were held accountable for the vast majority of retractions.
- All the HD-RNs and SD-RNs were included whereas all the CD-RNs were excluded to allow for an examination of differences/similarities between hard and soft disciplines.
- All the BM-RNs, IC-RNs, QC-RNs, and HE-RNs were included whereas all the UC-RNs were excluded to enable comparisons among retraction notices by severity of retraction reasons.
- All the JA-RNs and ARP-RNs were included whereas all other retraction notices were excluded to make it possible to identify potential differences/similarities in retraction notices by authorship.

As a result, the primary corpus for the study consisted of 3,296 retraction notices, totalling 780,488 words, with an average of approximately 237 words per retraction notice. The earliest and latest retraction notices in the primary corpus were published in 1980 and 2019, respectively. Table 4.1 summarizes the constituents of the corpus.

Table 4.1 Distributions of the retraction notices in the primary corpus

Discipline	Authorship	RP1 (before 2010)				RP2 (2010–2019)			
		BM	IC	QC	HE	BM	IC	QC	HE
HD	JA	261	21	0	11	2,149	180	34	93
	ARP	69	15	0	22	235	12	2	55
SD	JA	8	0	0	1	108	8	0	10
	ARP	0	0	0	0	2	0	0	0

Note. HD = hard disciplines; SD = in soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

To answer the first three sets of research questions (regarding retraction stigma construction strategies, retraction stigma management strategies, and grammatical assignment of agency), all retraction notices in the primary corpus were analyzed. To address the fourth set of research questions (regarding attitudinal evaluation of retraction), a different sampling approach was adopted to construct a sub-corpus for three logistic considerations. First, a close analysis of evaluative language resources in a large corpus was bound to be extremely time-consuming, which would impair the feasibility of the whole research project. Therefore, it was necessary and reasonable not to analyze all the 3,296 retraction notices in the primary corpus. Second, the ARP-RNs ($n = 412$) was disproportionately outnumbered by the JA-RNs ($n = 2{,}884$) in the primary corpus. Therefore, all the 412 ARP-RNs were selected, with 410 of them being HD-ARP-RNs in different categories (by retraction period and retraction reason). Third, to enable a parallel authorship-based comparison between HD-ARP-RNs and HD-JA-RNs, the same number of 410 HD-JA-RNs in different categories were randomly sampled, when possible. Notably, since the HD-ARP-RNs outnumbered the HD-JA-RNs in the HE-RP1 category by 11 (22–11), all the 11 HD-JA-RNs in the RP1-HE category were included, and the balance ($n = 22–11 = 11$) was added to the HD-JA-RNs in the RP2-HE category. Consequently, 66 (55+11) retraction notices were randomly sampled from the 93 HD-JA-RNs in the RP2-HE category. As a result, a secondary corpus of 957 retraction notices was constructed for the last set of research questions, totalling 223,532 words, with an average of approximately 234 words per retraction notice. The earliest and latest retraction notices in the secondary corpus were published in 1980 and 2019, respectively. Table 4.2 summarizes the constitution of the secondary corpus.

Table 4.2 Distributions of the retraction notices in the secondary corpus

Discipline	Authorship	RP1 (1980–2009)				RP2 (2010–2019)			
		BM	IC	QC	HE	BM	IC	QC	HE
HD	JA	69	15	0	11	235	12	2	66
	ARP	69	15	0	22	235	12	2	55
SD	JA	8	0	0	1	108	8	0	10
	ARP	0	0	0	0	2	0	0	0

4.4 Data Coding

This section consists of four parts, with each of them reporting on the coding scheme, coding reliability, and coding unit for each of the four sets of research questions posed for this study.

4.4.1 Retraction stigma construction strategies

The first set of research questions concerning retraction stigma construction strategies investigated content cues used as rhetorical strategies for constructing retraction stigma in the retraction notices. An interactive approach was adopted to flesh out the four types of retraction stigma construction strategies proposed in Section 2.2.1 (i.e., *creating marks*, *making labels*, *assigning responsibility*, and *exposing peril*). Specifically, all the retraction notices in the primary corpus were analyzed for rhetorical strategies that could be categorized into each of the four types of retraction stigma construction strategies. All those coded rhetorical strategies were then further categorized as distinct individual strategies under each of the four types of strategies. The identification of the individual strategies went through an iterative process, which involved rounds of revisions and adjustments based on in-depth discussion between me and my chief supervisor. Table 4.3 outlines the four types of retraction stigma construction strategies and their 14 distinct individual strategies, whose definitions illustrated with examples from the corpus are presented in Appendix D. The analytical framework in Table 4.3 fleshed out in the appendix was used as a coding scheme for identifying retraction stigma construction strategies. All the information available in each retraction notice in the primary corpus was analyzed. Due to the nature of the first set of research questions, each retraction notice in the corpus was coded as an independent unit for raw frequencies of all the four types of retraction stigma construction strategies and the 14 individual construction strategies.

To establish coding reliability, an inter-coder reliability test was conducted. A PhD candidate in Applied Linguistics at a prestigious university in the mainland of China was invited as a second coder. Before the coding reliability test, I provided a two-step training session to the invited coder. First, I introduced the coding scheme to the invited coder and demonstrated to her how to code four retraction notices, which covered all the codes in the coding scheme. Second, the invited coder and I independently coded 20 randomly sampled

retraction notices, and coding discrepancies between us were resolved through discussion. As expected, this two-step training session helped the invited coder comprehend and internalize the coding scheme. Subsequently, randomly sampled 5% (n = 165) of the corpus, excluding those used in the previous training session, were independently coded by the invited coder and myself for an inter-coder reliability test. A Cohen's kappa test indicated excellent inter-coder agreement (k = .842). All the discrepancies were resolved through discussion between us. Given the high inter-coder reliability, I coded all the remaining retraction notices.

Table 4.3 Retraction stigma construction strategies

1. Creating marks
1.1 Specifying the retracted publication
1.2 Identifying authors of the retracted publication
1.3 Distinguishing accountable authors
1.4 Increasing mark visibility
2. Making labels
3. Assigning responsibility
3.1 Disclosing reasons for the retraction
3.2 Agreeing to the retraction decision
3.3 Highlighting accountability for the retraction
3.4 Lacking cooperation in handling the retraction
3.5 Revealing a poor record of publishing
3.6 Imposing tangible punishment
4. Exposing peril
4.1 Affecting retraction stakeholders
4.2 Violating research and publication ethics
4.3 Contaminating the literature
4.4 Causing unspecified adverse consequences

4.4.2 Retraction stigma management strategies

The second set of research questions regarding retraction stigma management strategies sought to find out how retraction stigma was mitigated through rhetorical strategies in retraction notices. To answer the research questions, the preliminary analytical framework proposed in Section 2.2.2 was fleshed out, which took the same interactive approach and involved a similar process to the one adopted to identify retraction construction strategies, as detailed in Section 4.4.1. Table 4.4 summarizes the four types of retraction stigma management strategies and their 14 individual strategies, whose definitions, together with illustrative examples from the corpus, are presented in Appendix E. Notably, three management strategies in Table 6 (i.e., *specifying the retracted publication*, *distinguishing accountable authors*, and *disclosing reasons for the retraction*) were not identified in the dataset of this study but adopted from Xu and Hu (under

review), which drew on the same preliminary dataset but a different data coverage from this one. The three strategies were incorporated to make the analytical framework a parallel to the one for identifying retraction stigma construction strategies and present a fuller picture of retraction stigma management strategies. The appendix was used as a coding scheme for the second set of research questions. All the information available in each retraction notice in the primary corpus was analyzed. Due to the nature of the second set of research questions, each retraction notice in the corpus was coded as an independent unit for raw frequencies of all the four types of retraction stigma construction strategies and the 14 individual management strategies.

Table 4.4 Retraction stigma management strategies

1. Concealing stigma visibility
1.1 Not specifying the retracted publication
1.2 Not identifying authors of the retracted publication
1.3 Not distinguishing accountable authors
1.4 Decreasing mark visibility
2. Refraining from labelling
3. Manipulating responsibility assignment
3.1 Disclosing no reasons for the retraction
3.2 Objecting to the retraction decision
3.3 Denying retraction-engendering allegations
3.4 Displaying cooperation in investigations
3.5 Claiming unintentionality of fault
3.6 Downplaying severity and consequences
4. Offering correction and remediation
4.1 Requesting or performing the retraction
4.2 Self-reporting retraction-engendering problems
4.3 Rectifying retraction-engendering problems
4.4 Promising no recurrence of the fault

An inter-coder reliability test was conducted to establish reliability in coding retraction stigma management strategies. The same PhD candidate in Applied Linguistics, who had participated in the previous inter-coder reliability test on coding retraction stigma construction strategies, was invited again to a pre-test training session intended to facilitate her comprehension and internalization of the coding scheme. The training session started with an introduction to the coding scheme and then involved a detailed demonstration on how to code four well-selected retraction notices using the coding scheme introduced. Subsequently, each of us independently coded 20 randomly sampled retraction notices, and coding discrepancies were resolved through discussion between us. After the training session, randomly sampled 5% (n = 165) of the retraction notices in the corpus, which did not include any of the 24 retraction

notices used in the training session, were independently coded by the invited coder and me for an inter-coder agreement test. A Cohen's kappa test indicated excellent inter-coder agreement (k = .859) in our coding, and all the coding discrepancies were resolved through discussion between us. Given the high inter-coder reliability, I coded all the remaining retraction notices.

4.4.3 Grammatical assignment of agency/responsibility for retraction

The third set of research questions of this study investigated grammatical resources used in retraction notices to assign authors' responsibility for retraction. The analytical framework developed by Hu and Xu (2020), which is briefly introduced in Section 2.2.4 and now detailed in Table 4.5, was adopted to code the data. Following Hu and Xu (2020), each reported retraction-engendering act committed by authors of retracted publications was coded for agent visibility (agent identified vs. agent obscured) and the relative magnitude of indicated responsibility, using an agency/responsibility score (ARS) ranging from 1 to 7. The ARS of a retraction notice is the aggregate of the ARS of each instance of reported retraction-engendering acts in the retraction notice divided by the total number of reported retraction-engendering acts in the retraction notice. For example, if a retraction notice reports four retraction-engendering acts coded as 7, 6, 5, and 4 in ARS respectively, the ARS of the retraction notice is 5.5 ([7+6+5+4]/4).

Following Hu and Xu (2020), the 3,296 retraction notices in the primary corpus were analyzed, adopting two exclusion criteria. First, only the body text of the retraction notices was analyzed whereas the other parts of the retraction notices (e.g., titles, by-lines, affiliation, other bibliographic information, and references) were excluded from analysis because they did not involve grammatical assignment of responsibility and were not presented in the form of clauses. Second, direct quotations from entities other than authors of retracted publications (n = 6) in the retraction notices produced by authors of retracted publications and those from entities other than journal authorities (n = 120) in the retraction notices issued by journal authorities were excluded from analysis. Those excluded direct quotations were not genuine linguistic output of retraction notice authors, and an analysis of them would undermine the reliability of the authorship-based comparison between the retraction notices produced by authors of retracted publications and those issued by journal authorities. As a result of the above two exclusion criteria, the corpus totalled 456,315 words, with an average of approximately 138 words per retraction notice.

To establish coding reliability, an inter-coder reliability test was conducted, following an intensive training session. The same PhD candidate in Applied Linguistics, who had joined in the previous inter-coder reliability tests on coding retraction stigma construction and management strategies, was involved. She was first introduced to the coding scheme and then

provided with a think-aloud of me coding four well-selected retraction notices using the coding scheme introduced. Each of us then independently coded 20 randomly sampled retraction notices and resolved our coding discrepancies through discussion. Subsequently, each of us independently coded randomly sampled 5% (n = 165) of the retraction notices in the corpus, excluding those used in the training session. A Cohen's kappa test indicated excellent inter-coder agreement (k = .828) in the coding of the 165 retraction notices, and all the coding discrepancies were resolved through discussion between us. Given the high inter-coder reliability, I coded all the remaining retraction notices.

Table 4.5 Grammatical means for representing agency/responsibility for retraction

ARS	AI	Grammatical means with illustrative examples
7	Yes	Agent + Active Voice
		• …the author plagiarized other work in the published article. (RN-A&HCI-00015)
6	Yes	Passive Voice + Agent
		• …the mentioned data were falsified by the first author. (RN-SCIE-1080)
5	Yes	Nominalization with an Agent Marker
		• This constitutes a serious copyright infringement by the authors. (RN-SCIE-3763)
4	No	Passive Agentless Construction
		• …data in the published paper has been manipulated. (RN-SCIE-0324)
3	No	Active Agentless Ergative Construction
		• …research misconduct had taken place …. (RN-SCIE-5547)
2	No	Active Voice with an Inanimate Subject
		• The paper plagiarized part of a paper that had already appeared in the journal Solid State Phenomena …. (RN-SCIE-0134)
1	No	Nominalization without an Agent Marker
		• …the misconduct is serious enough to warrant a retraction. (RN-SCIE-1314)

Note. ARS = agency/responsibility score; AI = agent identification; Yes = agent-identifying; No = agent-obscuring; adapted from Hu and Xu (2020, p. 5) with examples cited from the dataset of this study.

4.4.4 Explicit attitudinal evaluation of retraction

The fourth set of research questions investigated the marking of retraction-related attitudes in retraction notices. The analytical framework based on Martin and White's (2005) appraisal theory, which was introduced in Section 2.2.5 and visually represented in Figure 4.2, was employed to code various types of explicit attitude in the retraction notices. Each retraction notice in the corpus was coded as an independent unit for the frequency of each sub-category

of explicit attitudinal evaluation and their polarity. Due to the focus of this study on authors of retracted publications who were held accountable for retraction, all the explicit attitudinal evaluation regarding entities other than authors of retracted publications were excluded from coding and analysis. For instance, Example 1 represents an instance of evaluation of the research performing organization rather than the retracted publication or its authors.

Example 1

> We [journal authorities] extend our sincere appreciation to Toride Kyodo General Hospital for their review of the status of Dr. Fujii's research and to the investigating committee for their review of his research findings. (RN-SCIE-3932)

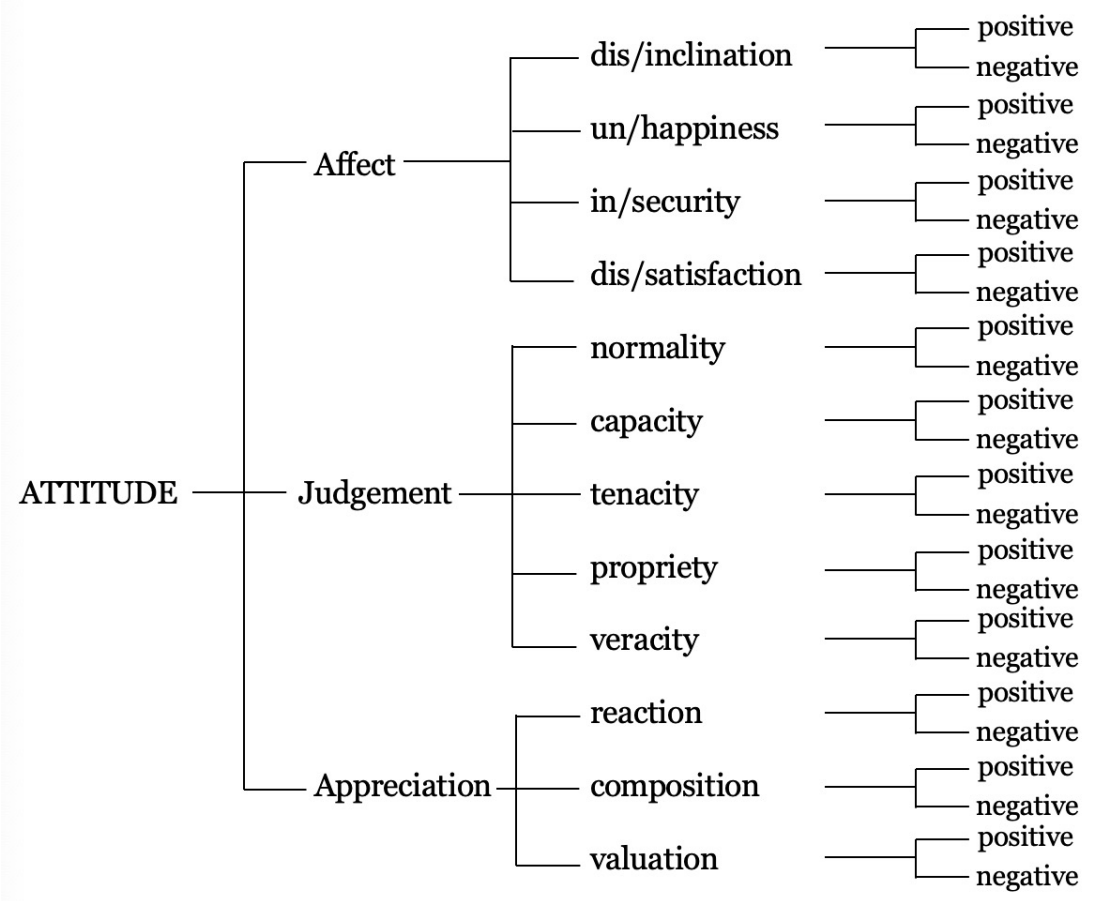

Figure 4.2 *Analytical framework for attitudinal evaluation of retraction*

Following Hu and Xu (2020), the 957 retraction notices in the corpus were analyzed, following two exclusion criteria. First, only the body text of the retraction notices was analyzed. If text other than the body text of the retraction notices (e.g., titles, by-lines, affiliations, other bibliographic information, and references), which did not involve explicit attitudinal evaluation of retraction, had been included for analysis, the comparison in the standardized frequency would have been skewed since the body text of the retraction notices tended to be short (i.e., 146 words on average). Second, direct quotations from entities other than authors of retracted publications in the retraction notices issued by authors of retracted publications (n = 6) and those from entities other than journal authorities in the retraction notices authored by journal

authorities (n = 30) were excluded for analysis. Since those excluded direct quotations were not genuine linguistic output of retraction notice authors, an analysis of them would undermine the reliability of the authorship-based comparison between the retraction notices produced by the two different groups of entities (i.e., journal authorities and authors of retracted publications).

To minimize subjectivity of data coding and ensure coding reliability, I conducted a pilot coding of the whole corpus, based on which a code book (see Appendix F) was compiled after rounds of consultation and discussion with four doctoral candidates and one postdoctoral fellow at two prestigious universities, who were either conducting research on attitudinal evaluation or had published research using Martin and White's (2005) appraisal theory. The pilot data coding followed the analytical framework in Figure 4.2 adopted from Martin and White (2005). The code book developed from the pilot coding defined each identified category of explicit attitudinal evaluation of retraction, illustrated those categories with retraction notice excerpts from the corpus, and provided a list of frequently used lexis under each evaluation category.

A minimal lexis-based semantic unit was adopted as the unit of analysis for the data coding in this study, as illustrated by the underlined text in Examples 2–3 and 5–6. This study focused on explicit attitudinal evaluation of retraction and excluded implicit attitudinal evaluation of retraction. For instance, in Example 4, the lack of ethical approval prior to conducting research is unethical, which goes against the normal practice. However, the abnormal practice is represented as "they [the authors] did not obtain ethical approval", indicating that the retraction notice author is refraining from explicitly evaluating the lack of ethical approval as a misbehavior (i.e., negative normality). Explicit attitudinal evaluation of retraction in this study was dichotomized as positive and negative. Specifically, negative evaluation (indicated by the sign "–") concerned any expression that negatively reflected on the retracted publication and/or any of its authors and consequently could be image-tarnishing or stigmatizing, as demonstrated by Examples 2 and 3. By contrast, positive evaluation (+) referred to any expression that positively reflected on the retracted publication and/or any of its authors and thus could be image-repairing or de-stigmatizing, as illustrated by Examples 2–3 and 5–6. For instance, in Example 6, the text "declined to sign this Letter of Retraction" literally shows the first two authors' disinclination but rhetorically serves as a strategy for mitigating retraction stigma (i.e., *objecting to the retraction decision*); therefore, it was coded as + disinclination.

Example 2

> The authors have plagiarized [Judgement: – propriety] parts of two papers that had already appeared in…. (RN-SCIE-1459)

Example 3

> The authors would like [Affect: – inclination] to apologize [Affect: – unhappiness] for any inconvenience [Appreciation: – reaction] to readers. (RN-SCIE-0005)

Example 4

> While the authors contacted the NHRC about this study, they did not obtain ethical approval. (RN-SCIE-0088)

Example 5

> They [authors] are therefore confident [Affect: + security] that the conclusions of this article remain valid [Appreciation: + valuation]…. (RN-SCIE-0784)

Example 6

> The first two authors declined to sign this Letter of Retraction. [Affect: + disinclination]. (RN-SCIE-4834)

To establish coding reliability, one of the four doctoral students, who had been consulted in compiling the code book, was invited to an inter-coder reliability test. Before the test, the invited coder was provided with a training session, in which she was demonstrated how to code five representative retraction notices using the analytical framework and the code book. Subsequently, each of us independently coded randomly sampled 5% (n = 48) of the 957 retraction notices in the corpus, excluding those used in the training session. A Cohen's kappa test indicated excellent inter-coder agreement (k = .831) in the test coding, and all the discrepancies in our coding were resolved through discussion between us. Given the high inter-coder reliability, I proceeded to code all the remaining data.

4.5 Data Analysis

MAXQDA (Version 20.2.1) (VERBI Software, 2019) were used for data coding in this study because it enables manual tagging of text segments and cross-dataset text search, making the content analysis handy. The coded data were exported from MAXQDA into Excel spreadsheets to prepare quantitative data for statistical analyses. All the statistical tests were performed with JAMOVI (Version 2.2) (The jamovi project, 2021) rather than SPSS because the former is more user-friendly than the latter in terms of operation and output.

Each of the four sets of research questions of this study involved four independent variables (i.e., the four contextual factors), namely retraction period (i.e., 1980–2009 vs. 2010–2019), academic discipline (i.e., hard disciplines vs. soft disciplines), retraction notice authorship (i.e., authors of retracted publications vs. journal authorities), and retraction reason

(i.e., blatant misconduct vs. inappropriate conduct vs. questionable conduct vs. honest error), all of which were categorical by nature. The outcome/dependent variables for the four sets of research questions were retraction stigma construction strategies, retraction stigma management strategies, agency/responsibility scores of the retraction notices, and markers of explicit attitudinal evaluation of retraction. All the outcome/dependent variables were coded for continuous values (in the form of raw frequencies and agency/responsibility scores). Given the nature of the independent and dependent variables, multiple linear regression tests were conducted to find out whether the four contextual factors were associated with the employment of each retraction stigma construction and management strategy, the agency/responsibility scores, and the employment of each type of attitudinal evaluation resource. Notably, Chi-square tests were carried out for five management strategies (i.e., *not specifying the retracted publication*, *not identifying authors of the retracted publication*, *not distinguishing accountable authors*, *refraining from labelling*, and *disclosing no reasons for the retraction*) because they were coded dichotomously (i.e., presence vs. absence), identification of agents of retraction-engendering acts, and occurrence of markers of explicit attitudinal evaluation of retraction. The alpha level of a significant difference in all the statistical tests was set at .05 (2-tailed).

4.6 Summary of the Chapter

This chapter first introduced the overall research design developed for the present study, namely an observational parallel convergent design (i.e., QUAN + qualitative analysis), through which triangulation can be achieved. This was followed by a detailed account of the collection of retraction notices and the construction of corpora. The chapter concluded with a description of the data coding and analyses conducted to answer the research questions.

CHAPTER V: RESULTS AND DISCUSSIONS

Reporting on and discussing the research findings of this study, this chapter is organized around the four sets of research questions formulated for the study. Specifically, the chapter is divided into four sections, with each of them starting with a presentation of the research findings for one set of research questions and concluding with discussion about the reported research findings. By doing so, it is expected to make the thesis more reader-friendly because the proximity between results and discussions can reduce the tremendous amount of working memory required for connecting the overwhelming number of reported research findings with their corresponding intensive discussions.

5.1 Retraction Stigma Construction Strategies

This section starts with a report on the findings on the employment of retraction stigma construction strategies in the corpus and concludes with discussion about the reported findings.

5.1.1 Results

This section reports on the research findings on the use of retraction stigma construction strategies and is structured into five sub-sections, with the first sub-section focusing on descriptive findings and the remaining four on identified variations in the deployment of retraction stigma management strategies by retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively.

5.1.1.1 Use of retraction stigma management strategies in the corpus

To control for the varying length of the retraction notices, the raw frequencies of the retraction stigma construction strategies identified were normalized by 1,000 words. As summarized in Table 5.1 the most frequently used type of construction strategy in the corpus was *creating marks* (21.24), followed by *assigning responsibility* (11.71), *exposing peril* (1.91), and *making labels* (0.02). Notably, *creating marks* and *assigning responsibility* were employed in every retraction notice, whereas *making labels* and *exposing peril* were used in 0.42% (n = 14) and 63.50% (n = 2,093) of the 3,296 retraction notices in the corpus, respectively.

Despite the widespread deployment of *creating marks* and *assigning responsibility*, only two of their 10 individual strategies (i.e., *specifying the retracted publication* and *disclosing reasons for the retraction*) were identified in every retraction notice, whereas the remaining eight were not employed in 0.18–36.13% (n = 6–1,191) of the retraction notices examined. The three most frequently used individual construction strategies were *specifying the retracted publication*, *identifying authors of the retracted publication*, and *disclosing reasons for the retraction*, which occurred, on average, 7.49–10.02 times per retraction notice.

Three less frequently used individual strategies appeared, on average, 1.09–2.79 times per retraction notice. In sharp contrast, the remaining eight individual construction strategies were employed, on average, less than once (i.e., 0.05–0.65) per retraction notice.

Table 5.1 Normalized frequencies of retraction stigma construction strategies

Retraction stigma construction strategies	*M*	*SD*	Min	Max
1. Creating marks	21.24	9.12	0.72	81.08
1.1 Specifying the retracted publication	7.49	4.16	0.36	37.04
1.2 Identifying authors of the retracted publication	8.88	4.93	0.00	37.04
1.3 Distinguishing accountable authors	2.79	3.81	0.00	27.03
1.4 Increasing mark visibility	2.08	3.12	0.00	17.54
2. Making labels	0.02	0.29	0.00	8.26
3. Assigning responsibility	11.71	6.70	0.36	43.48
3.1 Disclosing reasons for the retraction	10.02	5.78	0.36	43.31
3.2 Agreeing to the retraction decision	0.64	1.76	0.00	11.90
3.3 Highlighting accountability for the retraction	0.65	1.94	0.00	16.81
3.4 Lacking cooperation in handling the retraction	0.15	0.86	0.00	10.64
3.5 Revealing a poor record of publishing	0.20	1.03	0.00	15.50
3.6 Imposing tangible punishment	0.05	0.50	0.00	9.62
4. Exposing peril	1.91	2.87	0.00	16.95
4.1 Affecting retraction stakeholders	0.51	1.60	0.00	12.35
4.2 Violating research and publication ethics	1.09	2.11	0.00	13.70
4.3 Contaminating the literature	0.23	1.09	0.00	13.51
4.4 Causing unspecified adverse consequences	0.08	0.67	0.00	11.11

A series of multiple linear regression analyses were run to investigate whether four contextual factors (i.e., retraction period, academic discipline, retraction notice authorship, and retraction reason) could significantly predict the employment of the four types of strategies and the 14 individual strategies for constructing retraction stigma. All the four factors were entered simultaneously into the regressions because there were no theoretically motivated predications about the relative importance of the variables concerned and their order of effects. Following Field's (2009) suggestion, dummy coding was adopted in all the regression analyses regarding retraction reason severity because they involved a variable with more than two levels. Specifically, the retraction notices published in the first retraction period (i.e., before 2010), in soft disciplines, issued by authors of retracted publications, and honest error were adopted as the baseline in the comparisons by retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively. Presented below are the results of the multiple linear regression analyses, which indicated significant associations at the alpha level of .05.

5.1.1.2 Creating marks

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of the retraction stigma construction strategy of *creating marks*, $F(6, 3289) = 24.18$, $p < .001$, $R^2 = .04$. As can be seen in Table 5.2, the retraction notices published before 2010 ($M = 22.54$, $SD = 9.71$) were more likely than those published between 2010 and 2019 ($M = 21.05$, $SD = 9.02$) to create marks, so were the retraction notices in soft disciplines ($M = 27.01$, $SD = 11.69$) than those in hard disciplines were ($M = 20.99$, $SD = 8.91$). Blatant misconduct ($M = 20.98$, $SD = 8.88$), inappropriate conduct ($M = 23.95$, $SD = 10.46$), and questionable conduct ($M = 30.44$, $SD = 6.67$) were more likely than honest error ($M = 19.96$, $SD = 9.73$) to predict the employment of this type of strategy.

Table 5.2 Multiple regression results for creating marks ($N = 3,296$)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	27.760	1.101		25.203	< .001	25.600	29.919
PR2 – PR1	-1.624	0.479	-0.178	-3.391	.001	-2.562	-0.685
HD – SD	-6.393	0.782	-0.701	-8.170	< .001	-7.927	-4.859
JA – ARP	-0.732	0.488	-0.080	-1.501	.134	-1.688	0.224
BM – HE	1.428	0.681	0.157	2.096	.036	0.092	2.764
IC – HE	4.393	0.880	0.482	4.994	< .001	2.668	6.117
QC – HE	11.386	1.633	1.249	6.973	< .001	8.184	14.588

Note. PR2 = 2010–2019; PR1 = before 2010; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; HE = honest error; IC = inappropriate conduct; QC = questionable conduct

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of *specifying the retracted publication*, $F(6, 3289) = 19.24$, $p < .001$, $R^2 = .03$. As shown in Table 5.3, the retraction notices produced by journal authorities ($M = 7.58$, $SD = 4.21$) were more likely than those written by authors of retracted publications ($M = 6.86$, $SD = 3.75$) to specify retracted publications. Inappropriate conduct ($M = 8.98$, $SD = 4.32$) and questionable conduct ($M = 13.05$, $SD = 5.96$) were more likely than honest error ($M = 6.80$, $SD = 4.36$) to be a significant predictor of the employment of this individual strategy.

Table 5.3 Multiple regression results for *specifying the retracted publication* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	6.678	0.505		13.230	< .001	5.688	7.668
PR2 – PR1	0.099	0.219	0.024	0.452	.651	-0.331	0.529
HD – SD	-0.327	0.359	-0.079	-0.911	.362	-1.030	0.376
JA – ARP	0.580	0.223	0.139	2.594	.010	0.141	1.018
BM – HE	0.372	0.312	0.089	1.193	.233	-0.240	0.985
IC – HE	2.019	0.403	0.485	5.008	< .001	1.228	2.809
QC – HE	6.048	0.748	1.454	8.082	< .001	4.581	7.516

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of *identifying authors of the retracted publication*, $F(6, 3289) = 12.67$, $p < .001$, $R^2 = .023$. As can be seen in Table 5.4, the retraction notices published before 2010 ($M = 10.08$, $SD = 5.58$) were more likely than those published between 2010 and 2019 ($M = 8.71$, $SD = 4.18$) to identify authors of retracted publications, so were the retraction notices in soft disciplines ($M = 9.79$, $SD = 5.78$) in comparison with those in hard disciplines ($M = 8.84$, $SD = 4.89$) and the retraction notices produced by authors of retracted publications ($M = 9.52$, $SD = 5.09$) in comparison with those issued by journal authorities ($M = 8.78$, $SD = 4.90$). Blatant misconduct ($M = 8.90$, $SD = 4.89$), inappropriate conduct ($M = 9.81$, $SD = 5.85$), and questionable conduct ($M = 9.21$, $SD = 2.76$) were more likely than honest error ($M = 7.31$, $SD = 4.27$) to predict the employment of this individual strategy.

Table 5.4 Multiple regression results for *identifying authors of the retracted publication* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	10.038	0.602		16.684	< .001	8.859	11.218
PR2 – PR1	-1.309	0.262	-0.265	-5.006	< .001	-1.822	-0.796
HD – SD	-1.197	0.427	-0.243	-2.800	.005	-2.035	-0.359
JA – ARP	-0.880	0.266	-0.178	-3.305	.001	-1.402	-0.358
BM – HE	1.947	0.372	0.395	5.231	< .001	1.217	2.676
IC – HE	2.816	0.480	0.571	5.861	< .001	1.874	3.758
QC – HE	2.508	0.892	0.509	2.811	.005	0.759	4.257

The multiple regression analysis showed that the four contextual factors collectively predicted the employment of *distinguishing accountable authors*, $F(6, 3289) = 56.94$, $p < .001$, $R^2 = .094$. As indicated in Table 5.5, the retraction notices published before 2010 ($M = 3.97$, $SD = 4.39$) were more likely than those published between 2010 and 2019 ($M = 2.62$, $SD = 3.69$) to distinguish accountable authors, so were the retraction notices in soft disciplines ($M = 5.50$, $SD = 4.24$) when compared with those in hard disciplines ($M = 2.67$, $SD = 3.74$) and the retraction notices penned by authors of retracted publications ($M = 4.75$, $SD = 4.60$) when

compared with those written by journal authorities (M = 2.51, SD = 3.59). Honest error (M = 4.47, SD = 4.87) was more likely than blatant misconduct (M = 2.58, SD = 3.62) but less likely than questionable conduct (M = 6.66, SD = 4.56) to predict the employment of this individual strategy.

Table 5.5 Multiple regression results for *distinguishing accountable authors* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	9.615	0.447		21.509	< .001	8.739	10.492
PR2 – PR1	-1.111	0.194	-0.292	-5.720	< .001	-1.492	-0.730
HD – SD	-3.172	0.318	-0.833	-9.988	< .001	-3.794	-2.549
JA – ARP	-2.069	0.198	-0.544	-10.454	< .001	-2.457	-1.681
BM – HE	-1.173	0.277	-0.308	-4.241	< .001	-1.715	-0.631
IC – HE	-0.418	0.357	-0.110	-1.170	.242	-1.117	0.282
QC – HE	3.286	0.663	0.863	4.958	< .001	1.986	4.585

The multiple regression analysis run on the employment of *increasing mark visibility* yielded a significant model, $F(6, 3289) = 33.47$, $p < .001$, $R^2 = .058$, and the four predictors collectively explained 5.8% of the variance in the outcome variable. As shown in Table 5.6, the retraction notices published between 2010 and 2019 (M = 2.20, SD = 3.19) were more likely than those published before 2010 (M = 1.21, SD = 2.39) to increase mark visibility, so were the retraction notices in soft disciplines (M = 3.93, SD = 4.63) compared with those in hard disciplines did (M = 2.00, SD = 3.01) and the retraction notices produced by journal authorities (M = 2.31, SD = 3.21) compared with those issued by authors of retracted publications (M = 0.46, SD = 1.62).

Table 5.6 Multiple regression results for *increasing mark visibility* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	1.428	0.374		3.823	<.001	0.696	2.160
PR2 – PR1	0.698	0.162	0.224	4.297	< .001	0.379	1.016
HD – SD	-1.697	0.265	-0.544	-6.397	< .001	-2.218	-1.177
JA – ARP	1.638	0.165	0.525	9.904	< .001	1.313	1.962
BM – HE	0.282	0.231	0.090	1.220	.223	-0.171	0.735
IC – HE	-0.024	0.298	-0.008	-0.082	.935	-0.609	0.561
QC – HE	-0.456	0.554	-0.146	-0.823	.411	-1.541	0.630

5.1.1.3 Making labels

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of *making labels*, $F(6, 3289) = 2.45$, $p = .023$, $R^2 = .004$. As can be seen in Table 5.7, the retraction notices published before 2010 (M = 0.06, SD = 0.58) were more likely than those published between 2010 and 2019 (M = 0.01, SD = 0.22) to make labels.

Table 5.7 Multiple regression results for *making labels* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.010	0.035		0.270	.787	-0.060	0.079
PR2 – PR1	-0.051	0.015	-0.177	-3.301	.001	-0.081	-0.021
HD – SD	0.018	0.025	0.062	0.704	.481	-0.032	0.067
JA – ARP	0.026	0.016	0.090	1.655	.098	-0.005	0.057
BM – HE	0.015	0.022	0.051	0.674	.500	-0.028	0.058
IC – HE	-0.007	0.028	-0.023	-0.234	.815	-0.062	0.049
QC – HE	-0.001	0.052	-0.003	-0.019	.985	-0.104	0.102

5.1.1.4 Assigning responsibility

The multiple regression analysis found that the four contextual factors collectively predicted the employment of *assigning responsibility*, $F(6, 3289) = 6.47$, $p < .001$, $R^2 = .01$. As summarized in Table 5.8, the retraction notices in hard disciplines ($M = 11.76$, $SD = 6.74$) were more likely than those in soft disciplines ($M = 10.56$, $SD = 5.76$) to assign responsibility, so were the retraction notices penned by authors of retracted publications ($M = 12.88$, $SD = 6.14$) when compared with those authored by journal authorities ($M = 11.55$, $SD = 6.76$). Honest error ($M = 13.71$, $SD = 6.61$) was more likely than blatant misconduct ($M = 11.65$, $SD = 6.80$), inappropriate conduct ($M = 11.29$, $SD = 5.65$), and questionable conduct ($M = 8.69$, $SD = 2.68$) to predict the employment of this type of strategy.

Table 5.8 Multiple regression results for *assigning responsibility* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	13.399	0.822		16.292	< .001	11.787	15.012
PR2 – PR1	-0.243	0.357	-0.036	-0.680	.496	-0.944	0.458
HD – SD	1.154	0.584	0.172	1.976	.048	0.009	2.300
JA – ARP	-0.966	0.364	-0.144	-2.654	.008	-1.680	-0.252
BM – HE	-1.777	0.509	-0.265	-3.493	.001	-2.775	-0.780
IC – HE	-2.158	0.657	-0.322	-3.286	.001	-3.446	-0.870
QC – HE	-4.707	1.219	-0.702	-3.860	<.001	-7.098	-2.316

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of the strategy of *disclosing reasons for the retraction*, $F(6, 3289) = 2.41$, $p = .025$, $R^2 = .004$. However, only retraction reason was a significant predictor. As revealed by Table 5.9, honest error ($M = 10.67$, $SD = 5.41$) was more likely than inappropriate conduct ($M = 9.23$, $SD = 4.25$) and questionable conduct ($M = 8.69$, $SD = 2.68$) to be a significant predictor of the employment of this individual strategy.

Table 5.9 Multiple regression results for *disclosing reasons for the retraction* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	9.360	0.711		13.162	< .001	7.966	10.755
PR2 – PR1	0.193	0.309	0.033	0.623	.533	-0.413	0.799
HD – SD	0.954	0.505	0.165	1.889	.059	-0.036	1.945
JA – ARP	0.417	0.315	0.072	1.323	.186	-0.201	1.034
BM – HE	-0.755	0.440	-0.131	-1.717	.086	-1.618	0.107
IC – HE	-1.584	0.568	-0.274	-2.789	.005	-2.697	-0.470
QC – HE	-2.210	1.054	-0.383	-2.096	.036	-4.278	-0.143

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of *agreeing to the retraction decision*, $F(6, 3289) = 2.97$, $p = .007$, $R^2 = .01$. As can be seen in Table 5.10, the retraction notices issued by authors of retracted publications ($M = 0.86$, $SD = 1.98$) were more likely than those published by journal authorities ($M = 0.61$, $SD = 1.72$) to reveal authors' agreement to retraction decisions. Honest error ($M = 0.83$, $SD = 1.80$) was more likely than questionable conduct ($M = 0.00$, $SD = 0.00$) to predict the employment of this individual strategy.

Table 5.10 Multiple regression results for *agreeing to the retraction decision* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.638	0.217		2.946	.003	0.213	1.063
PR2 – PR1	0.145	0.094	0.083	1.544	.123	-0.039	0.330
HD – SD	0.228	0.154	0.130	1.482	.138	-0.074	0.530
JA – ARP	-0.242	0.096	-0.137	-2.521	.012	-0.430	-0.054
BM – HE	-0.140	0.134	-0.079	-1.041	.298	-0.402	0.123
IC – HE	-0.063	0.173	-0.036	-0.364	.716	-0.402	0.276
QC – HE	-0.783	0.321	-0.445	-2.439	.015	-1.413	-0.154

The multiple regression analysis run on the employment of *highlighting accountability for the retraction* yield a significant model, $F(6, 3289) = 57.61$, $p < .001$, $R^2 = .10$, and the four predictors collectively explained 10% of the variance in the outcome variable. As shown in Table 5.11, the retraction notices published before 2010 ($M = 1.22$, $SD = 2.70$) were more likely than those published between 2010 and 2019 ($M = 0.57$, $SD = 1.80$) to highlight accountability for retraction, so were the retraction notices in soft disciplines ($M = 0.81$, $SD = 2.14$) in comparison with those in hard disciplines ($M = 0.65$, $SD = 1.93$) and the retraction notices produced by authors of retracted publications ($M = 2.04$, $SD = 3.07$) in comparison with those issued by journal authorities ($M = 0.46$, $SD = 1.63$). When compared with blatant misconduct ($M = 0.57$, $SD = 1.78$), inappropriate conduct ($M = 0.57$, $SD = 2.15$) and questionable conduct ($M = 0.00$, $SD = 0.00$), honest error ($M = 2.05$, $SD = 3.16$) was a significant predictor of the employment of this individual strategy.

Table 5.11 Multiple regression results for *highlighting accountability for the retraction* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	3.512	0.228		15.411	< .001	3.065	3.959
PR2 – PR1	-0.401	0.099	-0.207	-4.051	< .001	-0.596	-0.207
HD – SD	-0.320	0.162	-0.165	-1.978	.048	-0.638	-0.003
JA – ARP	-1.382	0.101	-0.712	-13.694	< .001	-1.579	-1.184
BM – HE	-1.046	0.141	-0.539	-7.419	< .001	-1.322	-0.770
IC – HE	-1.069	0.182	-0.551	-5.875	< .001	-1.426	-0.712
QC – HE	-1.486	0.338	-0.765	-4.397	< .001	-2.148	-0.823

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of *lacking cooperation in handling the retraction*, $F(6, 3289) = 8.37$, $p < .001$, $R^2 = .02$. As shown in Table 5.12, the retraction notices published between 2010 and 2019 ($M = 0.16$, $SD = 0.90$) were more likely than those published before 2010 ($M = 0.05$, $SD = 0.55$) to reveal authors' lack of cooperation in handling retraction, so were the retraction notices in hard disciplines ($M = 0.16$, $SD = 0.88$) compared with those in soft disciplines ($M = 0.00$, $SD = 0.00$) and the retraction notices produced by journal authorities ($M = 0.17$, $SD = 0.92$) compared with those issued by authors of retracted publications ($M = 0.00$, $SD = 0.00$). Inappropriate conduct ($M = 0.41$, $SD = 1.42$) was more likely than honest error ($M = 0.02$, $SD = 0.22$) to predict the employment of this individual strategy.

Table 5.12 Multiple regression results for *lacking cooperation in handling the retraction* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	-0.323	0.105		-3.058	.002	-0.529	-0.116
PR2 – PR1	0.099	0.046	0.115	2.165	.031	0.009	0.189
HD – SD	0.176	0.075	0.204	2.345	.019	0.029	0.323
JA – ARP	0.152	0.047	0.176	3.251	.001	0.060	0.243
BM – HE	0.070	0.065	0.081	1.068	.286	-0.058	0.198
IC – HE	0.346	0.084	0.402	4.110	< .001	0.181	0.511
QC – HE	-0.096	0.156	-0.111	-0.612	.540	-0.402	0.211

The multiple regression analysis indicated that the four contextual factors collectively did not predict the employment of *revealing a poor record of publishing*, $F(6, 3289) = 1.81$, $p = .093$, $R^2 = .003$. However, as can be seen in Table 5.13, compared with honest error ($M = 0.14$, $SD = 0.85$), inappropriate conduct ($M = 0.38$, $SD = 2.14$) was a significant predictor of the employment of this individual strategy.

Table 5.13 Multiple regression results for *revealing a poor record of publishing* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.036	0.126		0.284	.776	-0.212	0.284
PR2 – PR1	0.017	0.055	0.016	0.303	.762	-0.091	0.124
HD – SD	0.107	0.090	0.105	1.194	.232	-0.069	0.283
JA – ARP	-0.011	0.056	-0.010	-0.188	.851	-0.120	0.099
BM – HE	0.045	0.078	0.043	0.570	.569	-0.109	0.198
IC – HE	0.233	0.101	0.227	2.307	.021	0.035	0.431
QC – HE	-0.150	0.187	-0.146	-0.800	.424	-0.517	0.218

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of *imposing tangible punishment*, $F(6, 3289) = 23.00$, $p < .001$, $R^2 = .04$. As indicated in Table 5.14, the retraction notices published before 2010 ($M = 0.30$, $SD = 1.12$) were more likely than those published between 2010 and 2019 ($M = 0.02$, $SD = 0.31$) to reveal the imposition of tangible punishment, so were the retraction notices produced by journal authorities ($M = 0.06$, $SD = 0.53$) in comparison with those issued by authors of retracted publications ($M = 0.00$, $SD = 0.00$).

Table 5.14 Multiple regression results for *imposing tangible punishment* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.174	0.060		2.885	.004	0.056	0.292
PR2 – PR1	-0.295	0.026	-0.592	-11.267	< .001	-0.346	-0.244
HD – SD	0.010	0.043	0.020	0.231	.817	-0.074	0.094
JA – ARP	0.100	0.027	0.200	3.738	<.001	0.047	0.152
BM – HE	0.050	0.037	0.100	1.331	.183	-0.023	0.123
IC – HE	-0.022	0.048	-0.043	-0.448	.654	-0.116	0.073
QC – HE	0.017	0.089	0.035	0.193	.847	-0.158	0.192

5.1.1.5 Exposing peril

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of *exposing peril*, $F(6, 3289) = 11.20$, $p < .001$, $R^2 = .02$. As can be seen in Table 5.15, the retraction notices in soft disciplines ($M = 2.63$, $SD = 3.50$) were more likely than those in hard disciplines ($M = 1.88$, $SD = 2.83$) to expose peril, so were the retraction notices produced by authors of retracted publications ($M = 2.84$, $SD = 3.53$) when compared with those issued by journal authorities ($M = 1.77$, $SD = 2.73$).

Table 5.15 Multiple regression results for *exposing peril* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	3.753	0.350		10.719	< .001	3.067	4.440
PR2 – PR1	-0.142	0.152	-0.050	-0.935	.350	-0.441	0.156
HD – SD	-0.880	0.249	-0.307	-3.536	<.001	-1.367	-0.392
JA – ARP	-1.094	0.155	-0.382	-7.059	< .001	-1.398	-0.790
BM – HE	0.083	0.217	0.029	0.383	.702	-0.342	0.508
IC – HE	0.201	0.280	0.070	0.719	.472	-0.347	0.749
QC – HE	-0.584	0.519	-0.204	-1.124	.261	-1.601	0.434

The multiple regression analysis run on the employment of *affecting retraction stakeholders* yielded a significant model, $F(6, 3289) = 64.34$, $p < .001$, $R^2 = .11$, and the four predictors collectively explained 11% of the variance in the outcome variable. As indicated in Table 5.16, the retraction notices penned by authors of retracted publications (M = 1.86, SD = 2.69) were more likely than those authored by journal authorities (M = 0.31, SD = 1.26) to expose the peril of affecting retraction stakeholders.

Table 5.16 Multiple regression results for *affecting retraction stakeholders* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	1.769	0.186		9.489	< .001	1.403	2.135
PR2 – PR1	-0.007	0.081	-0.004	-0.087	.930	-0.166	0.152
HD – SD	0.208	0.132	0.130	1.572	.116	-0.051	0.468
JA – ARP	-1.516	0.083	-0.949	-18.365	< .001	-1.677	-1.354
BM – HE	-0.151	0.115	-0.095	-1.309	.191	-0.377	0.075
IC – HE	0.042	0.149	0.026	0.281	.779	-0.250	0.334
QC – HE	-0.370	0.276	-0.232	-1.340	.180	-0.912	0.172

The multiple regression analysis run on the employment of *violating research and publication ethics* yielded a significant model, $F(6, 3289) = 17.67$, $p < .001$, $R^2 = .03$, and the four predictors collectively explained 3% of the variance in the outcome variable. As shown in Table 5.17, the retraction notices in soft disciplines (M = 2.01, SD = 2.83) were more likely than those in hard disciplines (M = 1.05, SD = 2.07) to expose the peril of violating research and publication ethics, so were the retraction notices issued by journal authorities (M = 1.21, SD = 2.20) in comparison with those produced by authors of retracted publications (M = 0.25, SD = 1.06). When compared with honest error (M = 0.51, SD = 1.45), blatant misconduct (M = 1.13, SD = 2.12) and inappropriate conduct (M = 1.15, SD = 2.25) significantly predicted the employment of this individual strategy.

Table 5.17 Multiple regression results for *violating research and publication ethics* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.757	0.256		2.952	.003	0.254	1.260
PR2 – PR1	0.061	0.111	0.029	0.544	.586	-0.158	0.279
HD – SD	-0.867	0.182	-0.411	-4.759	< .001	-1.224	-0.510
JA – ARP	0.864	0.114	0.409	7.611	< .001	0.641	1.087
BM – HE	0.377	0.159	0.179	2.378	.018	0.066	0.688
IC – HE	0.415	0.205	0.197	2.028	.043	0.014	0.817
QC – HE	0.179	0.380	0.085	0.471	.638	-0.566	0.925

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of *contaminating the literature*, $F(6, 3289) = 4.85$, $p < .001$, $R^2 = .01$. As can be seen in Table 5.18, the retraction notices published before 2010 ($M = 0.40$, $SD = 1.54$) were more likely than those published between 2010 and 2019 ($M = 0.21$, $SD = 1.01$) to expose the peril of contaminating the literature. When compared with blatant misconduct ($M = 0.23$, $SD = 1.10$), inappropriate conduct ($M = 0.08$, $SD = 0.71$) and questionable conduct ($M = 0.00$, $SD = 0.00$), honest error ($M = 0.46$, $SD = 1.46$) significantly predicted the employment of this individual strategy.

Table 5.18 Multiple regression results for *contaminating the literature* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.789	0.134		5.877	< .001	0.526	1.053
PR2 – PR1	-0.172	0.058	-0.157	-2.947	.003	-0.287	-0.058
HD – SD	-0.137	0.095	-0.125	-1.434	.152	-0.324	0.050
JA – ARP	-0.094	0.059	-0.086	-1.584	.113	-0.211	0.022
BM – HE	-0.189	0.083	-0.172	-2.269	.023	-0.351	-0.026
IC – HE	-0.348	0.107	-0.318	-3.242	.001	-0.558	-0.137
QC – HE	-0.392	0.199	-0.358	-1.966	.049	-0.782	-0.001

The multiple regression analysis found out that the four contextual factors collectively predicted the employment of *causing unspecified adverse consequences*, $F(6, 3289) = 17.09$, $p < .001$, $R^2 = .03$. As indicated in Table 5.19, the retraction notices issued by authors of retracted publications ($M = 0.38$, $SD = 1.43$) were more likely than those produced by journal authorities ($M = 0.03$, $SD = 0.45$) to expose the peril of causing unspecified adverse consequences.

Table 5.19 Multiple regression results for *causing unspecified adverse consequences* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.437	0.081		5.408	< .001	0.279	0.596
PR2 – PR1	-0.024	0.035	-0.036	-0.677	.499	-0.093	0.045
HD – SD	-0.084	0.057	-0.126	-1.461	.144	-0.197	0.029
JA – ARP	-0.348	0.036	-0.523	-9.725	< .001	-0.418	-0.278
BM – HE	0.045	0.050	0.068	0.903	.367	-0.053	0.143
IC – HE	0.092	0.065	0.138	1.421	.155	-0.035	0.218
QC – HE	-0.001	0.120	-0.001	-0.007	.995	-0.236	0.234

5.1.1.6 Summary of research findings about retraction stigma construction strategies

As many as 56 significant differences were found in employing the four types of retraction stigma construction strategies and 14 individual construction strategies in relation to the four contextual factors (i.e., retraction period, academic discipline, retraction notice authorship, and retraction reason). To present a full picture of the research findings of this study and facilitate discussion in the subsequent section, all the significant associations are summarized in Table 5.20, with the minus sign (–) and plus sign (+) in all the rows except the first one indicating negative significance and positive significance, respectively. In each of the six pairs of between-group comparisons listed in the first row, the group placed behind the minus sign was adopted as the baseline.

Table 5.20 Summary of the variations in employing retraction stigma construction strategies

Retraction stigma construction strategy	RP2–RP1	HD–SD	JA–ARP	BM–HE	IC–HE	QC–HE
1. Creating marks	–	–		+	+	+
1.1 Specifying the retracted publication			+		+	+
1.2 Identifying authors of the retracted publication	–	–	–	+	+	+
1.3 Distinguishing accountable authors	–	–	–	–		+
1.4 Increasing mark visibility	+	–	+			
2. Making labels	–					
3. Assigning responsibility		+	–	–	–	–
3.1 Disclosing reasons for the retraction					–	–
3.2 Agreeing to the retraction decision			–			–
3.3 Highlighting accountability for the retraction	–	–	–	–	–	–
3.4 Lacking cooperation in handling the retraction	+	+	+		+	
3.5 Revealing a poor record of publishing					+	
3.6 Imposing tangible punishment	–		+			
4. Exposing peril		–	–			
4.1 Affecting retraction stakeholders			–			
4.2 Violating research and publication ethics		–	+	+	+	
4.3 Contaminating the literature	–			–	–	–
4.4 Causing unspecified adverse consequences			–			

Note. RP2 = 2010–2019 RP1 = before 2010; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

5.1.2 Discussion

This section first discusses the stigmatizing nature of retraction notices before it zooms in on the identified variations associated with the four contextual factors in the employment of the retraction stigma construction strategies.

5.1.2.1 The stigmatizing nature of retraction notices

As reported earlier, 14 individual strategies, falling into four distinct types, were found in the retraction notices to construct retraction stigma. Notably, different from Xu and Hu's (under review) investigation into a much smaller dataset of retraction notices (N = 1,000), this study identified a new type of strategy for constructing retraction stigma, *making labels* (i.e., the use of negative language such as *offending publication*, *multi-recidivist*, and *incriminated author* in reference to the retracted publications or their authors). The strategies identified in this study engaged in the stigmatization of retraction by linking (accountable) authors to specific retracted publications, by assigning responsibility for retraction-engendering acts, which often constitute academic misconduct, and by making explicit the various grave consequences of retractions for the implicated authors, other stakeholders, the academic community at large, and scientific progress (Foo & Tan, 2014; Hadjiargyrou, 2015; Redman & Caplan, 2005, 2015; Smith, 2013; Sovacool, 2005).

The deployment of these stigma construction strategies could be attributed to three factors. First, the use of all the strategies in the category of *creating marks* and two strategies in the category of *assigning responsibility* (i.e., *disclosing reasons for the retraction* and *revealing a poor record of publishing*) seemed motivated by the dominant purpose of retraction, that is, to correct the literature (Xu & Hu, 2022b). To achieve this purpose effectively, retraction notices need to provide essential information such as the publications to be retracted, authors of the retracted publications, and retraction reasons. Such information is functionally compulsory for retraction but image-tarnishing to authors of retracted publications (Xu & Hu, 2021). Second, journal authorities and innocent co-authors could be reasonably expected to see the need to specify the accountable authors for various considerations (e.g., to avoid courtesy retraction stigma for the journals concerned and innocent co-authors). This need could account for the use of such strategies as *distinguishing accountable authors, highlighting accountability for the retraction*, and *revealing a poor record of publishing*. Third, an important function of retraction notices, from the perspectives of journal authorities and the academic community, is to deter potential retraction-engendering misbehaviors (Xu & Hu, 2022b). This function would be served well by strategies such as *imposing tangible punishment* and *exposing perils* of retraction. Regardless of the underlying motives, the use of the various stigma construction

strategies clearly shows that retraction notices are capable of stigmatizing.

5.1.2.2 Diachronic differences

The retraction notices published before 2010 were more likely than those published between 2010 and 2019 to create marks by identifying authors of retracted publications and distinguishing accountable authors. This diachronic difference can be attributed to the increasing popularization and implementation of the COPE guidelines that retraction should be restricted to correcting the literature rather than punishing misbehaving researchers (Wager et al., 2009). Given the rising number of COPE member journals and publishers since the debut of the first version of COPE retraction guidelines in late 2009, it is reasonable to expect the increasing popularity and implementation of such advocacy. This expectation is grounded on the diachronic increase in retraction notices citing the COPE retraction guidelines to justify retraction decisions. In the master dataset of this study, 1.36% (n = 4) of the 295 retraction notices published in 2010 (one year after the release of the first set of COPE retraction guidelines) cited the COPE retraction guidelines; by contrast, 6.22% (n = 381) of the 6,122 retraction notices published between 2010 and 2019 did so. Moreover, the stigmatizing nature of naming authors accountable for retraction would discourage authors of retracted publications from correcting the literature through self-reporting and/or self-retraction. As a result, the increased need to prioritize literature correction would have led to the observed decreased frequencies of naming authors of retracted publications.

The retraction notices published between 2010 and 2019 were less likely than those published before 2010 to make labels. As argued by Xu and Hu (under review), labelling is a strong indicator of stigmatization because it "facilitates the process of considering the stigmatized group as a coherent, distinct entity" (Smith et al., 2016, p. 6). The identified diachronic difference in labelling can be explained by the popularization of the COPE call for refraining from punishing researchers for retraction (Wager, 2015; Wager et al., 2009), which is widely supported in the scientific community (e.g., Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). To de-stigmatize retraction as a phenomenon in general, some scholars (e.g., Barbour et al., 2017; Enserink, 2017) have proposed to avoid using the words *retraction* and *withdrawal* and replace them with new terms. Given the increasing trend of de-stigmatizing retraction, it is reasonable to see less labelling of retracted publications (e.g., *offending paper* and *defamatory publication*) and their (accountable) authors (e.g., *offending / culpable / incriminated / guilty author* and *multi-recidivist*) over time.

The retraction notices published between 2010 and 2019 were more likely than those published before 2010 to increase mark visibility and highlight contamination of the literature.

These two findings can be first explained by the COPE retraction guideline that retraction notices should alert the scientific community to retracted publications by keeping them available as a literature record but marked out to warn against further positive circulation of them (Wager et al., 2009). Given the cumulative reach and influence of the COPE retraction guidelines and watchdogs of research integrity (e.g., Retraction Watch and PubPeer) (Xu & Hu, 2022a), the decades-long operation of the mechanism of retraction is expected to have increasingly popularized the importance of and standardized the practice of alerting the scientific community to the contaminated literature. Another possible explanation can be the growing difficulty in distinguishing between legitimate and contaminated academic literature, hence the greater need to highlight the latter. Due to the publish-or-perish culture in academia and the digitalization and commercialization of academic publishing, greater and greater volumes of academic literature have been produced, making it more difficult to identify and more necessary to highlight contaminating literature. If not highlighted, retracted publications will worsen literature contamination due to blind positive citations to them.

5.1.2.3 Cross-disciplinary differences

The retraction notices in soft disciplines were more likely than those in hard disciplines to create marks by identifying authors of retracted publications, distinguishing accountable authors, and increasing mark visibility, and to expose peril by highlighting authors' violation of research and publication ethics. This finding can be explained by possible disciplinary differences in perceptions of the relative severity of retraction reasons, which may very likely be determined by differences in retraction prevalence between hard and soft disciplines. Hard disciplines far outnumber soft disciplines in both the absolute number of retractions (Halevi, 2020; Shuai et al., 2017; van Leeuwen & Luwel, 2014; Xu & Hu, in press) and the ratio of retracted publications to total publications (Zhang & Grieneisen, 2013). Having encountered retractions far less often than their counterparts in hard disciplines, academics in soft disciplines may tend to be more sensitive to retractions and thus react more strongly to create marks by identifying authors of retracted publications, distinguishing accountable authors, and increasing mark visibility. Moreover, a considerable portion of high-profile retractions in soft disciplines is accounted for by several repeat offenders (Xu & Hu, 2018), which may have compelled academics in soft disciplines to be more reactive to retraction and more defensive about research integrity because repeat offence is a strong indicator of intentional misconduct and aggravates literature contamination.

The retraction notices in hard disciplines were more likely than those in soft disciplines to assign responsibility by revealing authors' lack of cooperation in handling retractions. Academic journal publishing tends to involve more regulation over data in hard disciplines

than in soft ones, and retractions in hard disciplines are more likely to involve data issues (e.g., data falsification and fabrication). Consequently, there are more opportunities for authors in hard disciplines to provide their data and more opportunities for them to refuse to provide the data required for institutional investigations in cases of retraction-engendering allegations. Therefore, authors' lack of cooperation throughout institutional investigations would have occurred more often in hard disciplines than in soft disciplines. Furthermore, research collaboration (as indicated by authorship lists of publications) tends to involve more researchers in hard disciplines than in soft disciplines, and authorship issues lead to retractions far more often in hard disciplines than in soft disciplines (Xu & Hu, in press). More collaborations involving more researchers may entail more complicated divisions of inter-related research work, making it hard to assign responsibility for retraction to individual researchers. Consequently, it is not surprising to see accountable authors appear uncooperative more often in hard disciplines than in soft disciplines. The retraction notices in soft disciplines were more likely than those in hard disciplines to highlight authors' accountability for retraction. As explained earlier, this cross-disciplinary difference can be ascribed to soft disciplines' higher sensitivity and reactiveness to retraction due to their lower frequency of encountering retractions in general and high-profile cases in particular.

5.1.2.4 Authorship-based differences

Authors of retracted publications were more likely than journal authorities to assign responsibility by disclosing authors' agreement to retraction decisions and highlighting their accountability for retraction. The identified authorship-based difference in disclosing authors' consent to retraction decisions can be attributed to different logistical difficulty in reaching all authors of retracted publications; that is, co-authors of retracted publications are collegially (and maybe also personally) familiar with each other, whereas journal authorities do not have such personal connections and proximity with authors of retracted publications. Accountable authors may feel less embarrassed to confess their accountability for retraction to their innocent co-authors but too reluctant to face journal authorities for fear of punishment from the latter. Journal authorities more often revealed authors' lack of cooperation in handling retraction and imposition of tangible punishment than authors of retracted publications did. This finding can be explained by the fact that journal authorities are usually the agents of retraction-engendering investigations and tangible sanctions on retraction, but it would have been too self-stigmatizing and self-destructive for authors of retracted publications to self-expose their lack of cooperation (e.g., being uncooperative in pre-retraction investigations and irresponsive to journal authorities' retraction decisions) and self-impose tangible punishment (e.g., a publishing ban).

Authors of retracted publications were more likely than journal authorities to expose peril by highlighting impact on retraction stakeholders and unspecified adverse consequences although journal authorities were more likely than authors of retracted publications to highlight authors' violation of research and publication ethics. By exposing authors' violation of research and publication ethics, journal authorities could not only justify their retraction decisions but also highlight their determination to combat and deter retraction-engendering misbehaviors. Authors of retracted publications may have deemed it too stigmatizing to self-impose such a verdict. Instead, self-exposure of the peril affecting retraction stakeholders is a showcase of authors' reflections on and remorse for the adverse consequences of their retraction-engendering misbehaviors, which may be intended to (and probably can) repair their image, according to Benoit's (2015) image repair theory. However, self-exposure of specific retraction peril in this way can lead to the construction of retraction stigma against themselves, which explains why authors of retracted publications exposed unspecified adverse consequences of retraction more often than journal authorities did.

5.1.2.5 Retraction reason-based differences

Honest error was less likely than blatant misconduct, inappropriate conduct, and questionable conduct to be associated with creating marks (by specifying retracted publications, identifying authors of retracted publications, and distinguishing accountable authors). These findings, taken together, pointed to a positive correlation between retraction reason severity and stigmatization of retraction and provided evidence in support of Xu and Hu's (2022b) hypothesis that retraction reason severity would be positively correlated with the stigmatizing force of retraction notices. The positive correlation identified could be explained in terms of attribution theory, which posits that the more accountable individuals are held for their own conditions, the more negatively they will be reacted to (Corrigan et al., 2003; Weiner, 1995; Weiner et al., 1988). More related to the context of retraction, as pointed out by Ben-Yehuda and Oliver-Lumerman (2017), reactions to fraud in research are expected to "be proportional to the severity of the case" (p. 195).

Compared with blatant misconduct, inappropriate conduct and questionable conduct, honest error significantly predicted responsibility assignment via disclosure of retraction reasons, authors' agreement to retraction decisions, and their accountability for retraction. It was also more likely than blatant misconduct to be associated with distinguishing accountable authors. The de-stigmatizing nature of honest error may have encouraged retraction notice authors to remain open and positive to distinguishing accountable authors and assigning responsibility unreservedly in various ways. In cases of retractions due to honest error, identifying accountable authors may not be deemed image-tarnishing or relationship-breaking

because the stigmatizing force of responsibility assignment and being identified as accountable for retraction can be minimized, if not diminished, through a claim of unintentionality of retraction-engendering misbehaviors. For instance, a case of plagiarism can be downplayed as an incident of honest error, as illustrated in the following retraction notice excerpt:

> The authors wish to retract this article owing to *inadvertent overlap* [emphasis added] with an earlier, broader study .... The data presented in Tables 1 and 2 of this article had previously been published in the supplementary tables of Jablonski et al [the plagiarized article]. (RN-SCIE-3422)

Honest error was found less likely than inappropriate conduct to be associated with disclosure of authors' lack of cooperation in handling reaction and their poor record of publishing. This finding could not substantially undermine the identified positive correlation between responsibility assignment and retraction reason severity and can be explained by the nature of inappropriate conduct. Since inappropriate conduct "may not necessarily undermine the scientific validity of published research" (Xu & Hu, in press, p. 7), authors of retracted publications may have deemed it unjustifiable to retract their publications and thus chosen not to cooperate in retraction handling. Although inappropriate conduct may not lead to retraction on the ground of invalidity of research data or findings, exposure of authors' poor record of publishing can suggest repeat offence and/or author's unwillingness or incapacity to confirm retraction-engendering problems with their retracted publications. This negative reflection can further justify retraction decisions.

Honest error was more likely than the other three types of retraction reason to expose literature contamination but less likely than blatant misconduct to disclose authors' violation of research and publication ethics. Since literature contamination due to honest error is less stigmatizing for the individuals concerned, it was more likely for it to be mentioned. This is consistent with the positive correlation between severity of retraction reasons and the stigmatizing force of retraction peril. Given the widely advocated differential and fair sanctions on research misconduct (Hall & Martin, 2019; Keränen, 2006; Yeo-Teh & Tang, 2022), the stigmatizing force of retraction peril is expected to be positively correlated with the severity of retraction reasons. Theoretically, the identified positive correlation between the severity of retraction reasons and the stigmatizing force of retraction peril is underpinned by attribution theory (Corrigan et al., 2003; Weiner, 1986), which posits that negative reactions to individuals are positively correlated with their accountability.

5.2 Retraction Stigma Management Strategies

This section consists of two parts, with the first part presenting the findings on the employment of retraction stigma management strategies and the second part discussing the reported findings.

5.2.1 Results

This section reports on the research findings on the use of retraction stigma management strategies and is divided into five parts. The first part focuses on descriptive statistics on the employment of retraction stigma management strategies. The remaining four parts concentrate on variations in the deployment of those management strategies that were related to retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively.

5.2.1.1 Use of retraction stigma management strategies in the corpus

To control for the varying length of the retraction notices, the frequencies of the retraction stigma management strategies identified were normalized by 1,000 words. As summarized in Table 5.21, the most frequent type of strategy for managing retraction stigma in the corpus was *refraining from labelling* (5.14), followed by *manipulating responsibility assignment* (2.58), *offering correction and remediation* (1.91), and *avoiding marks* (0.13). The two most frequent individual retraction stigma management strategies were *downplaying severity or consequences* (1.96) and *requesting or performing retraction* (1.34). The other nine less frequent individual management strategies were employed on average less than once (0.01–0.35) per retraction notice. Notably, three management strategies (i.e., *not specifying retracted publications*, *not distinguishing accountable authors*, and *disclosing no reasons for retraction*) were not found in the corpus but remained in the table for the reason mentioned in Section 4.4.2.

Since the employment of one type of management strategy and four individual management strategies, as asterisked in Table 5.21, was coded dichotomously (i.e., presence vs. absence) to result in categorical data, which could not be compared through linear regression analysis, a series of Chi-square tests were performed to identify potential associations between the employment of these strategies and the four contextual factors (i.e., retraction period, discipline, retraction notice authorship, and retraction reason). Given that the employment of all the other strategies was coded for frequencies, a series of multiple linear regression analyses were conducted on the normalized frequencies to investigate whether the four contextual factors could significantly predict the employment of the other three types of management strategies and ten individual strategies. All the four factors were entered simultaneously to build a model because there were no theoretically motivated predications about their relative importance and their order of effects. Following Field's (2009) suggestion,

dummy coding was adopted in all the regression analyses involving the variable of retraction reason severity since it had four rather than two levels. The retraction notices published before 2010, the retraction notices in soft disciplines, the retraction notices by authors of retracted publications, and honest error were adopted as the baseline in the comparisons by retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively.

Table 5.21 Normalized frequencies of retraction stigma management strategies

Retraction stigma management strategies	*M*	*SD*	Min	Max
1. Concealing stigma visibility	0.13	1.07	0.00	27.03
1.1 Not specifying the retracted publication*	/	/	/	/
1.2 Not identifying authors of the retracted publication*	/	/	/	/
1.3 Not distinguishing accountable authors*	/	/	/	/
1.4 Decreasing visibility	0.13	1.07	0.00	27.03
2. Refraining from labelling*	/	/	/	/
3. Manipulating responsibility assignment	2.57	4.34	0.00	36.67
3.1 Disclosing no reasons for the retraction*	/	/	/	/
3.2 Objecting to the retraction decision	0.23	1.01	0.00	13.89
3.3 Denying retraction-engendering allegations	0.05	0.46	0.00	8.04
3.4 Displaying cooperation in investigations	0.05	0.49	0.00	8.13
3.5 Claiming unintentionality of fault	0.27	1.21	0.00	15.87
3.6 Downplaying severity and consequences	1.96	3.76	0.00	27.78
4. Offering correction and remediation	1.87	3.64	0.00	27.40
4.1 Requesting or performing retraction	1.34	2.73	0.00	17.70
4.2 Self-reporting retraction-engendering problems	0.35	1.35	0.00	11.63
4.3 Rectifying retraction-engendering problems	0.17	0.89	0.00	15.96
4.4 Promising no recurrence of the fault	0.01	0.20	0.00	6.92

5.2.1.2 Concealing stigma visibility

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of *concealing stigma visibility*, $F(6, 3289) = 14.61$, $p < .001$, $R^2 = .03$. As can be seen in Table 5.22, the retraction notices published before 2010 ($M = 0.24$, $SD = 1.45$) were more likely than those published between 2010 and 2019 ($M = 0.12$, $SD = 1.01$) to conceal stigma visibility by decreasing mark visibility, so were the retraction notices issued by journal authorities ($M = 0.15$, $SD = 1.14$) in comparison with those produced by authors of retracted publications ($M = 0.00$, $SD = 0.00$). Compared with honest error ($M = 0.11$, $SD = 0.80$), questionable conduct ($M = 1.62$, $SD = 4.13$) significantly and positively predicted the employment of this type of retraction stigma management strategy.

Table 5.22 Multiple regression results for *concealing stigma visibility* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.082	0.130		0.632	.528	-0.173	0.338
PR2 – PR1	-0.165	0.057	-0.154	-2.907	.004	-0.276	-0.054
HD – SD	0.062	0.093	0.058	0.673	.501	-0.119	0.244
JA – ARP	0.177	0.058	0.165	3.063	.002	0.064	0.290
BM – HE	-0.040	0.081	-0.037	-0.493	.622	-0.198	0.118
IC – HE	0.006	0.104	0.006	0.058	.953	-0.198	0.210
QC – HE	1.468	0.193	1.371	7.591	< .001	1.089	1.848

Note. PR2 = 2010–2019; PR1 = before 2010; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; HE = honest error; IC = inappropriate conduct; QC = questionable conduct

The result of a Fisher's exact test (used when the expected frequency for one cell was less than five) indicated that the retraction notices issued by journal authorities were 7.93 times more likely than those produced by authors of retracted publications *not to identify authors of retracted publications*, $p = .041$, $\varphi = .034$. The results of a Chi-square test indicated that retraction reason was significantly associated with non-identification of authors of retracted publications, χ^2 (3, N = 3,296) = 21.84, $p < .001$, $\varphi = .08$. Post hoc analyses showed that inappropriate conduct was 14.32 times more likely than honest error not to identify authors of retracted publications, χ^2 (1, N = 428) = 4.913, $p = .027$, $\varphi = .124$.

5.2.1.3 Manipulating responsibility assignment

The multiple regression analysis run on the retraction stigma management strategy *manipulating responsibility assignment* yielded a significant model, $F(6, 3289) = 47.42$, $p < .001$, $R^2 = .08$, and the four predictors collectively explained 8% of the variance in the outcome variable. As indicated in Table 5.23, the retraction notices in hard disciplines (M = 2.64, SD = 4.39) were more likely than those in soft disciplines (M = 1.14, SD = 2.64) to manipulate responsibility assignment. Honest error (M = 7.17, SD = 3.98) was more likely than blatant misconduct (M = 2.26, SD = 4.18), inappropriate conduct (M = 2.89, SD = 4.63), and questionable conduct (M = 0.48, SD = 1.60) to be associated with the employment of this type of management strategy.

Table 5.23 Multiple regression results for *manipulating responsibility assignment* (*N* = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	5.520	0.514		10.736	< .001	4.512	6.528
PR2 – PR1	0.409	0.223	0.094	1.830	.067	-0.029	0.847
HD – SD	1.605	0.365	0.370	4.395	< .001	0.889	2.321
JA – ARP	-0.328	0.228	-0.076	-1.442	.149	-0.774	0.118
BM – HE	-4.865	0.318	-1.120	-15.297	< .001	-5.489	-4.242
IC – HE	-4.238	0.411	-0.976	-10.322	< .001	-5.043	-3.433
QC – HE	-6.748	0.762	-1.554	-8.853	< .001	-8.243	-5.254

The multiple regression analysis revealed that the four contextual factors collectively predicted the employment of the retraction stigma management strategy *objecting to the retraction decision*, $F(6, 3289) = 7.68$, $p < .001$, $R^2 = .01$. As can be seen in Table 5.24, the retraction notices published between 2010 and 2019 ($M = 0.26$, $SD = 1.07$) were more likely than those published before 2010 ($M = 0.06$, $SD = 0.47$) to reveal authors' objection to retraction decisions, so were the retraction notices in hard disciplines ($M = 0.24$, $SD = 1.04$) than those in soft disciplines ($M = 0.00$, $SD = 0.00$). Inappropriate conduct ($M = 0.49$, $SD = 1.88$) was more likely than honest error ($M = 0.07$, $SD = 0.50$) to be associated with the employment of this individual management strategy.

Table 5.24 Multiple regression results for *objecting to the retraction decision* ($N = 3,296$)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	-0.317	0.124		-2.550	.011	-0.560	-0.073
PR2 – PR1	0.214	0.054	0.211	3.958	< .001	0.108	0.320
HD – SD	0.244	0.088	0.241	2.770	.006	0.071	0.417
JA – ARP	-0.033	0.055	-0.033	-0.608	.543	-0.141	0.074
BM – HE	0.146	0.077	0.144	1.894	.058	-0.005	0.296
IC – HE	0.424	0.099	0.418	4.272	< .001	0.229	0.618
QC – HE	-0.110	0.184	-0.108	-0.596	.551	-0.471	0.251

The multiple regression analysis showed that the four contextual factors collectively predicted the employment of the retraction stigma management strategy *displaying cooperation in investigations*, $F(6, 3289) = 5.39$, $p < .001$, $R^2 = .01$. As indicated in Table 5.25, compared with blatant misconduct ($M = 0.05$, $SD = 0.45$), inappropriate conduct ($M = 0.02$, $SD = 0.32$) and questionable conduct ($M = 0.00$, $SD = 0.00$), honest error ($M = 0.22$, $SD = 1.00$) significantly and positively predicted the employment of this individual strategy.

Table 5.25 Multiple regression results for *displaying cooperation in investigations* ($N = 3,296$)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.234	0.061		3.850	<.001	0.115	0.353
PR2 – PR1	-0.046	0.026	-0.094	-1.754	.080	-0.098	0.005
HD – SD	0.052	0.043	0.106	1.210	.226	-0.032	0.137
JA – ARP	-0.049	0.027	-0.100	-1.839	.066	-0.102	0.003
BM – HE	-0.152	0.038	-0.308	-4.058	< .001	-0.226	-0.079
IC – HE	-0.181	0.049	-0.365	-3.726	<.001	-0.276	-0.086
QC – HE	-0.193	0.090	-0.390	-2.144	.032	-0.370	-0.017

The multiple regression analysis run on the employment of the retraction stigma management strategy of *claiming unintentionality of fault* yielded a significant model, $F(6, 3289) = 2473.22$, $p < .001$, $R^2 = .82$, and the four predictors collectively explained 82% of the variance in the outcome variable. As shown in Table 5.26, the retraction notices published

before 2010 (M = 0.47, SD = 1.74) were more likely than those published between 2010 and 2019 (M = 0.24, SD = 1.11) to claim unintentionality of authors' fault, so were the retraction notices written by authors of retracted publications (M = 0.84, SD = 1.98) when compared with those authored by journal authorities (M = 0.19, SD = 1.03). Honest error (M = 4.67, SD = 2.15) was significantly more likely than blatant misconduct (M = 0.00, SD = 0.00), inappropriate conduct (M = 0.00, SD = 0.00), and questionable conduct (M = 0.00, SD = 0.00) to be associated with the employment of this individual strategy.

Table 5.26 Multiple regression results for *claiming unintentionality of fault* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	4.651	0.064		73.126	< .001	4.526	4.775
PR2 – PR1	-0.099	0.028	-0.081	-3.566	<.001	-0.153	-0.044
HD – SD	0.067	0.045	0.055	1.480	.139	-0.022	0.155
JA – ARP	-0.062	0.028	0.051	2.208	.027	0.007	0.117
BM – HE	-4.683	0.039	-3.871	-119.047	< .001	-4.760	-4.606
IC – HE	-4.687	0.051	-3.874	-92.285	< .001	-4.786	-4.587
QC – HE	-4.678	0.094	-3.866	-49.608	< .001	-4.862	-4.493

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of the retraction stigma management strategy of *downplaying severity and consequences* yielded a significant model, $F(6, 3289) = 4.94$, $p < .001$, $R^2 = .01$. As summarized in Table 5.27, the retraction notices in hard disciplines (M = 2.02, SD = 3.81) were more likely than those in soft disciplines (M = 0.72, SD = 1.91) to downplay severity and consequences of retraction-engendering problems. Honest error (M = 2.14, SD = 3.40) was more likely than questionable conduct (M = 0.48, SD = 1.60) to be associated with the employment of this individual strategy.

Table 5.27 Multiple regression results for *downplaying severity and consequences* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.843	0.462		1.825	.068	-0.063	1.749
PR2 – PR1	0.345	0.201	0.092	1.716	.086	-0.049	0.738
HD – SD	1.291	0.328	0.343	3.934	< .001	0.648	1.935
JA – ARP	-0.336	0.205	-0.089	-1.644	.100	-0.737	0.065
BM – HE	-0.145	0.286	-0.039	-0.507	.612	-0.705	0.416
IC – HE	0.258	0.369	0.069	0.698	.485	-0.466	0.981
QC – HE	-1.686	0.685	-0.448	-2.461	.014	-3.029	-0.343

5.2.1.4 Offering correction and remediation

The multiple regression analysis run on the employment of the retraction stigma management strategy of *offering correction and remediation* yielded a significant model, $F(6, 3289) = 320.79$, $p < .001$, $R^2 = .37$, and the four predictors collectively explained 37% of the variance

in the outcome variable. As can be seen in Table 5.28, the retraction notices produced by authors of retracted publications (M = 7.53, SD = 4.42) were more likely than those issued by journal authorities (M = 1.06, SD = 2.67) to offer correction and remediation. Honest error (M = 5.49, SD = 4.94) was more likely than blatant misconduct (M = 1.56, SD = 3.33), inappropriate conduct (M = 2.80, SD = 4.26), and questionable conduct (M = 0.97, SD = 2.97) to be associated with the employment of this type of strategy.

Table 5.28 Multiple regression results for *offering correction and remediation* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	9.019	0.357		25.274	< .001	8.319	9.719
PR2 – PR1	-0.075	0.155	-0.021	-0.484	.628	-0.379	0.229
HD – SD	0.223	0.254	0.061	0.880	.379	-0.274	0.720
JA – ARP	-6.137	0.158	-1.686	-38.850	< .001	-6.447	-5.827
BM – HE	-2.137	0.221	-0.587	-9.681	< .001	-2.570	-1.704
IC – HE	-0.934	0.285	-0.256	-3.276	.001	-1.492	-0.375
QC – HE	-2.399	0.529	-0.659	-4.534	< .001	-3.436	-1.361

The multiple regression analysis run on the use of *requesting or performing the retraction* as a retraction stigma management strategy yielded a significant model, $F(6, 3289) = 307.61$, $p < .001$, $R^2 = .36$, and the four predictors collectively explained 36% of the variance in the outcome variable. As shown in Table 5.29, the retraction notices written by authors of retracted publications (M = 5.62, SD = 3.06) were more likely than those penned by journal authorities (M = 0.73, SD = 2.05) to disclose authors' request for or performance of retraction. Honest error (M = 3.27, SD = 3.30) was more likely than blatant misconduct (M = 1.56, SD = 3.33) and questionable conduct (M = 0.67, SD = 1.96) to be associated with the use of this individual management strategy.

Table 5.29 Multiple regression results for *requesting or performing the retraction* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	6.187	0.270		22.934	< .001	5.658	6.716
PR2 – PR1	-0.222	0.117	-0.081	-1.893	.058	-0.452	0.008
HD – SD	0.115	0.192	0.042	0.600	.549	-0.261	0.491
JA – ARP	-4.750	0.119	-1.739	-39.779	< .001	-4.984	-4.516
BM – HE	-0.699	0.167	-0.256	-4.191	< .001	-1.026	-0.372
IC – HE	0.056	0.215	0.020	0.259	.795	-0.367	0.478
QC – HE	-0.926	0.400	-0.339	-2.315	.021	-1.710	-0.142

The multiple regression analysis revealed that the four contextual factors collectively predicted the use of *self-reporting retraction-engendering problems* as a strategy for managing retraction stigma, $F(6, 3289) = 57.92$, $p < .001$, $R^2 = .10$. As indicated in Table 5.30, the retraction notices issued by authors of retracted publications (M = 1.28, SD = 2.33) were more

likely than those produced by journal authorities (M = 0.22, SD = 1.09) to reveal authors' self-report of retraction-engendering problems. Honest error (M = 1.46, SD = 2.44) was more likely than blatant misconduct (M = 0.26, SD = 1.77), inappropriate conduct (M = 0.62, SD = 1.77), and questionable conduct (M = 0.00, SD = 0.00) to be associated with the use of this individual management strategy.

Table 5.30 Multiple regression results for *self-reporting retraction-engendering problems* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	1.922	0.159		12.090	< .001	1.611	2.234
PR2 – PR1	0.052	0.069	0.038	0.754	.451	-0.083	0.188
HD – SD	0.055	0.113	0.041	0.488	.625	-0.166	0.277
JA – ARP	-0.934	0.070	-0.690	-13.272	< .001	-1.072	-0.796
BM – HE	-0.926	0.098	-0.684	-9.418	< .001	-1.119	-0.733
IC – HE	-0.575	0.127	-0.425	-4.530	< .001	-0.824	-0.326
QC – HE	-1.147	0.236	-0.847	-4.867	< .001	-1.610	-0.685

The multiple regression analysis showed that the four contextual factors collectively predicted the employment of the retraction stigma management strategy of *rectifying retraction-engendering problems*, $F(6, 3289) = 28.72$, $p < .001$, $R^2 = .05$. As can be seen in Table 5.31, the retraction notice published between 2010 and 2019 (M = 0.17, SD = 0.88) were more likely than those published before 2010 (M = 0.14, SD = 0.93) to reveal authors' rectification of retraction-engendering problems, so were the retraction notices written by authors of retracted publications (M = 0.58, SD = 1.59) in comparison with those penned by journal authorities (M = 0.11, SD = 0.72). Compared with blatant misconduct (M = 0.12, SD = 0.71), inappropriate conduct (M = 0.23, SD = 1.41) and questionable conduct (M = 0.30, SD = 1.32), honest error (M = 0.74, SD = 1.76) was a significant positive predictor of the employment of this individual management strategy.

Table 5.31 Multiple regression results for *rectifying retraction-engendering problems* (N = 3,296)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.859	0.107		8.028	< .001	0.649	1.069
PR2 – PR1	0.103	0.047	0.116	2.209	.027	0.012	0.194
HD – SD	0.048	0.076	0.054	0.637	.524	-0.101	0.197
JA – ARP	-0.409	0.047	-0.460	-8.639	< .001	-0.502	-0.316
BM – HE	-0.511	0.066	-0.575	-7.722	< .001	-0.641	-0.381
IC – HE	-0.404	0.085	-0.454	-4.729	< .001	-0.572	-0.237
QC – HE	-0.319	0.159	-0.358	-2.010	.045	-0.630	-0.008

The multiple regression analysis indicated that the four contextual factors collectively predicted the employment of the retraction stigma management strategy of *promising no*

recurrence of the fault, $F(6, 3289) = 3.33$, $p = .003$, $R^2 = 0.01$. As shown in Table 5.32, the retraction notices issued by authors of retracted publications ($M = 0.05$, $SD = 0.48$) were more likely than those produced by journal authorities ($M = 0.00$, $SD = 0.11$) to reveal authors' promise of no recurrence of fault.

Table 5.32 Multiple regression results for *promising no recurrence of the fault* ($N = 3{,}296$)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	0.051	0.024		2.100	.036	0.003	0.099
PR2 – PR1	-0.008	0.011	-0.040	-0.753	.451	-0.029	0.013
HD – SD	0.005	0.017	0.023	0.262	.794	-0.029	0.038
JA – ARP	-0.044	0.011	-0.220	-4.038	< .001	-0.065	-0.022
BM – HE	0.000	0.015	-0.001	-0.016	.987	-0.030	0.029
IC – HE	-0.010	0.019	-0.052	-0.525	.600	-0.048	0.028
QC – HE	-0.007	0.036	-0.033	-0.182	.855	-0.077	0.064

5.2.1.5 Summary of research findings about retraction stigma management strategies

As reported above, as many as 42 significant associations were identified between the four contextual factors and the employment of the three types of retraction stigma management strategies and 10 individual management strategies. All the significant associations are summarized in Table 5.33 to provide a full picture of the research findings and facilitate the subsequent discussion of these findings. Notably, the minus sign (–) and plus sign (+) in all the rows except the first one in the table indicate negative and positive associations, respectively. In the first row of the table, the group placed behind the minus sign was adopted as the baseline for the six pairs of between-group comparisons.

Table 5.33 Summary of the variations in employing retraction stigma management strategies

Retraction stigma management strategy	RP2–RP1	HD–SD	JA–ARP	BM–HE	IC–HE	QC–HE
1. Concealing stigma visibility	–		+			+
1.1 Not specifying the retracted publication						
1.2 Not identifying authors of the retracted publication			+		+	
1.3 Not distinguishing accountable authors						
1.4 Decreasing mark visibility	–		+			+
2. Refraining from labelling						
3. Manipulating responsibility assignment		+		–	–	–
3.1 Disclosing no reasons for the retraction						
3.2 Objecting to the retraction decision	+	+			+	
3.3 Denying retraction-engendering allegations						
3.4 Displaying cooperation in investigations				–	–	–
3.5 Claiming unintentionality of fault	–		–	–	–	–
3.6 Downplaying severity and consequences		+				–
4. Offering correction and remediation			–	–	–	–
4.1 Requesting or performing the retraction			–	–		–
4.2 Self-reporting retraction-engendering problems			–	–	–	–
4.3 Rectifying retraction-engendering problems	+		–	–	–	–
4.4 Promising no recurrence of the fault			–			

Note. RP2 = 2010–2019 RP1 = before 2010; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

5.2.2 Discussion

This section starts by discussing the de-stigmatizing nature of retraction notices and then zooms in on why the employment of the retraction stigma management strategies was associated differently with the four contextual factors, namely retraction period, academic discipline, retraction notice authorship, and retraction reason.

5.2.2.1 The destigmatizing nature of retraction notices

In contrast to the stigma construction strategies, the stigma management strategies identified in the retraction notices mitigated the stigma associated with retraction. The 14 individual management strategies, falling into four broad categories, contributed to the de-stigmatization of retraction by *concealing stigma visibility* in various ways, *refraining from labelling* retracted publications and/or their authors negatively, *manipulating responsibility assignment*, and *offering correction and remediation*.

The deployment of these strategies could be plausibly explained by three factors. First, many authors of the retraction notices might have prioritized correction of the literature over other purposes (Xu & Hu, 2022b), hence disclosing minimum information about authors of retracted publications and/or refraining from labelling the publications or their authors negatively. Since "labelling facilitates the process of considering the stigmatized group as a

coherent, distinct entity" (Smith et al., 2016, p. 6), the application of the aforementioned strategies worked toward diminishing retraction stigma. Second, the use of the various stigma management strategies can be seen as a positive response to the call for creating a shaming-free environment for effective retraction (e.g., Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). Such an environment is needed to encourage timely, self-initiated rectifications of the contaminate literature. Third, the use of the observed management strategies could also have been incentivized by the need perceived by authors of retracted publications to repair their tarnished reputation (Hu & Xu, 2020; Xu & Hu, 2018). As Benoit (2015) points out, strategies such as *offering correction and remediation* could be deployed to repair damaged image. Given the stigma management strategies observed in this study, it is clear that retraction notices are capable of de-stigmatizing.

5.2.2.2 Diachronic differences

The retraction notices published before 2010 were more likely than those published between 2010 and 2019 to conceal stigma visibility by decreasing mark visibility. The identified diachronic difference can be explained by the development of retraction as a mechanism of post-publication peer review of and correction to the literature. Since the debut of its first version of retraction guidelines in 2009, the COPE (Wager et al., 2009) and the Retraction Watch proposal (Oransky, 2015) have been emphasizing that retracted publications should be marked out and remain intact to keep a record of the academic literature and to alert the scientific community to retracted publications so as to avoid citations to them. The increasing call for creating a shaming-free environment for more effective handling of retraction (e.g., Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b) may also have contributed to the diachronic change in decreasing mark visibility.

The retraction notices published between 2010 and 2019 were more likely than those published before 2010 to reveal authors' objection to retraction decisions, and the latter were more likely than the former to claim authors' unintentionality of their fault. The diachronic difference in authors' objection to retraction decisions could be explained by the constantly increasing competition in academia, which is characterized with metrics-oriented assessment of research performance and the "publish or perish" culture. Therefore, it is in researchers' personal interest not to agree to retraction decisions. The frequency decrease in claiming authors' unintentionality of their retraction-engendering behavior from the first retraction period (before 2010) to the second (2010–2019) could be attributed to increases in institutional investigations into retraction-engendering allegations. Despite difficulties in confirming unintentionality of accountable authors' retraction-engendering behavior (Xu & Hu, in press),

institutional investigations could still confirm and disconfirm authors' claim of unintentional retraction-engendering behavior in cases where raw data were well documented and new technologies could be used to detect irregularities in text and images.

The retraction notices published between 2010 and 2019 were more likely than those published before 2010 to reveal authors' rectification of retraction-engendering problems. This diachronic change can be explained by retraction notices' increasing transparency about retraction reasons (Xu & Hu, 2022a, in press). Being transparent about retraction reasons requires thorough investigations into the causes of retraction-engendering problems by retrieving research documentation and conducting replication studies, which makes it possible to confirm and subsequently correct research and publication flaws. A diachronic increase in the awareness and acceptance of COPE's recommendation that retraction is intended to correct the literature rather than penalize misbehaving researchers may have encouraged more and more corrective actions. Rectification of retraction-engendering problems (e.g., replacing or republishing retracted publications with retraction-engendering problems being corrected) goes beyond retracting seriously flawed research/publications and thus should be encouraged. According to the RWDB, the rate of Retract and Replace to retracted publications between 2010 and 2019 (2.94% = 679*100/23,112) was approximately 3.6 times higher than that between 1980 and 2009 (0.82% = 24*100/2,933).

5.2.2.3 Cross-disciplinary differences

The retraction notices in hard disciplines were more likely than those in soft disciplines to manipulate responsibility assignment by disclosing authors' objection to retraction decisions and downplaying severity and consequences of their retraction-engendering problems. The severer competition for scientific innovation, the more metric-dominated assessment of research output, and the higher cost of scientific research in hard disciplines than in soft disciplines could explain why the authors of retracted publications in hard disciplines were more likely than their counterparts in soft disciplines to object retraction decisions on their publications. Since scientific research in hard disciplines tends to have a more direct and higher impact on research consumers, both academic and non-academic, than that in soft disciplines, the authors of retracted publications in hard discipline were more likely than their counterparts in soft disciplines to mitigate retraction stigma by downplaying severity and consequences of their retracted research, as illustrated by the statement "this retraction should not affect the validity of numerous articles published by other groups relating to the subject matter of the two retracted papers" (RN-SCIE-6409).

5.2.2.4 Authorship-based differences

Journal authorities concealed stigma visibility by decreasing mark visibility in their retraction notices more often than authors of retracted publications did. This authorship-based difference is clearly due to journal authorities' exclusive capacity to remove the retracted publications from their journal websites and relevant indexing databases, not to incorporate retracted published online first items into print issues or modify the authorship lists of retracted publications (in cases of retractions due to authorship issues). Journal authorities were more likely than authors of retracted publications to disclose unintentionality of authors' retraction-engendering fault. A close examination of this strategy indicated that in most cases unintentionality of authors' fault was self-claimed by authors of retracted publications, which can be explained by journal authorities' difficulties in ascertaining unintentionality of authors' retraction-engendering behavior (Xu & Hu, in press). The identified authorship-based difference can be explained by the COPE retraction guidelines' recommendation that negotiation over the wording of retraction notices should be allowed between journal authorities and authors of retracted publication (Wager et al., 2009). Journal authorities may have allowed this kind of negotiation for the purposes of helping fulfil the goal of correcting the literature and protecting the image of journals and publishers.

Authors of retracted publications were more likely than journal authorities to offer correction and remediation through authors' request for or performance of retraction, self-report of retraction-engendering problems, rectification of retraction-engendering problems, and promise of no recurrence of fault. Stigmatized individuals are not only supposed to eliminate the peril caused by their stigmatizing conditions (Deaux et al., 1995; Frable, 1993), but it is also in their favour to do so because reducing offensiveness and corrective actions can help repair tarnished image according to Benoit's (2015) image repair theory. It is thus expectable that authors of retracted publications offered correction and remediation in various ways. Authors of retracted publications would prefer to make such image-repairing offers through their own retraction notices for another benefit. That is, taking the initiative to issue retraction notices is assuming responsibility for eliminating peril and thus image-repairing (Xu & Hu, 2018). Therefore, it is more beneficial for authors of retracted publications to offer correction and remediation through retraction notices issued by themselves than those by journal authorities.

5.2.2.5 Retraction reason-based differences

Compared with the other three types of retraction reasons (i.e., blatant misconduct, inappropriate conduct, and questionable conduct), honest error was significantly more

frequently associated with manipulating responsibility assignment through displaying authors' cooperation in investigations and claiming unintentionality of authors' fault. Additionally, honest error was more likely than questionable conduct to be associated with the strategy of downplaying severity and consequences of authors' retraction-engendering problems. Taken together, these findings pointed to the overall pattern of severity of retraction reasons being negatively correlated with responsibility assignment, which is against our expectation that severer retraction reasons would be associated with a greater use of strategies for manipulating responsibility assignment. These unexpected findings can be explained by the unintentionality of honest error and its de-stigmatizing nature. Honest error, by definition, is unintentional; therefore, it is logical to be associated with claiming unintentionality of authors' retraction-engendering fault. It is image-repairing to display authors' cooperation in pre-retraction investigations and downplay severity and consequences of their fault, which is in accordance with the de-stigmatizing nature of honest error. Notably, these findings on honest error can justify the call for distinguishing honest error from other types of retraction reasons (Baskin et al., 2017; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b), which is conducive to encouraging fair sanctions on retraction and self-correction of the literature (Xu & Hu, in press). However, a closer examination of the honest error cases in the study revealed that unintentionality of retraction-engendering behavior was self-claimed by authors of retracted publications, which may undermine its retraction stigma-mitigating power because self-claimed honest error can be biased to the advantage of authors of retracted publications.

Honest error was more likely than blatant misconduct, inappropriate conduct, and questionable conduct to lead to offering correction and remediation through authors' self-report and rectification of retraction-engendering problems. Honest error was also more likely than blatant misconduct and questionable conduct to be associated with offering correction and remediation through authors' request for or performance of retraction. The explanation for these findings lies in the fact that honest error is perceived and handled relatively positively in the scientific community. The US Office of Research Integrity emphasizes that misconduct is committed "intentionally, or knowingly, or recklessly" (OSTP, 2000, p. 76261), and intent is adopted as the first-listed determining factor in international research integrity codes, such as the Singapore Statement on Research Integrity (Resnik & Shamoo, 2011). More specific to retraction, the first version of COPE retraction guidelines recommended distinguishing honest error from misconduct (Wager et al., 2009). Differentiating honest error from other types of retraction reason is advocated by many scholars who maintain that making such differentiation can encourage heroic retraction and proactive correction to the literature (Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). Accordingly, unintentionality has been adopted as one of the

criteria for severity-based assessment of research misconduct (Hall & Martin, 2019; Keränen, 2006; Yeo-Teh & Tang, 2022) and severity-based classification of retraction reasons (Xu & Hu, in press). Given the popular tolerance for it in the scientific community, unintentionality can not only minimize blame and sanctions on retraction-engendering acts (Hall & Martin, 2019) but also help repair tarnished image (Benoit, 2015). For these benefits, authors of retracted publications would have been motivated more strongly by honest error than by severer retraction reasons to maximize the de-stigmatizing nature of offering correction and remediation.

Inappropriate conduct was more likely than honest error to be associated with the manipulation of responsibility assignment through authors' objection to retraction decisions, and questionable conduct was more likely than honest error to be associated with *decreasing mark visibility*. Given that both inappropriate conduct and questionable conduct are more serious than honest error, there would have been a more strongly felt need to manage retraction stigma through objecting to retraction decisions and reducing the visibility of stigma marks. Although it deviates from the widely accepted research and publication norms, neither inappropriate conduct nor questionable conduct necessarily leads to unreliable research data and/or findings (Xu & Hu, in press, p. 7). Since COPE retraction guidelines upheld research invalidity as a dominant criterion for retraction (Wager et al., 2009), it may be deemed justifiable to disagree to retraction decisions and decrease mark visibility on the grounds of inappropriate conduct and questionable conduct, respectively.

5.3 Grammatical Assignment of Agency/Responsibility for Retraction

This section consists of two parts. The first part presents the findings on the grammatical assignment of agency/responsibility in the retraction notices examined in the study. The second part discusses the reported findings.

5.3.1 Results

This section consists of three parts. The first part reports on descriptive findings on agent identification and agency/responsibility assignment. The second part presents the associations of the four contextual factors with agent identification and agency/responsibility assignment. The third part discusses the findings about agency/responsibility assignment.

5.3.1.1 Agent identification and agency/responsibility assignment

As indicated in Table 5.34, no retraction-engendering acts could be identified in 257 retraction notices in the dataset, as illustrated by Examples 1 and 2. A logistic regression was run to determine whether the four contextual factors were associated with the presence/absence of retraction-engendering acts. The test results showed that retraction period and retraction reason

were significant predictors. Specifically, as can be seen in Table 5.35, the retraction notices published between 2010 and 2019 were 2.39 times more likely than those published before 2010 to disclose retraction-engendering acts, and honest error was 4.39 times more likely than inappropriate conduct to be associated with disclosure of retraction-engendering acts.

Example 1

> This article has been retracted by the journal due to it being highly redundant in both data and text with another publication.[1] (RN-SCIE-4506)

Example 2

> Retraction: This article has been retracted by agreement between the journal editors and Wiley Periodicals, Inc. as the identity of the peer reviewers could subsequently not be verified. (RN-SCIE-2724)

Therefore, a dataset of 3,039 retraction notices was analyzed for grammatical assignment of agency/responsibility for retraction. As can be seen from Table 5.36, a total of 7,725 retraction-engendering acts committed by authors of retracted publications were reported, averaging 2.54 per retraction notice for the whole corpus and 1.14–3.14 instances across the ten sub-corpora. In the corpus, the most frequently used construction is Passive Voice + Agent, followed by Active Voice with an Agent Marker, Nominalization without an Agent Marker, and Agent + Active Voice whereas the least frequently used construction is Nominalization with an Agent Marker, followed by Active Agentless Construction and Passive Voice + Agent. Similar distributional patterns were identified in the ten sub-corpora.

As indicated in Table 5.37, agents of retraction-engendering acts were identified in slightly more than one-third of the retraction notices in the corpus, with an average of 1.44 instances of agent identification per retraction notice. By contrast, agents of retraction-engendering acts were obscured in slightly less than two-thirds of the corpus, with an average of 3.12 instances of agent obscuration per retraction notice. The average agency/responsibility score of the corpus was below 3.5 (i.e., the middle point of the 7-point scale). The pattern of greater agent obscuration than identification was observed in all the ten sub-corpora except the HE one, where agents were identified in more than three-fourth of the retraction notices. The average agency/responsibility scores ranged from 3.13 to 3.98 across nine of the ten sub-corpora, whereas it reached 5.27 for the HE sub-corpus. The agency/responsibility scores of 323, 88, and 147 retraction notices were 1 (Example 3), 3.5 (Example 4), and 7 (Example 5) out of 7 points, respectively.

Example 3

> This article is retracted as requested by the authors because of <u>copyright violation</u> [nominalization without an agent marker]. (RN-SCIE-5648)

Example 4

A large portion of the data and the text in this article was copied from another source [passive agentless construction] as disclosed by a knowledgeable informant and subsequently confirmed by the Editorial Office. Authors have failed to the editorial request for explanation why this had happened [active agentless ergative construction] before deadline. Therefore, the entire article has been retracted in accordance with this journal's policy and Editorial decision. (RN-SCIE-13038)

Example 5

The editors would like to confirm the retraction of this paper at the request of the authors. The corresponding author published the paper without the full consent or acknowledgement of all the researchers [agent + active voice] and would like to apologize for this error [agent + active voice]. (RN-SCIE-5479)

Table 5.34 Retraction-engendering acts across the sub-corpora (N = 3,296)

REA	Retraction period				Academic discipline				Retraction notice authorship				Retraction reason							
	RP1 (n = 408)		RP2 (n = 2,888)		HD (n = 3,159)		SD (n = 137)		JA (n = 2,884)		ARP (n = 412)		BM (n = 2,832)		IC (n = 236)		QC (n = 36)		HE (n = 192)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
No	59	14.46	198	6.86	245	7.76	12	8.76	229	7.94	28	6.80	199	7.03	47	19.92	1	2.78	10	5.21
Yes	349	85.54	2,690	93.14	2,914	92.24	125	91.24	2,655	92.06	384	93.20	2,633	92.97	189	80.08	35	97.22	182	94.79

Note. REA = retraction-engendering act; No = REA not identified; Yes = REA identified; RP1 = before 2010; RP2 = between 2010 and 2019; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publication; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

Table 5.35 Logistic regression results for obscuration of retraction-engendering acts (N = 3,296)

Predictor	*B*	SE	Wald	*p*	Odds ratio (OR)	95% CI for OR	
PR2 – PR1	0.870	0.164	5.295	< .001	2.386	1.729	3.292
HD – SD	0.201	0.314	0.642	.521	1.223	0.661	2.262
JA – RPA	-0.307	0.219	-1.401	.161	0.735	0.478	1.130
BM – HE	-0.297	0.340	-0.873	.382	0.743	0.382	1.447
IC – HE	-1.478	0.369	-4.001	< .001	0.228	0.111	0.470
QC – HE	0.542	1.069	0.507	.612	1.719	0.212	13.959

R^2 = .020 (Cox & Snell); R^2 = .047 (Nagelkerke) Model χ^2 = 66.511, p < .001

Table 5.36 Incidences of grammatical means for representing agency/responsibility (N = 3,039)

Grammatical means	Corpus (N = 3,039)		Retraction period				Academic discipline				Retraction notice authorship				Retraction reason							
			PR1 (n = 349)		PR2 (n = 2,690)		HD (n = 2,914)		SD (n = 125)		JA (n = 2,655)		ARP (n = 384)		BM (n = 2,633)		IC (n = 189)		QC (n = 35)		HE (n = 182)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Agent + Active Voice	1,109	14.36	201	24.51	908	13.15	1,060	14.28	49	16.17	781	11.94	328	27.66	856	12.73	79	20.26	19	47.5	155	27.10
Passive Voice + Agent	245	3.17	34	4.15	211	3.06	219	2.95	26	8.58	211	3.23	34	2.87	212	3.15	22	5.64	1	2.5	10	1.75
Nominalization with an Agent Marker	149	1.93	20	2.44	129	1.87	136	1.83	13	4.29	113	1.73	36	3.04	97	1.44	19	4.87	8	20	25	4.37
Passive Agentless Construction	2,260	29.26	194	23.66	2,066	29.92	2,214	29.83	46	15.18	1,931	29.53	329	27.74	2,005	29.82	130	33.33	4	10	121	21.15
Active Agentless Ergative Construction	244	3.16	30	3.66	214	3.10	243	3.27	1	0.33	185	2.83	59	4.97	214	3.18	7	1.79	0	0	23	4.02
Active Voice with an Inanimate Subject	2,145	27.77	197	24.02	1,948	28.21	2,056	27.70	89	29.37	1,986	30.37	159	13.41	2,002	29.78	71	18.21	3	7.5	69	12.06
Nominalization without an Agent Marker	1,573	20.36	144	17.56	1,429	20.70	1,494	20.13	79	26.07	1,332	20.37	241	20.32	1,337	19.89	62	15.90	5	12.5	169	29.55
Subtotal	7,725	100.00	820	100.00	6,905	100.00	7,422	100.00	303	100.00	6,539	100.00	1,186	100.00	6,723	100.00	390	100.00	40	100	572	100.00

Note. PR1 = before 2010; PR2 = between 2010 and 2019; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publications; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

Table 5.37 Incidences of agent identification (N = 3,039)

AI	Corpus (N = 3,039)		Retraction period				Academic discipline				Notice authorship				Retraction reason							
			PR1 (n = 349)		PR2 (n = 2,690)		HD (n = 2,914)		SD (n = 125)		JA (n = 2,655)		ARP (n = 384)		BM (n = 2,633)		IC (n = 189)		QC (n = 35)		HE (n = 182)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Yes	1044	34.35	152	43.55	892	33.16	984	33.77	60	48.00	811	30.55	233	60.68	832	31.60	77	40.74	27	77.14	108	59.34
No	1995	65.65	197	56.45	1798	66.84	1930	66.23	65	52.00	1844	69.45	151	39.32	1801	68.40	112	59.26	8	22.86	74	40.66

Note. AI = agent identification; Yes = agent identified; No = agent obscured

5.3.1.2 Variations in agent identification

Since the outcome variable is a dichotomous one (i.e., presence vs. absence), a simple logistic regression was run to determine whether there were significant associations between agent identification and the four contextual factors, namely retraction period (i.e., before 2010 [RP1] vs. 2010–2019 [RP2]), academic discipline (i.e., hard disciplines [HD] vs. soft disciplines [SD]), retraction notice authorship (i.e., journal authorities [JA] vs. authors of retracted publications [ARP]), and retraction reason severity (i.e., blatant misconduct [BM] vs. inappropriate conduct [IC] vs. questionable conduct [QC] vs. honest error [HE]). The analysis found that the four contextual factors collectively predicted the outcome variable, accounting for 6.7% (Cox & Snell R^2) or 9.3% (Nagelkerke R^2) of its variance. As summarized in Table 5.38, the retraction notices published before 2010 were 1.34 times more likely than those published between 2010 and 2019 to identify agents of retraction-engendering acts. The retraction notices in soft disciplines were 2.18 times more likely than those in hard disciplines did to identify agents of retraction-engendering acts. The retraction notices written by authors of retracted publications were 3.23 times more likely than those produced by journal authorities to identify agents of retraction-engendering acts. Honest error was 2.25 times more likely than blatant misconduct to have agents of retraction-engendering acts identified, whereas questionable conduct was 3.84 times more likely than honest error to have the agents identified.

Table 5.38 Logistic regression results for agent identification (N = 3,039)

Predictor	*B*	SE	Wald	*p*	Odds ratio (OR)	95% CI for OR	
RP2 – RP1	-0.293	0.122	-2.401	.016	0.746	0.587	0.948
HD – SD	-0.781	0.186	-4.197	< .001	0.458	0.318	0.659
JA – ARP	-1.171	0.117	-9.978	< .001	0.310	0.246	0.390
BM – HE	-0.809	0.165	-4.893	< .001	0.445	0.322	0.616
IC – HE	-0.376	0.220	-1.705	.088	0.687	0.446	1.058
QC – HE	1.346	0.436	3.089	.002	3.841	1.635	9.021

R^2 = .067 (Cox & Snell); R^2 = .093 (Nagelkerke); Model χ^2 = 212.137, p < .001

5.3.1.3 Variations in agency/responsibility assignment

Given that grammatical assignment of agency/responsibility was measured as a continuous variable, a multiple linear regression test was run to determine whether the four contextual factors were significantly associated with this outcome variable. Following Field's (2009) suggestion, all the four predictors were entered simultaneously to build a model since no theoretically motivated predications about the relative importance of the variables concerned and their order of effects were expected. Dummy coding was adopted for the variable with

more than two levels, namely retraction reason, which had four levels. The retraction notices published before 2010, the retraction notices in soft disciplines, the retraction notices produced by authors of retracted publications, and honest error were adopted as the baseline in the comparisons by retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively.

The test results indicated that the four contextual factors collectively predicted the grammatical assignment of agency/responsibility in the retraction notices, $F(6, 3032) = 36.75$, $p < .001$, $R^2 = .07$. As can be seen in Table 5.39, the retraction notices published before 2010 ($M = 3.57$, $SD = 1.74$) had significantly higher agency/responsibility scores than those published between 2010 and 2019 did ($M = 3.19$, $SD = 1.50$). The retraction notices written by authors of retracted publications ($M = 3.98$, $SD = 1.66$) had significantly higher agency/responsibility scores than those penned by journal authorities did ($M = 3.13$, $SD = 1.49$). Honest error ($M = 3.63$, $SD = 1.79$) had significantly lower agency/responsibility scores than inappropriate conduct ($M = 3.73$, $SD = 1.61$) and questionable conduct ($M = 5.27$, $SD = 2.13$).

Table 5.39 Multiple regression results for agency/responsibility scores ($N = 3.039$)

Model	*B*	error	*β*	*t*	*p*	95% CI for *B*	
Constant	4.364	0.191		22.901	< .001	3.990	4.737
PR2 – PR1	-0.265	0.086	-0.173	-3.101	.002	-0.433	-0.098
HD – SD	-0.049	0.136	-0.032	-0.359	.720	-0.316	0.218
JA – ARP	-0.808	0.084	-0.526	-9.584	< .001	-0.973	-0.643
BM – HE	-0.210	0.117	-0.137	-1.802	.072	-0.440	0.019
IC – HE	0.374	0.157	0.243	2.385	.017	0.066	0.681
QC – HE	1.979	0.276	1.289	7.170	< .001	1.438	2.520

5.3.1.4 Summary of research findings

This section summarizes the 11 significant associations reported in the preceding three sections. They are presented together in Table 5.40 to facilitate the discussion in the following section.

Table 5.40 Summary of the findings on retraction-engendering act (REA) disclosure, agent identification, and agency/responsibility scores

	RP2–RP1	HD–SD	JA–ARP	BM–HE	IC–HE	QC–HE
Disclosure of REAs	+				–	
Agent identification	–	–	–	–		–
Agency/responsibility score	–		–		+	+

5.3.2 Discussion

This section starts by discussing the salient characteristics of agent identification and agency/responsibility assignment in the corpus before it zooms in on why agent identification

and agency/responsibility assignment varied by the four contextual factors, namely retraction period, academic discipline, retraction notice authorship, and retraction reason.

5.3.2.1 Visibility of agents and their agency/responsibility

No retraction-engendering acts could be identified in 7.80% (n = 257) of the 3,296 retraction notices in the primary dataset. The lack of representation of retraction-engendering acts can be explained by two factors. First, 13.6% (n = 35) of those 257 retraction notices included direct quotations from entities other than retraction notice authors, whose representation of retraction-engendering acts was excluded from analysis to ensure unbiased authorship-based comparisons of retraction notices. Second, it is technically possible to disclose retraction reasons without representing retraction-engendering acts, as illustrated by Examples 1and 2 in Section 5.3.1, which serves as a strategy for mitigating retraction stigma (Xu & Hu, 2022b).

Consistent with Hu and Xu's (2020) investigation, the four agent-obscuring grammatical means were used more often than the three agent-identifying ones in both raw and unique frequencies, and the average agency/responsibility score of the corpus was below the middle point of the 7-point scale. Taken together, the findings revealed that various grammatical means were deployed strategically in the retraction notices to mitigate rather than reinforce retraction stigma. Therefore, these findings support the point that retraction notice authors can manipulate the stigmatizing force of retraction notices through non-representation of retraction-engendering acts or selective deployment of various grammatical means for assigning responsibility, as demonstrated by Examples 1–5 in Section 5.3.1.

5.3.2.2 Diachronic differences

The retraction notices published between 2010 and 2019 were more likely than those published before 2010 to disclose retraction-engendering acts. This diachronic difference can be explained by COPE's proposal for and the scientific community's call for increasing transparency about retraction reasons. Differently, the retraction notices published before 2010 identified agents of retraction-engendering acts more often and more clearly than those published between 2010 and 2019 did. This diachronic difference can be ascribed to COPE's insistence on the non-retaliatory nature of retraction; that is, retraction is intended to correct the literature rather than penalize misbehaving researchers (COPE Council, 2019; Wager et al., 2009). Although the first version of COPE retraction guidelines emphasizes the necessity and importance of being transparent about retraction reasons, it does not recommend that authors accountable for retraction should be identified in retraction notices. COPE's tacit permission

to obscure agents of retraction-engendering acts appears to be echoed by Retraction Watch, whose proposal for what information an ideal retraction notice should communicate does not include identification of accountable authors (Oransky, 2015). Taken together, the accumulative number of COPE member journals and publishers and the increasing reach and influence of Retraction Watch (Xu & Hu, 2022a) very likely have led to the observed diachronic decrease in the identification of accountable authors and the assignment of agency/responsibility to them. Apart from the aforementioned lack of institutional support for agent identification, individual scholars' increasing consensus on the need to forge a shaming-free environment for more effective handling of retraction (Barbour et al., 2017; Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Fanelli, 2016; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b) may also have contributed to the diachronic decrease in agent identification and agency/responsibility assignment. The diachronic difference can also be attributed to the growing association between retraction and stigma over time, which could lead to an increasingly perceived need for retraction notice authors (especially authors of retracted publications) to manage retraction stigma.

5.3.2.3 Cross-disciplinary differences

Although the retraction notices in soft disciplines were more likely than those in hard disciplines to identify authors accountable for retraction, hard and soft disciplines didn't differ in their agency/responsibility scores (hence degree of stigmatization). In comparison with hard disciplines, soft disciplines' less frequent encounter with retractions (Halevi, 2020; Shuai et al., 2017; van Leeuwen & Luwel, 2014; Xu & Hu, in press; Zhang & Grieneisen, 2013) and more frequent institutional investigations (Hu & Xu, 2020), together with the involvement of repeat offenders in high-profile cases of retraction in soft disciplines (Hu & Xu, 2020; Xu & Hu, 2018), may have rendered soft disciplines more reactive to retractions and thus led them to take a harder approach to handling retractions by identifying agents of retraction-engendering acts. It is not surprising that the retraction notices in soft disciplines were not significantly more stigmatizing than those in hard disciplines were because COPE's (COPE Council, 2019; Wager et al., 2009) and Retraction Watch's (Oransky, 2015) discouragement of agent identification and the scientific community's call for de-stigmatization of retraction (Barbour et al., 2017; Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Fanelli, 2016; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b) are not discipline-specific but applicable to both hard and soft disciplines. The identified cross-disciplinary inconsistencies between results concerning agent identification and those concerning agency/responsibility assignment can be explained by the

difference in the frequencies of grammatical structures with lower and higher agent/responsibility scores. More than two-thirds of the retraction-engendering acts were represented with grammatical structures with lower agency/responsibility scores (no more than 4 out of 7). By contrast, a much smaller proportion of retraction-engendering acts were communicated through grammatical structures with higher agency/responsibility scores (at least 5 out of 7), which was not enough to sway the agency/responsibility scores for disciplines. The two findings, taken together, point to the need to use both measures (i.e., agent identification and agency/responsibility score) to capture a more nuanced picture of how retraction stigma is constructed and managed in retraction notices.

5.3.2.4 Authorship-based differences

The retraction notices written by authors of retracted publications identified agents of retraction-engendering acts more often than those authored by journal authorities did, and the former significantly outnumbered the latter in agency/responsibility scores. Three author-related factors may have contributed to the more frequent agent identification and higher agency/responsibility assignment scores. First, due to their proximity and familiarity with each other, authors of retracted publications could easily access original research data, retrieve the record of research processes, and reach out to accountable co-authors to confirm retraction-engendering allegations. Second, when issuing retraction notices, innocent authors of retracted publications may prioritize their need to avoid falling prey to courtesy retraction stigma and thus had to dissociate from their accountable co-authors by identifying them in retraction notices (Hu & Xu, 2020; Xu & Hu, 2022b). This speculation is supported by Benoit's (2015, p. 22) argument that "it seems reasonable to assume that a person's reputation will suffer in proportion to the extent to which they are personally or individually responsible for the undesirable action." Third, when penning retraction notices, accountable authors of retracted publications may elect to identify themselves as accountable for retraction-engendering acts and self-assign agency/responsibility "either because they anticipated more serious consequences of denying their responsibility or because they were remorseful and wanted to repair their tarnished image by adopting an ethical response" (Hu & Xu, 2020, p. 9). Additionally, to repair impaired collegiality with research team members and maintain in-group solidarity for future collaboration, accountable authors may voluntarily exonerate their innocent co-authors through self-identification as agents of retraction-engendering acts and unreservedly self-assign agency/responsibility (Xu & Hu, under review).

The identified authorship-based differences can be plausibly explained by three factors on the part of journal authorities, as summarized by Hu and Xu (2020). First, since journal authorities were not accountable for any retraction examined in this study, they did not need to "distance themselves by explicitly identifying the offenders" (p. 10). Second, even if journal authorities may want to deter potential offenders through agent identification and agency/responsibility assignment, their attempt may be hindered by authors' (and sometimes their institutions') lack of cooperation in pre-retraction investigations or their lack of "legal powers to seize or peruse lab notes or any other raw data that is not voluntarily submitted by the authors" (Williams & Wager, 2013, p. 8), consequently putting journal authorities at the risk of being litigated by identified accountable authors especially when in lack of hard evidence. Third, journal authorities may follow the COPE retraction guideline that retraction should not punish misbehaving researchers but focus on correcting the literature and ensuring its integrity (COPE Council, 2019; Wager et al., 2009). Moreover, the increasing call for creating a shaming-free environment for more effective handling of retraction (e.g., Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b) may have further encouraged journal authorities' prioritization of correcting the literature over punishing accountable authors.

5.3.2.5 Retraction reason-based differences

In light of attribution theory (Corrigan et al., 2003; Weiner, 1986, 1995; Weiner et al., 1988), which posits that negative reactions to individuals are positively correlated with their personal accountability for their own conditions, it was hypothesized that agent identification and agency/responsibility assignment would be positively correlated with the severity of retraction reasons. This hypothesis was further motivated by the call for differentiated sanctions on retraction-engendering behaviors (Ben-Yehuda & Oliver-Lumerman, 2017; Hall & Martin, 2019; Keränen, 2006; Xu & Hu, in press; Yeo-Teh & Tang, 2022). The hypothesis was not confirmed in this study because retraction reason severity was negatively correlated with both agent identification and agency/responsibility assignment. Furthermore, honest error was more likely than inappropriate conduct to be associated with disclosure of retraction-engendering acts. These findings can be explained by the de-stigmatizing nature of honest error. The severer a retraction-engendering act is, the more image-damaging it is, and consequently, a greater need to obscure/lower visibility of the agent. Since less serious retraction-engendering acts (e.g., honest error) have less negative impact on accountable authors, identifying agents of less serious retraction-engendering acts and assigning responsibility rigorously to them do not

tarnish their reputation as badly as more serious retraction-engendering acts do but may bring along benefits. That is, being transparent about agents of less serious retraction-engendering acts and appearing harsh in assigning responsibility can showcase retraction notice authors' determination to assume responsibility for effective handling of retraction, which can be perceived positively by the scientific community and thus can help repair guilty authors' tarnished image and mitigate, if not avoid, courtesy retraction stigma that may be felt by journal authorities and innocent authors. The unexpected finding can also be explained by the prerequisite for the disproven hypothesis. That is, retraction stigma was weaponized to punish misbehaving researchers to deter potential offence (Xu & Hu, 2022b). However, this prerequisite went against the COPE's advocacy of non-retaliatory and punishment-free retraction (COPE Council, 2019; Wager et al., 2009), which appear to have been followed by many COPE member journals and publishers and supported by more and more scholars calling for a shaming-free environment for more effective handling of retraction (e.g., Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). Therefore, to mitigate the stigmatizing nature of more serious retraction reasons, agents of retraction-engendering acts should be identified less often, and agency/responsibility for retraction should be assigned to them less explicitly.

5.4 Explicit Attitudinal Evaluation of Retraction

This section starts with a presentation of the findings on explicit attitudinal evaluation of retraction in the 957 retraction notices investigated in this study, followed by a discussion on the reported significant findings.

5.4.1 Results

This section reports on the descriptive statistics regarding explicit attitudinal evaluation of retraction, followed by a detailed presentation of inferential statistics concerning the four contextual factors, namely retraction period, academic discipline, retraction notice authorship, and retraction reason.

5.4.1.1 Explicit attitudinal evaluation of retraction in the corpus

Explicit attitudinal evaluation of retraction was not found in 72 of the 957 retraction notices in the corpus. Presented in Table 5.41 are the distributions of the 72 retraction notices across the 10 sub-corpora. A logistic regression was run to determine whether the presence/absence of explicit attitudinal evaluation of retraction in the retraction notices were systematically related to the four contextual factors. The results of the logistic regression indicated that three of the

Table 5.41 Explicit attitudinal evaluation of retraction across the sub-corpora ($N = 957$)

EAE	Retraction period				Academic discipline				Retraction notice authorship				Retraction reason							
	RP1 ($n = 210$)		RP2 ($n = 747$)		HD ($n = 820$)		SD ($n = 137$)		JA ($n = 545$)		ARP ($n = 412$)		BM ($n = 726$)		IC ($n = 62$)		QC ($n = 4$)		HE ($n = 165$)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
No	21	10.00	51	6.83	56	6.83	16	11.68	59	10.83	13	3.16	62	8.54	3	4.84	2	50	5	3.03
Yes	189	90.00	696	93.17	764	93.17	121	88.32	486	89.17	399	96.84	664	91.46	59	95.16	2	50	160	96.97

Note. EAE = explicit attitudinal evaluation; RP1 = before 2010; RP2 = between 2010 and 2019; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publication; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

Table 5.42 Logistic regression results for presence of attitudinal evaluation ($N = 957$)

Predictor	*B*	SE	Wald	*p*	Odds ratio (OR)	95% CI for OR	
PR2 – PR1	0.658	0.289	2.273	.023	1.931	1.095	3.404
HD – SD	0.203	0.322	0.630	.529	1.224	0.652	2.300
JA – RPA	-1.328	0.329	-4.033	< .001	0.265	0.139	0.505
BM – HE	-1.022	0.478	-2.140	.032	0.360	0.141	0.918
IC – HE	-0.244	0.758	-0.322	.748	0.784	0.177	3.462
QC – HE	-3.862	1.157	-3.337	< .001	0.021	0.002	0.203

$R^2 = .041$ (Cox & Snell); $R^2 = .098$ (Nagelkerke) Model $\chi^2 = 39.668$, $p < .00$

four factors (i.e., retraction period, retraction notice authorship, and retraction reason) significantly predicted the presence/absence of explicit attitudinal evaluation. As can be seen in Table 5.42, the retraction notices published between 2010 and 2019 were 1.93 times more likely than those published before 2010 to inscribe explicit attitudinal evaluation, and the retraction notices produced by authors of retracted publications were 3.77 time more likely than those issued by journal authorities to do so. Honest error was 2.78 and 47.62 times more likely than blatant misconduct and questionable conduct to evoke explicit attitudinal evaluation, respectively.

Given the scope of the study, the 72 retraction notices, in which no explicit attitudinal evaluation was identified, were excluded from further analysis. In the remaining 885 retraction notices, 4,969 instances of explicit attitudinal evaluation were identified, with an average of 5.61 instances per retraction notice. To control for the varying lengths of retraction notices, the instances of explicit attitudinal evaluation identified in the corpus were normalized by 1,000 words, with an average of 41.486 instances of explicit attitudinal evaluation per 1,000 words. Both positive and negative realizations of all the 12 sub-categories of attitude, except positive normality, negative tenacity, and positive reaction, were identified in the corpus.

A paired samples T-test was run to find out whether positive explicit attitudinal evaluation significantly differed from negative explicit attitudinal evaluation. The test results indicated that negative evaluation (M = 32.359, SD = 21.588) was communicated significantly more often than positive evaluation (M = 9.126, SD = 10.434) was, $t(884) = 30.640$, $p < .001$, Cohen's d = 1.030 (95% CI: 0.948–1.111). A repeated measures ANOVA was performed to identify significant differences among the three categories of explicit attitudinal evaluation (i.e., Affect, Judgement, and Appreciation). As can be seen in Table 5.43, Affect (M = 20.186, SD = 15.385) was communicated significantly more often than Appreciation (M = 12.061, SD = 11.906), and Appreciation was conveyed significantly more often than Judgement (M = 9.239, SD = 11.066) was, $F(2, 1768) = 199.064$, $p < .001$, $\eta^2_p = 0.184$.

Table 5.43 Repeated measures ANOVA results for normalized frequencies of explicit Affect, Judgement, and Appreciation (N = 885)

	MD	*SE*	*df*	*t*	$P_{Bonferroni}$
Affect vs. Judgement	10.947	0.567	884	19.317	< .001
Affect vs. Appreciation	8.125	0.582	884	13.951	< .001
Judgement vs. Appreciation	-2.822	0.560	884	-5.042	< .001

In each of the following three sections, a series of multiple linear regression analyses were conducted to see whether the four contextual factors (i.e., retraction period, academic

discipline, retraction notice authorship, and retraction reason) were significantly associated with the communication of positive and negative explicit attitudinal evaluation, except positive normality, negative tenacity, and positive reaction, which were not identified in the corpus. All the four contextual factors were entered simultaneously into the regressions as predictor variables due to the lack of theoretically motivated predications about their relative importance and their order of effects. Following Field's (2009) suggestion, dummy coding was adopted in all the regression tests involving the predictor variable of retraction reason because it had more than two levels. Specifically, the retraction notices published before 2010, those in soft disciplines, those issued by authors of retracted publications, and honest error were adopted as the baseline in the comparisons by retraction period, academic discipline, retraction notice authorship, and retraction reason, respectively.

5.4.1.2 Variations in Affect and its four sub-categories

The multiple regression model significantly predicted the communication of Affect in the retraction notices, $F(6, 878) = 24.142$, $p < .001$, $R^2 = .142$. As can be seen in Table 5.44, the retraction notices in hard disciplines ($M = 21.548$, $SD = 15.565$) were more likely than those in soft disciplines ($M = 11.589$, $SD = 10.814$) to convey Affect, so were the retraction notices written by authors of retracted publication ($M = 25.643$, $SD = 15.125$) when compared with those penned by journal authorities ($M = 15.706$, $SD = 14.109$). Honest error ($M = 25.702$, $SD = 14.420$) was more likely than blatant misconduct ($M = 18.738$, $SD = 14.833$) to invoke the communication of Affect.

Table 5.44 Multiple regression results for Affect ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	25.393	2.288	11.101	< .001		20.903	29.883
RP2 – RP1	0.133	1.204	0.111	.912	0.009	-2.229	2..496
HD – SD	4.996	1.508	3.313	<.001	0.325	2.036	7.956
JA – ARP	-8.579	1.033	-8.307	< .001	-0.558	-10.606	6.552
BM – HE	-6.211	1.265	-4.909	< .001	-0.404	-8.694	-3.727
IC – HE	-3.851	2.207	-1.744	.081	-0.250	-8.138	0.482
QC – HE	1.212	10.193	0.119	.905	0.079	-18.794	21.217

Note. RP2 = between 2010 and 2019; RP1 = before 2010; HD = hard disciplines; SD = soft disciplines; JA = journal authorities; ARP = authors of retracted publication; BM = blatant misconduct; IC = inappropriate conduct; QC = questionable conduct; HE = honest error

The multiple regression model significantly predicted the communication of positive Affect in the retraction notices, $F(6, 878) = 34.841$, $p < .001$, $R^2 = .192$. As indicated in Table 5.45, the retraction notices in hard disciplines ($M = 7.894$, $SD = 9.427$) were more likely than

those in soft disciplines (M = 2.159, SD = 4.755) to communicate positive Affect, so were the retraction notices written by authors of retracted publication (M = 9.137, SD = 9.399) in comparison with those authored by journal authorities (M = 5.446, SD = 8.593). Honest error (M = 13.945, SD = 9.490) was more likely than blatant misconduct (M = 5.225, SD = 7.738) and inappropriate conduct (M = 9.450, SD = 12.442) to invoke the communication of positive Affect.

Table 5.45 Multiple regression results for positive Affect (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	12.853	1.319	9.743	< .001		10.264	15.442
RP2 – RP1	-0.905	0.694	-1.304	.193	-0.099	-2.267	0.458
HD – SD	3.391	0.870	3.899	< .001	0.371	1.684	5.098
JA – ARP	-2.587	0.596	-4.343	< .001	-0.283	-3.756	-1.418
BM – HE	-8.328	0.730	-11.412	< .001	-0.910	-9.760	-6.895
IC – HE	-4.411	1.273	-3.465	< .001	-0.482	-6.910	-1.913
QC – HE	1.903	5.878	0.324	.746	0.208	-9.635	13.440

The multiple regression model significantly predicted the communication of negative Affect in the retraction notices, $F(6, 878) = 11.611$, $p < .001$, $R^2 = .074$. As shown in Table 5.46, the retraction notices produced by authors of retracted publication (M = 16.506, SD = 12.656) were more likely than those issued by journal authorities (M = 10.260, SD = 10.871) to convey negative Affect. Blatant misconduct (M = 13.513, SD = 12.492) was more likely than honest error (M = 11.757, SD = 10.090) to be associated with the communication of negative Affect.

Table 5.46 Multiple regression results for negative Affect (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	12.540	1.870	6.704	< .001		8.869	16.211
RP2 – RP1	1.038	0.984	1.055	.292	0.086	-0.894	2.970
HD – SD	1.605	1.233	1.302	.193	0.133	-0.815	4.026
JA – ARP	-5.992	0.844	-7.096	< .001	-0.495	-7.650	-4.335
BM – HE	2.117	1.035	2.046	.041	0.175	0.086	4.147
IC – HE	0.561	1.805	0.311	.756	0.046	-2.982	4.103
QC – HE	-0.691	8.335	-0.083	.934	-0.057	-17.049	15.667

The multiple regression model did not significantly predict the communication of happiness in the retraction notices, $F(6, 878) = 2.012$, $p = .062$, $R^2 = .014$. However, as summarized in Table 5.47, the retraction notices produced by authors of retracted publication

(M = 0.337, SD = 2.155) were more likely than those authored by journal authorities (M = 0.013, SD = 0.278) to express happiness.

Table 5.47 Multiple regression results for happiness (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.361	0.234	1.539	.124		-0.099	0.820
RP2 – RP1	0.042	0.123	0.337	.736	0.028	-0.200	0.283
HD – SD	0.021	0.154	0.138	.890	0.015	-0.282	0.324
JA – ARP	-0.321	0.106	-3.038	.002	-0.219	-0.529	-0.114
BM – HE	-0.081	0.130	-0.626	.531	-0.055	-0.335	0.173
IC – HE	-0.221	0.226	-0.978	.328	-0.150	-0.665	0.223
QC – HE	-0.423	1.044	-0.406	.685	-0.288	-2.472	1.625

The multiple regression model significantly predicted the communication of unhappiness in the retraction notices, $F(6, 878) = 33.581$, $p < .001$, $R^2 = .187$. As can be seen in Table 5.48, the retraction notices written by authors of retracted publication (M = 7.778, SD = 8.016) were more likely than those penned by journal authorities (M = 1.778, SD = 4.680) to convey unhappiness.

Table 5.48 Multiple regression results for unhappiness (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	7.870	1.022	7.700	< .001		5.864	9.876
RP2 – RP1	-1.031	0.538	-1.916	.056	-0.146	-2.086	0.025
HD – SD	0.807	0.674	1.197	.232	0.114	-0.516	2.129
JA – ARP	-5.731	0.461	-12.418	< .001	-0.811	-6.636	-4.825
BM – HE	-0.241	0.565	-0.426	.670	-0.034	-1.350	0.869
IC – HE	0.832	0.986	0.843	.399	0.118	-1.104	2.768
QC – HE	-0.400	4.554	-0.088	.930	-0.057	-9.339	8.539

The multiple regression model significantly predicted the communication of inclination in the retraction notices, $F(6, 878) = 54.179$, $p < .001$, $R^2 = .270$. As indicated in Table 5.49, the retraction notices published before 2010 (M = 6.385, SD = 8.669) were more likely than those published between 2010 and 2019 (M = 4.218, SD = 6.716) to communicate inclination, so were the retraction notices issued by authors of retracted publication (M = 6.595, SD = 7.734) compared with those produced by journal authorities (M = 3.110, SD = 6.375). Honest error (M = 11.324, SD = 8.462) was more likely than blatant misconduct (M = 2.898, SD = 5.535) and inappropriate conduct (M = 6.305, SD = 8.553) to be associated with the expression of inclination.

Table 5.49 Multiple regression results for inclination (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	12.961	0.991	13.080	< .001		11.016	14.906
RP2 – RP1	-1.581	0.521	-3.033	.002	-0.219	-2.605	-0.558
HD – SD	1.187	0.653	1.816	.070	0.164	-0.096	2.469
JA – ARP	-2.847	0.447	-6.365	< .001	-0.394	-3.726	-1.969
BM – HE	-8.206	0.548	-14.972	< .001	-1.135	-9.282	-7.130
IC – HE	-5.258	0.956	-5.499	< .001	-0.727	-7.135	-3.381
QC – HE	4.675	4.415	1.059	.290	0.647	-3.990	13.341

The multiple regression model did not significantly predict the presence of disinclination in the retraction notices, $F(6, 878) = 1.436$, $p = .198$, $R^2 = .010$. However, as shown in Table 5.50, the retraction notices written by authors of retracted publication (M = 3.011, SD = 5.217) were more likely than those authored by journal authorities (M = 2.223, SD = 4.511) to communicate disinclination.

Table 5.50 Multiple regression results for disinclination (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	3.686	0.775	4.754	< .001		2.164	5.208
RP2 – RP1	-0.122	0.408	-0.300	.765	-0.025	-0.923	0.678
HD – SD	-0.538	0.511	-1.053	.293	-0.111	-1.542	0.465
JA – ARP	-0.885	0.350	-2.529	.012	-0.182	-1.572	-0.198
BM – HE	-0.064	0.429	-0.150	.881	-0.013	-0.906	0.777
IC – HE	-0.329	0.748	-0.439	.661	-0.068	-1.797	1.140
QC – HE	4.221	3.455	1.222	.222	0.869	-2.560	11.002

The multiple regression model did not significantly predict the revelation of satisfaction in the retraction notices, $F(6, 878) = 1.902$, $p = .078$, $R^2 = .013$. However, as revealed in Table 5.51, the retraction notices published between 2010 and 2019 (M = 0.593, SD = 2.537) were more likely than those published before 2010 (M = 0.251, SD = 1.434) to reveal satisfaction, so were the retraction notices in hard disciplines (M = 0.589, SD = 2.493) in comparison with those in soft disciplines (M = 0.086, SD = 0.947).

Table 5.51 Multiple regression results for satisfaction (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *β*	
Constant	-0.243	0.374	-0.649	.516		0.978	0.492
RP2 – RP1	0.431	0.197	2.189	.029	0.184	0.045	0.818
HD – SD	0.600	0.247	2.431	.015	0.256	0.116	1.085
JA – ARP	0.094	0.169	0.558	.577	0.040	-0.237	0.426
BM – HE	-0.202	0.207	-0.975	.330	-0.086	-0.608	0.205
IC – HE	0.113	0.361	0.314	.754	0.048	-0.596	0.823
QC – HE	-0.788	1.669	-0.472	.637	-0.336	-4.063	2.487

The multiple regression model significantly predicted the communication of positive security in the retraction notices, $F(6, 878) = 2.306$, $p = .032$, $R^2 = .016$. As indicated in Table 5.52, the retraction notices in hard disciplines (M = 1.926, SD = 4.669) were more likely than those in soft disciplines (M = 0.642, SD = 2.064) to convey security.

Table 5.52 Multiple regression results for positive security (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	-0.226	0.705	-0.320	.749		-1.609	1.158
RP2 – RP1	0.204	0.371	0.550	.583	0.046	-0.524	0.932
HD – SD	1.583	0.465	3.406	< .001	0.358	0.671	2.495
JA – ARP	0.487	0.318	1.532	.126	0.110	-0.137	1.112
BM – HE	0.162	0.390	0.414	.679	0.036	-0.604	0.927
IC – HE	0.954	0.680	1.403	.161	0.216	-0.381	2.289
QC – HE	-1.561	3.141	-0.497	.619	-0.353	-7.725	4.603

The multiple regression model significantly predicted the disclosure of negative security in the retraction notices, $F(6, 878) = 5.399$, $p < .001$, $R^2 = .036$. As shown in Table 5.53, the retraction notices published between 2010 and 2019 (M = 4.538, SD = 6.604) were more likely than those published before 2010 (M = 2.850, SD = 6.005) to disclose negative security, so were the retraction notices penned by journal authorities (M = 4.586, SD = 7.009) compared with those written by authors of retracted publications (M = 3.681, SD = 5.826). Blatant misconduct (M = 4.718, SD = 6.951) was more likely than honest error (M = 2.786, SD = 4.775) to see the disclosure of negative security.

Table 5.53 Multiple regression results for negative security ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.229	1.027	0.223	.823		-1.786	2.244
RP2 – RP1	1.495	0.540	2.767	.006	0.229	0.434	2.555
HD – SD	0.927	0.677	1.369	.171	0.142	-0.402	2.255
JA – ARP	0.959	0.464	2.069	.039	0.147	0.049	1.869
BM – HE	1.966	0.568	3.462	< .001	0.302	0.851	3.080
IC – HE	-0.340	0.991	-0.343	.732	-0.052	-2.284	1.605
QC – HE	-2.651	4.575	-0.579	.562	-0.407	-11.630	6.328

5.4.1.3 Variations in Judgement and its five sub-categories

The multiple regression model significantly predicted the presence of Judgement in the retraction notices, $F(6, 878) = 2.369$, $p = .028$, $R^2 = .016$. As revealed in Table 5.54, the retraction notices produced by authors of retracted publications ($M = 10.672$, $SD = 10.246$) were more likely those issued by journal authorities ($M = 8.062$, $SD = 11.575$) to present Judgement.

Table 5.54 Multiple regression results for Judgement ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	10.600	1.762	6.017	< .001		7.142	14.058
RP2 – RP1	0.763	0.927	0.823	.411	0.069	-1.056	2.582
HD – SD	-0.185	1.162	-0.160	.873	-0.017	-2.465	2.094
JA – ARP	-2.713	0.795	-3.411	< .001	-0.245	-4.274	-1.152
BM – HE	-0.510	0.974	-0.524	.601	-0.046	-2.423	1.402
IC – HE	1.163	1.700	0.684	.494	0.105	-2.174	4.500
QC – HE	-2.557	7.850	-0.326	.745	-0.231	-17.964	12.851

The multiple regression model significantly predicted the communication of positive Judgement in the retraction notices, $F(6, 878) = 5.264$, $p < .001$, $R^2 = .035$. As indicated in Table 5.55, the retraction notices written by authors of retracted publications ($M = 0.843$, $SD = 2.633$) were more likely those penned by journal authorities ($M = 0.170$, $SD = 1.131$) to communicate positive Judgement.

Table 5.55 Multiple regression results for positive Judgement ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.440	0.313	1.407	.160		-0.174	1.054
RP2 – RP1	0.313	0.165	1.900	.058	0.158	-0.010	0.636
HD – SD	0.214	0.206	1.037	.300	0.108	-0.191	0.619
JA – ARP	-0.648	0.141	-4.590	< .001	-0.327	-0.925	-0.371
BM – HE	-0.036	0.173	-0.205	.837	-0.018	-0.375	0.304
IC – HE	-0.184	0.302	-0.610	.542	-0.093	-0.777	0.408
QC – HE	-0.967	1.394	-0.694	.488	-0.487	-3.702	1.769

The multiple regression model did not significantly predict the communication of negative Judgement in the retraction notices, $F(6, 878) = 1.437$, $p = .197$, $R^2 = .010$. However, as can be seen in Table 5.56, the retraction notices issued by authors of retracted publications ($M = 9.829$, $SD = 10.171$) were more likely than those produced by journal authorities ($M = 7.892$, $SD = 11.568$) to communicate negative Judgement.

Table 5.56 Multiple regression results for negative Judgement ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	10.160	1.756	5.785	< .001		6.713	13.606
RP2 – RP1	0.450	0.924	0.487	.626	0.041	-1.363	2.264
HD – SD	-0.399	1.158	-0.345	.730	-0.036	-2.672	1.873
JA – ARP	-2.065	0.793	-2.604	.009	-0.188	-3.621	-0.509
BM – HE	-0.475	0.971	-0.489	.625	-0.043	-2.381	1.432
IC – HE	1.347	1.695	0.795	.427	0.123	-1.979	4.674
QC – HE	-1.590	7.826	-0.203	.839	-0.145	-16.949	13.769

The multiple regression model did not significantly predict the communication of positive capacity in the retraction notices, $F(6, 878) = 1.977$, $p = .066$, $R^2 = .013$. However, as can be seen in Table 5.57, inappropriate conduct ($M = 0.203$, $SD = 1.559$) was more likely than honest error ($M = 0.022$, $SD = 0.199$) to invoke positive capacity.

Table 5.57 Multiple regression results for positive capacity ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	-0.062	0.075	-0.833	.405		-0.208	0.084
RP2 – RP1	0.057	0.039	1.464	.143	0.123	-0.020	0.134
HD – SD	0.039	0.049	0.797	.426	0.084	-0.057	0.136
JA – ARP	0.004	0.034	0.115	.909	0.008	-0.062	0.070
BM – HE	-0.010	0.041	-0.231	.818	-0.020	-0.090	0.071
IC – HE	0.199	0.072	2.766	.006	0.426	0.058	0.340
QC – HE	-0.034	0.332	-0.104	.917	-0.074	-0.686	0.617

The multiple regression model significantly predicted the communication of negative capacity in the retraction notices, $F(6, 878) = 18.258$, $p < .001$, $R^2 = .111$. As indicated in Table 5.58, the retraction notices issued by authors of retracted publications ($M = 4.200$, $SD = 7.093$) were more likely than those produced by journal authorities ($M = 2.240$, $SD = 5.505$) to convey negative capacity. Honest error ($M = 6.924$, $SD = 8.158$) was more likely than blatant misconduct ($M = 2.093$, $SD = 5.163$) and inappropriate conduct ($M = 4.234$, $SD = 8.313$) to invoke negative capacity.

Table 5.58 Multiple regression results for negative capacity ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	8.019	0.960	8.355	< .001		6.135	9.903
RP2 – RP1	-0.593	0.505	-1.173	.241	-0.093	-1.584	0.399
HD – SD	0.291	0.633	0.459	.646	0.046	-0.951	1.533
JA – ARP	-1.720	0.433	-3.969	< .001	-0.271	-2.570	-0.869
BM – HE	-4.737	0.531	-8.923	< .001	-0.747	-5.779	-3.695
IC – HE	-2.763	0.926	-2.984	.003	-0.436	-4.581	-0.946
QC – HE	0.904	4.277	0.211	.833	0.142	-7.490	9.297

The multiple regression model significantly predicted the communication of negative normality in the retraction notices, $F(6, 878) = 6.067$, $p < .001$, $R^2 = .040$. As shown in Table 5.59, the retraction notices written by authors of retracted publications ($M = 0.770$, $SD = 2.978$) were more likely than those penned by journal authorities ($M = 0.196$, $SD = 1.466$) to convey negative normality. Inappropriate conduct ($M = 1.675$, $SD = 5.503$) was more likely than honest error ($M = 0.236$, $SD = 1.048$) to invoke negative normality.

Table 5.59 Multiple regression results for negative normality ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.236	0.360	0.654	.513		-0.472	0.943
RP2 – RP1	0.291	0.190	1.533	.126	0.127	-0.082	0.663
HD – SD	0.078	0.238	0.330	.741	0.034	-0.388	0.545
JA – ARP	-0.589	0.163	-3.617	< .001	-0.257	-0.908	-0.269
BM – HE	0.192	0.199	0.963	.336	0.084	-0.199	0.583
IC – HE	1.548	0.348	4.451	< .001	0.675	0.865	2.231
QC – HE	-0.605	1.606	-0.377	.706	-0.264	-3.757	2.547

The multiple regression model did not significantly predict the presence of positive tenacity in the retraction notices, $F(6, 878) = 1.630$, $p = .136$, $R^2 = .011$. However, as can be seen in Table 5.60, the retraction notices published before 2010 ($M = 0.134$, $SD = 1.347$) were

more likely than those published between 2010 and 2019 (M = 0.000, SD = 0.000) to present positive tenacity.

Table 5.60 Multiple regression results for positive tenacity (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.152	0.099	1.526	.127		-0.043	0.347
RP2 – RP1	-0.136	0.052	-2.607	.009	-0.219	-0.239	-0.034
HD – SD	-0.014	0.066	-0.207	.836	-0.022	-0.142	0.115
JA – ARP	-0.058	0.045	-1.285	.199	-0.093	-0.146	0.030
BM – HE	0.040	0.055	0.726	.468	0.064	-0.068	0.148
IC – HE	-0.036	0.096	-0.375	.708	-0.058	-0.224	0.152
QC – HE	-0.002	0.443	-0.004	.997	-0.003	-0.872	0.868

The multiple regression model did not significantly predict the communication of positive veracity in the retraction notices, $F(6, 878) = 0.997$, $p = .426$, $R^2 = .007$. As indicated in Table 5.61, howeve3r, honest error (M = 0.021, SD = 0.267) was more likely than blatant misconduct (M = 0.000, SD = 0.000) to invoke positive veracity.

Table 5.61 Multiple regression results for positive veracity (N = 885)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.022	0.018	1.233	.218		-0.013	0.058
RP2 – RP1	0.006	0.010	0.577	.564	0.049	-0.013	0.024
HD – SD	-0.001	0.012	-0.104	.917	-0.011	-0.025	0.022
JA – ARP	-0.009	0.008	-1.065	.287	-0.077	-0.025	0.007
BM – HE	-0.021	0.010	-2.082	.038	-0.184	-0.041	-0.001
IC – HE	-0.019	0.018	-1.103	.270	-0.170	-0.054	0.015
QC – HE	-0.027	0.081	-0.329	.742	-0.235	-0.186	0.132

The multiple regression model significantly predicted the communication of negative veracity in the retraction notices, $F(6, 878) = 5.728$, $p < .001$, $R^2 = .038$. As revealed in Table 5.62, the retraction notices in soft disciplines (M = 0.989, SD = 2.462) were more likely than those in hard disciplines (M = 0.185, SD = 1.385) to convey negative veracity. Inappropriate conduct (M = 0.620, SD = 3.345) was more likely than honest error (M = 0.093, SD = 0.741) to invoke negative veracity.

Table 5.62 Multiple regression results for negative veracity ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.542	0.252	2.155	.031		0.049	1.036
RP2 – RP1	0.200	0.132	1.511	.131	0.125	-0.060	0.460
HD – SD	-0.707	0.166	-4.263	< .001	-0.443	-1.033	-0.382
JA – ARP	0.095	0.114	0.835	.404	0.059	-0.128	0.318
BM – HE	0.158	0.139	1.137	.256	0.099	-0.115	0.431
IC – HE	0.530	0.243	2.185	.029	0.332	0.054	1.007
QC – HE	-0.035	1.121	-0.031	.975	-0.022	-2.236	2.165

The multiple regression model significantly predicted the communication of positive propriety in the retraction notices, $F(6, 878) = 5.911$, $p < .001$, $R^2 = .039$. As can be seen in Table 5.63, the retraction notices published between 2010 and 2019 ($M = 0.487$, $SD = 1.972$) were more likely than those published before 2010 ($M = 0.157$, $SD = 0.947$) to convey positive propriety, so were the retraction notices produced by authors of retracted publication ($M = 0.746$, $SD = 2.418$) compared with those issued by journal authorities ($M = 0.145$, $SD = 0.995$).

Table 5.63 Multiple regression results for positive propriety ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.328	0.284	1.154	.249		-0.230	0.886
RP2 – RP1	0.386	0.150	2.582	.010	0.214	0.093	0.680
HD – SD	0.189	0.187	1.011	.312	0.105	-0.178	0.557
JA – ARP	-0.586	0.128	-4.562	< .001	-0.324	-0.838	-0.334
BM – HE	-0.045	0.157	-0.287	.774	-0.025	-0.354	0.264
IC – HE	-0.328	0.274	-1.194	.233	-0.181	-0.866	0.211
QC – HE	-0.904	1.267	-0.713	.476	-0.500	-3.390	1.583

The multiple regression model significantly predicted the communication of negative propriety, $F(6, 878) = 4.398$, $p < .001$, $R^2 = .029$. As indicated in Table 5.64, blatant misconduct ($M = 5.750$, $SD = 9.902$) was more likely than honest error ($M = 1.824$, $SD = 4.720$) to invoke negative propriety.

Table 5.64 Multiple regression results for negative propriety ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	1.362	1.453	0.938	.349		-1.490	4.214
RP2 – RP1	0.552	0.765	0.722	.470	0.060	-0.948	2.053
HD – SD	-0.061	0.958	-0.064	.949	-0.007	-1.941	1.819
JA – ARP	0.148	0.656	0.226	.821	0.016	-1.139	1.436
BM – HE	3.912	0.804	4.867	< .001	0.426	2.334	5.489
IC – HE	2.032	1.402	1.449	.148	0.221	-0.720	4.784
QC – HE	-1.853	6.474	-0.286	.775	-0.202	-14.854	10.854

5.4.1.4 Variations in Appreciation and its three sub-categories

The multiple regression model significantly predicted the communication of Appreciation, $F(6, 878) = 12.778$, $p < .001$, $R^2 = .080$. As can be seen in Table 5.65, the retraction notices penned by authors of retracted publications ($M = 15.194$, $SD = 12.900$) were more likely than those produced by journal authorities ($M = 9.489$, $SD = 10.349$) to convey Appreciation. Honest error ($M = 15.394$, $SD = 12.659$) was more likely than blatant misconduct ($M = 11.636$, $SD = 11.678$) and inappropriate conduct ($M = 7.970$, $SD = 10.481$) to be associated with communication of Appreciation.

Table 5.65 Multiple regression results for Appreciation ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	16.774	1.832	9.154	< .001		13.178	20.370
RP2 – RP1	0.859	0.964	0.891	.373	0.072	-1.033	2.571
HD – SD	0.853	1.208	0.706	.481	0.072	-1.518	3.224
JA – ARP	-5.514	0.827	-6.666	< .001	-0.463	-7.138	-3.891
BM – HE	-3.479	1.014	-3.432	< .001	-0.292	-5.468	-1.490
IC – HE	-6.908	1.768	-3.907	< .001	-0.580	-10.378	-3.438
QC – HE	-11.239	8.165	-1.377	.169	-0.944	-27.263	4.786

The multiple regression model significantly predicted the communication of positive Appreciation, $F(6, 878) = 2.424$, $p = .025$, $R^2 = .016$. As revealed in Table 5.66, the retraction notices written by authors of retracted publications ($M = 2.040$, $SD = 4.537$) were more likely than those authored by journal authorities ($M = 1.134$, $SD = 3.713$) to convey Appreciation.

Table 5.66 Multiple regression results for positive Appreciation ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	1.288	0.657	1.961	.050		-0.001	2.577
RP2 – RP1	-0.040	0.346	-0.117	.907	-0.010	-0.719	0.638
HD – SD	0.774	0.433	1.787	.074	0.188	-0.076	1.624
JA – ARP	-0.728	0.297	-2.456	.014	-0.176	-1.310	-0.146
BM – HE	0.043	0.363	0.118	.906	0.010	-0.670	0.756
IC – HE	-0.140	0.634	-0.220	.826	-0.034	-1.384	1.105
QC – HE	-2.021	2.927	-0.691	.490	-0.490	-7.766	3.723

The multiple regression model significantly predicted the communication of negative Appreciation, $F(6, 878) = 10.885$, $p < .001$, $R^2 = .069$. As shown in Table 5.67, the retraction notices produced by authors of retracted publications ($M = 13.153$, $SD = 12.473$) were more likely than those issued by journal authorities ($M = 8.355$, $SD = 9.697$) to convey negative Appreciation. Honest error ($M = 13.796$, $SD = 12.334$) was more likely than blatant misconduct ($M = 10.088$, $SD = 11.049$) and inappropriate conduct ($M = 6.581$, $SD = 8.869$) to invoke negative Appreciation.

Table 5.67 Multiple regression results for negative Appreciation ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	15.486	1.747	8.863	< .001		12.057	18.915
RP2 – RP1	0.899	0.919	0.978	.328	0.080	-0.905	2.704
HD – SD	0.079	1.152	0.068	.946	0.007	-2.182	2.339
JA – ARP	-4.786	0.789	-6.067	< .001	-0.424	-6.334	-3.238
BM – HE	-3.522	0.966	-3.644	< .001	-0.312	-5.419	-1.625
IC – HE	-6.768	1.686	-4.014	< .001	-0.600	-10.077	-3.459
QC – HE	-9.217	7.785	-1.184	.237	-0.817	-24.497	6.062

The multiple regression model did not significantly predict the communication of positive composition, $F(6, 878) = 1.313$, $p = .248$, $R^2 = .009$. As shown in Table 5.68, however, the retraction notices written by authors of retracted publications ($M = 0.123$, $SD = 1.026$) were more likely than those produced by journal authorities ($M = 0.002$, $SD = 0.040$) to convey positive composition.

Table 5.68 Multiple regression results for positive composition ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	0.070	0.111	0.629	.529		-0.147	0.286
RP2 – RP1	0.031	0.058	0.537	.592	0.045	-0.083	0.145
HD – SD	0.004	0.073	0.056	.956	0.006	-0.139	0.147
JA – ARP	-0.124	0.050	-2.482	.013	-0.179	-0.222	-0.026
BM – HE	0.038	0.061	0.620	.535	0.055	-0.082	0.158
IC – HE	-0.020	0.107	-0.189	.850	-0.029	-0.229	0.189
QC – HE	-0.105	0.492	-0.213	.832	-0.151	-1.071	0.862

The multiple regression model significantly predicted the communication of negative reaction, $F(6, 878) = 14.624$, $p < .001$, $R^2 = .091$. As can be seen in Table 5.69, the retraction notices issued by authors of retracted publications ($M = 3.555$, $SD = 5.571$) were more likely than those published by journal authorities ($M = 0.836$, $SD = 3.318$) to convey negative reaction.

Table 5.69 Multiple regression results for negative reaction ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	2.470	0.715	3.454	< .001		1.067	3.874
RP2 – RP1	0.479	0.376	1.273	.203	0.102	-0.260	1.218
HD – SD	0.687	0.472	1.456	.146	0.147	-0.239	1.612
JA – ARP	-2.573	0.323	-7.967	< .001	-0.550	-3.206	-1.939
BM – HE	-0.047	0.396	-0.118	.906	-0.010	-0.823	0.730
IC – HE	0.926	0.690	1.342	.180	0.198	-0.429	2.280
QC – HE	3.610	3.187	1.133	.258	0.773	-2.644	9.865

The multiple regression model did not significantly predict the communication of positive valuation, $F(6, 878) = 2.002$, $p = .063$, $R^2 = .013$. However, as revealed in Table 5.70, the retraction notices penned by authors of retracted publications ($M = 1.917$, $SD = 4.472$) were more likely than those authored by journal authorities ($M = 1.132$, $SD = 3.713$) to convey positive valuation.

Table 5.70 Multiple regression results for positive valuation ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	1.219	0.652	1.869	.062		-0.061	2.498
RP2 – RP1	-0.072	0.343	-0.209	.834	-0.018	-0.745	0.601
HD – SD	0.770	0.430	1.792	.074	0.188	-0.074	1.613
JA – ARP	-0.604	0.294	-2.054	.040	-0.148	-1.182	-0.027
BM – HE	0.005	0.361	0.014	.989	0.001	-0.702	0.713
IC – HE	-0.119	0.629	-0.190	.850	-0.029	-1.354	1.115
QC – HE	-1.917	2.904	-0.660	.509	-0.469	-7.617	3.783

The multiple regression model significantly predicted the communication of negative valuation, $F(6, 878) = 6.616$, $p < .001$, $R^2 = .043$. As shown in Table 5.71, the retraction notices penned by authors of retracted publications ($M = 8.987$, $SD = 10.536$) were more likely than those written by journal authorities ($M = 7.043$, $SD = 8.576$) to convey negative valuation. Honest error ($M = 10.952$, $SD = 10.990$) was more likely than blatant misconduct ($M = 7.581$, $SD = 9.134$) and inappropriate conduct ($M = 3.778$, $SD = 7.744$) to invoke negative valuation.

Table 5.71 Multiple regression results for negative valuation ($N = 885$)

Predictor	*B*	*SE*	*t*	*p*	*β*	95% CI for *B*	
Constant	12.298	1.500	8.201	< .001		9.355	15.241
RP2 – RP1	0.059	0.789	0.074	.941	0.006	-1.490	1.607
HD – SD	-0.382	0.989	-0.387	.699	-0.040	-2.323	1.558
JA – ARP	-1.999	0.677	-2.953	.003	-0.209	-3.328	-0.670
BM – HE	-3.326	0.829	-4.010	< .001	-0.348	-4.954	-1.698
IC – HE	-7.102	1.447	-4.907	< .001	-0.743	-9.942	-4.261
QC – HE	-11.974	6.682	-1.792	.073	-1.253	-25.089	1.141

5.4.1.5 Summary of research findings about explicit attitudinal evaluation

Table 5.72 summarizes the 54 significant associations identified and reported in the preceding four subsections to present a full picture of explicit attitudinal evaluation in the 957 retraction notices examined in relation to the four contextual factors. This is expected to facilitate the discussion of these findings in the following section.

Table 5.72 Summary of the findings on explicit attitudinal evaluation of retraction

Category	RP2 – RP1	HD – SD	JA – ARP	BM – HE	IC – HE	QC -HE
Presence/absence	+		–	–		–
Affect		+	–	–		
+ Affect		+	–	–	–	
– Affect			–	+		
+ un/happiness			–			
– un/happiness			–			
+ dis/inclination	–		–	–	–	
– dis/inclination			–			
+ dis/satisfaction	+	+				
+ in/security		+				
– in/security	+		+	+		
Judgement			–			
+ Judgement			–			
– Judgement			–			
+ capacity					+	
– capacity			–	–	–	
– normality			–		+	
+ tenacity	–					
– veracity		–			–	
+ propriety	+		–			
– propriety				+		
Appreciation			–	–	–	
+ Appreciation			–			
– Appreciation			–	–	–	
+ composition			–			
– reaction			–			
+ valuation			–			
– valuation			–	–	–	

5.4.2 Discussion

This section first discusses the (de-)stigmatizing nature of retraction notices, based on the findings about explicit attitudinal evaluation in the retraction notices. The discussion then unfolds into four sub-sections, focusing on the identified variations in attitudinal evaluation by retraction period, academic discipline, retraction notice authorship, and retraction reason separately.

5.4.2.1 Communication of explicit attitudinal evaluation in the corpus

Explicit attitudinal evaluation was identified in 92.48% (n = 885) of the 957 retraction notices investigated in this study. The pervasive employment of explicit attitudinal evaluation

resources indicates that retraction notices as a high-stakes academic genre (Xu & Hu, 2021) is characterized by a personalized use of explicit attitudinal evaluation resources. Explicit attitudinal evaluation personalises retraction notices to create a space for inter-personal communication between authors and readers of retraction notices, as illustrated by Example 1. By contrast, absence of attitudinal evaluation renders retraction notices impersonal, as can be seen in Example 2.

Example 1

> After careful (+) consideration, we (the authors) recognized that our paper contains many defects (–) both in English and content (such as use of the same picture and unclear description (–) in the Materials and Methods). Our co-first author was, unfortunately (–), an inexperienced author. Our English and writing skills were inadequate (–). There are some unintentional (+) errors (–) in the paper, and we had not addressed them fully (–). We assure (+) you that the results and the data are original (+), based on clinical findings, including the in vivo mouse model and in vitro cell experiment. We would like (+) to withdraw this paper in order to be responsible for the readers of the journal. All of the authors have agreed (–) to withdraw the paper. (RN-SCIE-12959)

Example 2

> The paper titled … published in Advances in High Energy Physics has been retracted by the authors as they did not have full permission to use the data to submit the manuscript. (RN-SCIE-2626)

The identification of both negative and positive explicit attitudinal evaluation shows that retraction notices are imbued with intentions and strategies to stigmatize or de-stigmatize retraction-engendering behaviors, as demonstrated by Example 1. The retraction notices in my corpus communicated negative explicit attitudinal evaluation more often than positive explicit attitudinal evaluation, suggesting that retraction notices tend to be more stigmatizing than de-stigmatizing. However, the leaning toward stigmatization in terms of attitudinal evaluation was somewhat counterbalanced by the proportion (7.52%) of retraction notices that did not convey attitudinal evaluation explicitly. These findings about the communication and polarization of the three categories of attitudinal evaluation indicate that evaluative language resources are utilized to manipulate retraction stigma communication, which confirms Xu and Hu's (2022b) hypothesis that use of linguistic resources may influence the stigmatizing force of retraction notices.

The subjects of Appreciation and Judgement were retracted publications and their authors' behaviors, respectively. Since retracted publications are inanimate products of authors' retraction-engendering misbehaviors, Appreciation is less directly finger-pointing at

(accountable) authors of retracted publications than Judgement is. In other words, Appreciation is less stigmatizing and more de-stigmatizing than Judgement is. Therefore, the finding that Appreciation was communicated more often than Judgement indicates that retraction notices tend to mitigate more than reinforce their stigmatizing force. Given that Affect refers to emotions triggered by the subjects of both Appreciation and Judgement, it was found, as expected, that Affect was communicated more frequently than both Judgement and Appreciation in the corpus of retraction notices. Taken together, the findings based on the normalized frequencies of the three categories of attitudinal evaluation and those on the polarization and absence of attitudinal evaluation in the corpus suggest that the stigmatizing force of retraction notices is multifaceted and can be manipulated through use of attitudinal evaluative resources in different ways.

5.4.2.2 Diachronic differences

The retraction notices published between 2010 and 2019 were more likely than those published before 2010 to communicate attitudinal evaluation of retraction explicitly, indicating a diachronic increase in the personal involvement of retraction notice authors in a high-stakes academic genre. The identified change over the two retraction periods can be attributed to the increasingly uncovered gravity of problematic research and publications, as indicated by the constant increase in the number of retractions (Retraction Watch, 2020) and the frequent occurrence of repeat offenders (Retraction Watch, n.d.-b). Retraction notice authors are expected to appear personal in retraction notices to showcase their care about handling retractions and literature correction because doing so can reflect on them positively. Furthermore, non-academic platforms' increasing negative coverage of the phenomenon of retraction and the severity of retractable publications (Didier & Guaspare-Cartron, 2018; Teixeira da Silva & Al-Khatib, 2019) may have propelled retraction notice authors to show more personal involvement in retraction notices to manipulate their perceived retraction stigma.

The retraction notices published between 2010 and 2019 conveyed satisfaction, positive propriety, and negative security more often than those published before 2010 did. Negative security was communicated to indicate certainty about problems with retracted publications, misbehaviors of their authors, and peril caused by the problems and misbehaviors, and to reveal uncertainty about merits of retracted publications and their authors. The observed increase in negative security can be attributed to the development of technologies that can be used to detect and confirm retraction-engendering problems, such as plagiarism (Lukashenko et al., 2007) and image manipulation (White, 2007). The increase in institutional investigations into

retraction-engendering allegations can be another factor that increased confidence in confirming retraction-engendering problems. Additionally, the call for commendable retraction (Fanelli et al., 2018; Vuong, 2019b) may have encouraged more self-reporting of retraction-engendering problems, which was communicated through negative security. The observed diachronic increase in satisfaction and positive propriety can be explained by the constant call for creating a stigma-free environment for correcting the literature (e.g., Baskin et al., 2017; Cagney et al., 2016; Enserink, 2017; Teixeira da Silva & Al-Khatib, 2019; Vuong, 2019b). Satisfaction and positive propriety were communicated to recognize the merits of retracted publications and their authors' behaviors, which can help de-stigmatize those held accountable for retraction and encourage future self-retraction. Converse to the finding discussed above, the retraction notices published before 2010 conveyed positive inclination and positive tenacity more often than those published between 2010 and 2019 did. Positive inclination was communicated to show an intent to retract a problematic publication, promise no re-occurrence of retraction-engendering problems, and correct the problems or re-submit corrected publications, to discloses unintentionality in making retraction-engendering mistakes, and to reveal dispute over allegations and retraction decisions. Positive tenacity was conveyed to authors' persistency in examining their alleged publications. The diachronic difference identified can be attributed to the lack of retraction guidelines before 2010. Given the unavailability of retraction guidelines before 2010, positive inclination and positive tenacity could be used to justify retraction decisions. In other words, only when authors of retracted publications were positively inclined or determined to retract their publications could alleged publications be retracted without a risk of journal authorities being litigated by authors of retracted publications.

5.4.2.3 Cross-disciplinary differences

The retraction notices in hard disciplines were more likely than those in soft disciplines to disclose positive Affect, namely satisfaction and security. Far more publications were retracted in hard disciplines than in soft disciplines, indicating that the issue of retractable publications was more serious in hard disciplines than in soft disciplines. Therefore, to mitigate retraction stigma for the purpose of enhancing literature correction, retraction notices in hard disciplines were more likely than those in soft disciplines to highlight positive aspects, if any, in retracted publications and their authors by communicating satisfaction and security, as illustrated in the following two excerpts.

Example 3

> The editors applaud [+ satisfaction] the authors for the honest and transparent fashion in which they brought this matter to our attention. (RN-SCIE-1062)

Example 4

> The committee concluded [+ security] and confirmed [+ security] that all authors exercised appropriate responsibility and integrity in ensuring the validity of the data. (RN-SCIE-9893)

Notably, the retraction notices in soft disciplines communicated negative veracity more often than those in hard disciplines did. Negative veracity was communicated to expose authors' untruthful presentation of their research data and information needed for peer review. Since there were far fewer retractions and more frequent occurrences of repeat offences (i.e., multiple retractions by the same offenders) in soft disciplines than in hard disciplines, retractions were more likely to trigger stronger reactions in soft disciplines than in hard disciplines (Hu & Xu, 2020; Xu & Hu, 2021), which can explain why the retraction notices in soft disciplines were more likely than those in hard disciplines to convey negative veracity, as demonstrated in the following excerpt.

Example 5

> Apologies are offered to the reviewers whose identities were assumed and to the readers of the journal that this deception [- veracity] was not detected during the submission process. (RN-SSCI-0206)

5.4.2.4 Authorship-based differences

Authors of retracted publications conveyed explicit attitudinal evaluation at the aggregate levels of Affect, Judgement and Appreciation and those of positive and negative evaluation more often than journal authorities did, indicating that the former tended to appear more personally involved in retraction notices than the latter did. The identified variations in personal involvement of retraction notice authors can be explained by the differences in retraction notice authors' accountability for retraction and their prioritized purposes for issuing retraction notices. Not accountable for any retraction in this study, journal authorities were supposed to play the role of gatekeepers of research and publication norms, whose top priority was to correct the literature (Hu & Xu, 2020; Xu & Hu, 2021), and it would be better for them to put on a poker face to perform the role. If journal authorities convey positive attitudinal evaluation too often, it would undermine the justifiability of their retraction decisions and impair their image as stern gatekeepers of scientific integrity. If journal authorities communicate negative attitudinal evaluation too frequently, it might lead to two adverse consequences. First, journal authorities may end up being litigated by authors of retracted publications, handling of which would take up extra academic resources of journals and publishers. Second, too frequent

communication of negative attitudinal evaluation would discourage self-retraction and consequently impede effective and efficient literature correction. Different from journal authorities, authors of retracted publications were accountable for all the retractions examined in this study and thus are expected to have prioritized their need to repair their tarnished image (Hu & Xu, 2020; Xu & Hu, 2021). Such a need can be fulfilled to a certain extent, if not fully, by communicating both positive and negative attitudinal evaluation, as analyzed in detail below.

Positive explicit attitudinal evaluation of retraction reflects positively on retracted publications and their authors, and the de-stigmatizing nature of positive explicit attitudinal evaluation serves the interest of authors of retracted publications. Therefore, it does not go against our expectation that authors of retracted publications were more likely than journal authorities to communicate two sub-categories of positive Affect (i.e., happiness and inclination), one sub-category of positive Judgement (i.e., propriety), and two sub-categories of positive Appreciation (i.e., composition and valuation). Different from conveying positive attitudinal evaluation, authors' communication of negative explicit attitudinal evaluation of retraction can have a double-edged effect. Authors of retracted publications should have avoided communicating negative attitudinal evaluation due to its stigmatizing nature. However, communicating negative Appreciation and negative Judgement is conducive to correcting the literature because they explicitly disclose the problems with retracted publications and the retraction-engendering misbehaviors behind them. By conveying negative Affect, authors of retracted publications can showcase their sincerity in self-reflecting their retraction-engendering misbehaviors and highlight their willingness to assume the responsibility for handling retractions. These endeavors, according to image repair theory (Benoit, 2015), can trigger positive feelings in retraction notice readers towards authors of retracted publications. Therefore, it is not surprising that authors of retracted publications in my corpus communicated two sub-categories of negative Affect (i.e., unhappiness and disinclination), one sub-category of negative Judgement (i.e., normality), and two sub-categories of negative Appreciation (i.e., reaction and valuation) more often than journal authorities did, as demonstrated in the following excerpt.

Example 6

> … In addition, there were a number of mislabelings in Figures 3A and 4A [– valuation] in the second paper[1] and in Figures 7A and 8A from the first paper.[2] Furthermore, the antibody labelling of Figure1 CJJ in the second paper[1] was incorrect [– valuation]. Although these mistakes [– valuation] may not [+ security] influence final conclusions [– valuation], we consider these irregularities very serious [– valuation] and therefore withdraw both papers. We

deeply regret [– unhappiness] these errors [– Valuation] and sincerely [– inclination] apologize [– unhappiness] for any inconvenience [– reaction] caused to our readers. (RN-SCIE-6139)

Inconsistent with the authorship-based trend discussed above, journal authorities were more likely than authors of retracted publications to convey negative security. To justify their retraction decisions or endorse other entities' request for retraction, it is necessary for journal authorities to highlight their certainty or confidence in confirming retraction-engendering problems with retracted publications and their authors' retraction-engendering misbehaviors, as illustrated in the following excerpt.

Example 7

The investigative committee of the National University of Singapore concluded [– security] that Dr. Melendez committed serious scientific misconduct [– propriety]. (RN-SCIE-3699)

By contrast, it is in the interest of authors of retracted publications to convey negative security less often to hedge the retraction-engendering problems with their misbehaviors and publications, which can help mitigate retraction stigma.

5.4.2.5 Retraction reason-based differences

Honest error was more likely than both blatant misconduct and questionable conduct to invoke explicit attitudinal evaluation of retraction. This retraction reason-based difference can be explained by the less stigmatizing nature of honest error, which may have encouraged more personal involvement via explicit attitudinal evaluation in the retraction notices. In other words, because honest error is less stigmatizing than other types of reasons, retraction notice authors could be expected to be more transparent about the nature of the retractions and thus were less likely to distance themselves from the retraction-handling process by communicating more explicit attitudinal evaluation in their retraction notices. This trend is expected to have been reinforced in cases of disclosing positive information about the retracted publications and their authors, as displayed in Examples 3 and 4. The relationships discussed above can explain why honest error was more likely than both blatant misconduct and inappropriate conduct to invoke positive Affect (i.e., inclination), negative Appreciation (i.e., valuation), and negative capacity, and why it was also more likely than inappropriate conduct to convey negative veracity. By contrast, in cases of retractions due to reasons more serious than honest error, the problems are graver and called for corresponding response on the part of the retraction notice authors. Thus, they are expected to be more negative about their characterization of the retraction-engendering acts and showcase their stance on adhering to research and publication norms. This explains why honest error was less likely than blatant misconduct to invoke negative Affect (i.e.,

security) and negative propriety, and so was it than inappropriate conduct to predict negative normality, as illustrated in the following two excerpts.

Example 8

> In the course of intense investigations, the first author (D.R.) has admitted [– security] that he has committed intentional, systematic manipulation [– propriety] of the elec-trophysiological data collected in Cologne. (RN-SCIE-3897)

Example 9

> In view of this irregularity in the submission process [– normality], we request that that paper be retracted. (RN-SCIE-7388)

However, inappropriate conduct was found to be more likely than honest error to invoke positive capacity. This finding was against our expectation that a more serious retraction reason would more likely lead to communication of negative attitudinal evaluation, an expectation grounded on attribution theory (Corrigan et al., 2003; Weiner, 1995; Weiner et al., 1988). This unexpected finding could be attributed to the difference in research validity between inappropriate conduct and honest error. According to Xu and Hu (in press), inappropriate conduct may not necessarily invalidate research data or findings, whereas honest error may actually result in invalid research data or findings due to unintentional retraction-engendering misbehaviors. Therefore, it is not surprising that inappropriate conduct was more likely than honest error to invoke positive capacity of authors of retracted publications to highlight what was good about their retracted research.

5.5 *Retraction Stigma Communication: A Miniatured Panoramic View*

In addition to the retraction notice excerpts cited and qualitatively analyzed in the preceding four sections to support the discussion of some research findings, four retraction notices (see Appendix G) were selected from the secondary corpus of 957 retraction notices to compile a mini corpus for a holistic examination. The holistic analysis of the mini corpus was meant to present a miniatured panoramic view of retraction stigma communication via retraction notices. Specifically, the holistic qualitative analysis focused on identifying rhetorical strategies and linguistic resources used to communicate retraction stigma and mapping out the (de-)stigmatizing nature of retraction notices. Table 5.73 summarizes the characteristics of the four selected retraction notices. Notably, the average word count of the mini corpus was 242.5 words, close to the average length (n = 237) of the primary corpus of 3,296 retraction notices examined in the study. Furthermore, the mini corpus represented all the contextual factors

investigated in this study. The similar average text length and the same contextual factors covered could help ensure the representativeness of the selected four retraction notices.

Table 5.73 Profile of the selected four retraction notices

ID	RN-1	RN-2	RN-3	RN-4
Word count	139	396	290	145
Retraction period 1 (before 2010)	✓	✓		
Retraction period 2 (2010–2019)			✓	✓
Hard disciplines			✓	✓
Soft disciplines	✓	✓		
Journal authorities	✓	✓		
Authors of retracted publication			✓	✓
Blatant misconduct		✓		
Inappropriate conduct			✓	
Questionable conduct				✓
Honest error	✓			

5.5.1 Holistic qualitative analysis

This subsection presents a holistic qualitative analysis of each of the four selected retraction notices.

- RN–1 (RN-SSCI-0517)

This retraction notice constructed retraction stigma by creating marks and assigning responsibility. Specifically, marks were created by specifying the retracted publication through the retraction notice title and identifying authors of the retracted publication through the by-line of the retraction notice, as indicated in the following excerpt

> *Effectiveness of research training workshop taught by traditional and video-teleconference methods in a developing country*
>
> *By S. Dodani, K.A. Kazmi, R.E. Laporte & J.P. Wilson*

Marks were also created by identifying an individual author accountable for the retraction, as indicated in *The duplicate publication appears to have been caused by an oversight by the authors at the submission stage.* The retraction notice assigned responsibility through two instances of disclosure of retraction reasons, as shown in the preceding and the following excerpt *This is due to an earlier and fundamentally similar version of the article having been published in the Elsevier journal Public Health.* Notably, the latter disclosure revealed the retraction reason (i.e., *duplicate publication*, a serious form of self-plagiarism) euphemistically, and the former disclosure further de-stigmatized the duplicate publication as an honest error (i.e., *an oversight by the authors*).

No labels were used in the retraction notice to stigmatize the retracted publication or its authors, which is interpreted as a strategy for mitigating the constructed retraction stigma. Another de-stigmatizing strategy used in the retraction notice is to manipulate responsibility assignment by claiming unintentionality of the retraction-engendering act (i.e., *an oversight by the authors*) and indicating the retraction notice authors' uncertainty about the retraction reason (i.e., *appears to have been caused*). Grammatically, one nominalization was used without an agent marker (i.e., *duplicate publication*), leaving it unknown for retraction notice readers who accounted for the retraction-engendering act. However, another nominalization was used with an agent marker (i.e., *an oversight by the authors*) to indicate that all the authors were held collectively responsible for the retraction. The retraction notice contained four instances of explicit attitudinal evaluation of retraction (i.e., *The duplicate publication* [– valuation] *appears* [+ security] *to have been caused by an oversight* [+ inclination] *by the authors* [– capacity] *at the submission stage*), suggesting a fair balance between stigmatizing and de-stigmatizing the authors of the retracted publication lexically.

- RN–2 (RN-SSCI-0574)

In this retraction notice, retraction stigma was constructed through creating marks, assigning responsibility, and exposing peril. Specifically, marks were created by specifying the retracted publication and identifying its authors in the body text of the retraction notice (i.e., *The Editors of International Studies Quarterly retract and rescind the article ''From Punitive to a Bargaining Model of Sanctions: The Case of Iraq,'' authored by Euclid A. Rose, published in International Studies Quarterly (2005) 49, 459–479*). The retraction notice also created marks by identifying an individual accountable author (i.e., *portions of their book were allegedly plagiarized by Dr. Rose*) and revealing investigation report (i.e., *It is not possible to publish here a full presentation of the results of our investigation….Our full report and several accompanying appendices are available from….*). Responsibility for the retraction was assigned through disclosure of the retraction reason (i.e., *The article contains improperly appropriated and referenced materials....These plagiarized usages include instances of borrowing, without proper scholarly citation, of ideas, organization, sequencing of arguments and, in some cases, exact wording from…*). The retraction notice exposed retraction peril by highlighting a considerable amount of time that the journal authorities had spent in investigating and confirming the retraction-engendering allegation (i.e., *It is not possible to publish here a full presentation of the results of our investigation, to which we devoted hundreds of hours of our time over the course of four months*).

The retraction notice did not adopt any label to name either the retracted publication or any of its authors. In addition to refraining from labelling, the retraction notice managed the constructed retraction stigma through concealment of stigma visibility and manipulation of responsibility assignment. Stigma visibility was concealed by terminating the circulation of the retracted publication in the scientific literature (i.e., *Since the allegations were brought forth, ISQ has not disseminated or published additional copies of Dr. Rose's article. The article will no longer be made available online by Blackwell Publishing*). Responsibility assignment was manipulated through highlighting an individual author's ungrounded denial of the retraction-engendering allegation of plagiarism (i.e., *Dr. Rose denied the allegations of plagiarism and claimed a draft of his article originally appeared on the web in 1998. ISQ requested a copy of the 1998 draft that Rose failed to provide*).

The retraction notice used different grammatical means to identify and obscure the agent of the retraction-engendering act, serving to reinforce and mitigate retraction stigma. The agent was identified through a passive voice construction (i.e., *portions of their book were allegedly plagiarized by Dr. Rose*) and obscured through an active voice construction with an inanimate participant (i.e., *The article contains improperly appropriated and referenced materials*) and a nominal group without an agent marker (i.e., *instances of borrowing, without proper scholarly citation, of ideas, organization, sequencing of arguments and, in some cases, exact wording from …*). Lexically, the retraction notice reflected on the retracted publication and the individual authors accountable for the retraction negatively (i.e., seven times) more often than positively (i.e., four times) through explicit attitudinal evaluation, as illustrated in the following coded excerpt.

> *The article contains improperly appropriated and referenced materials* [– valuation]. *These plagiarized usages* [– valuation] *include instances of borrowing, without proper scholarly citation* [– propriety] …. *portions of their book were allegedly* [+ security] *plagiarized by Dr. Rose* [– propriety] *in his article. Dr. Rose denied* [+ inclination] *the allegations* [+ security] *of plagiarism* [– propriety]…. *Rose failed to provide* [– capacity]…. *Since the allegations* [– satisfaction; + security] *were brought forth*….

- RN–3 (RN-SCIE-4010)

Retraction stigma in this retraction notice was constructed through creation of marks and responsibility assignment. Specifically, stigmatizing marks were created by specifying the retracted publication and identifying its authors through the retraction notice title, the body text of the retraction notice, and the signature of the retraction notice, and by identifying all the authors as being collectively accountable for the retraction (i.e., *the request for retraction is due*

to the indiscretion of the authors). The retraction notice's assignment of responsibility for retraction was realized through authors' self-disclosure of the retraction-engendering problem with the retracted publication (i.e., *a few parts that disclosed confidential information*) and admission of the cause of the problem (i.e., *We admit that the request for retraction is due to the indiscretion of the authors*). The constructed retraction stigma was managed by using no labelling in the retraction notice and offering correction and remediation through the authors' request for retraction of their own publication (i.e., *To Editor in Chief: We would like to request a retraction of our paper*).

Grammatically, the collective agent of the retraction-engendering act was identified through a nominalization with an agent marker (i.e., *the request for retraction is due to the indiscretion of the authors*), but the agent was obscured through an active voice with an inanimate participant (i.e., *a few parts that disclosed confidential information*) and a passive agentless construction (i.e., *which* [the confidential information] *should have been protected under patent law*). Lexically, the retraction notice reinforced the retraction stigma with four instances of negative explicit attitudinal evaluation of retraction but mitigated it with one instance of positive explicit attitudinal evaluation of retraction, as demonstrated in the following coded excerpt.

> *We would like to request* [+ inclination] *a retraction of our paper…. We* regret [– unhappiness] *to inform that the published paper included a few parts that disclosed confidential information* [– valuation] *which should have been protected under patent law. We admit* [– security] *that the request for retraction is due to the indiscretion of the authors* [– capacity] ….

- RN–4 (RN-SCIE-11928)

By creating marks and assigning responsibility for retraction, retraction stigma was constructed in this retraction notice. Specifically, it created marks by specifying the retracted publication in the retraction notice title, identifying authors of the retracted publications in the by-line of the retraction notice, and distinguishing all the authors collectively as accountable for the retraction (i.e., *…we the authors wish to submit a full length paper with updated material*), and increasing mark visibility through emphasis of the availability of the retracted publication: (i.e., *DOI of original article: https://doi.org/10.1016/j.hlc.2019.02.183*) at the end the retraction notice. The assignment of responsibility for retraction in the retraction notice was realized through disclosing a problem with the retracted publication indirectly (i.e., *we the authors wish to submit a full length paper with updated material*) and the behavioral cause of the problem (i.e., *this abstract has been published due to a miscommunication in the ANZSCTS ASM conference supplement*). The constructed retraction stigma was mitigated through refraining from labelling and offering

correction and remediation. To help de-stigmatize the retraction stigma, correction and remediation was realized through the authors' collective request to retract their own publication (i.e., *This article has been retracted at the request of the Authors*) and their willingness to rectify the retraction-engendering problem (i.e., *…we the authors wish to submit a full length paper with updated material*).

Grammatically, in assigning responsibility for retraction, the retraction notice obscured the agent of the retraction-engendering act (i.e., *due to a miscommunication in the ANZSCTS ASM conference supplement*). Lexically, the retraction notice communicated two instances of positive but one negative explicit attitudinal evaluation of retraction, as can be seen in the following coded excerpt. Notably, the communication of the two instances of positive explicit attitudinal evaluation of retraction took place in offering correction and remediation, suggesting the retraction notice author's (i.e., authors of the retracted publication) intent to reinforce the de-stigmatizing force of their retraction notice.

> *This article has been retracted at the request of the Authors* [+ inclination]. *This abstract has been published due to a miscommunication* [– capacity] *in the ANZSCTS ASM conference supplement. It needs to be retracted as we the authors wish* [+ inclination] *to submit a full length paper with updated material*.

5.5.2 Use of rhetorical strategies and linguistic resources

A holistic qualitative analysis of the four selected retraction notices revealed that a variety of rhetorical strategies and linguistic resources were used to communicate retraction stigma, as summarized in Table 5.74. Specifically, retraction stigma was constructed through three rhetorical strategies, namely *creating marks*, *assigning responsibility*, and *exposing peril*. Retraction stigma was managed through *concealing stigma visibility*, *refraining from labelling*, *manipulating responsibility assignment*, and *offering correction and remediation*. All the grammatical means for assigning agency/responsibility for retraction, including three agent-identifying ones and four agent-obscuring ones, were identified in the mini corpus. Three categories of explicit attitudinal evaluation of retraction, namely negative and positive Affect, negative Judgement, and negative Appreciation were employed in the four retraction notices. Taken together, these findings were generally consistent with the research findings of the analyses of the primary corpus of 3,296 retraction notices in this study. However, there were four discrepancies in the research findings between the mini corpus and the primary/secondary corpus. Making label as a retraction stigma construction strategy was employed in the primary corpus but not in the mini corpus. The Active agentless ergative construction was found in the

primary corpus but not in the mini corpus. Positive Judgement and positive Appreciation were identified in the secondary corpus of 957 retraction notices but not in the mini corpus. These discrepancies resulted from the sharp gap in size between the mini corpus and the primary/secondary corpus, as well as the low employment frequency of *making labels*, positive Judgement, and positive Appreciation in the primary/secondary corpus.

Table 5.74 Results of a holistic analysis of four retraction notices

Rhetorical strategies and linguistic resources	RN-1	RN-2	RN-3	RN-4
• Raw frequency of RSCSs				
1. Creating marks	3	7	6	4
2. Making labels				
3. Assigning responsibility	2	2	1	1
4. Exposing peril		1		
• Raw frequency of RSMSs				
1. Concealing stigma visibility		1		
2. Refraining from labelling *	1	1	1	1
3. Manipulating responsibility assignment	2	1		
4. Offering correction and remediation			1	2
• Raw frequency of grammatical assignment of responsibility [#]				
1. Agent + Active Voice (7)				1
2. Passive Voice + Agent (6)		1		
3. Nominalization with an Agent Marker (5)	1		1	
4. Passive Agentless Construction (4)			1	
5. Active Agentless Ergative Construction (3)				
6. Active Voice with an Inanimate Subject (2)		1	1	
7. Nominalization without an Agent Marker (1)	1	1		1
• Raw frequency of attitudinal evaluation				
1. Affect	2	5	4	2
Positive Affect	2	4	2	2
Negative Affect		1	2	
2. Judgement	1		2	1
Positive Judgement				
Negative Judgement	1		2	1
3. Appreciation	1	2		
Positive Appreciation				
Negative Appreciation	1	2		

Note. RN = retraction notice; RSCS = retraction stigma construction strategy; RSMS = retraction stigma management strategy; * = data coded dichromatically; [#] = the numbers in round brackets refer to agency/responsibility scores.

5.5.3 Stigmatizing and de-stigmatizing forces of retraction notices

The qualitative holistic analysis of the mini corpus of four retraction notices presented above revealed that retraction notices are a high-stakes academic genre that accommodates two conflicting forces, with one of them stigmatizing retraction and the other de-stigmatizing it. Both the stigmatizing and the de-stigmatizing forces of retraction notices are realized both rhetorically (i.e., content cues as rhetorical strategies) and linguistically (i.e., at both grammatical and lexical levels). On the one hand, retraction is stigmatized through three rhetorical strategies for constructing retraction stigma (i.e., *creating marks*, *assigning responsibility*, and *exposing peril*), three agent-identifying grammatical means for assigning agency/responsibility for retraction (i.e., agent + active voice, passive voice + agent, and nominalization with an agent marker), and three categories of negative explicit attitudinal evaluation of retraction (i.e., Affect, Judgement, and Appreciation). On the other hand, retraction is de-stigmatized through four rhetorical strategies for managing retraction stigma (i.e., *concealing stigma visibility*, *refraining from labelling*, *manipulating responsibility assignment*, and *offering correction and remediation*), four agent-obscuring grammatical means for assigning agency/responsibility for retraction (i.e., passive agentless construction, active agentless ergative construction, active voice with an inanimate subject, and nominalization without an agent marker), and one category of positive explicit attitudinal evaluation of retraction (i.e., Affect). The (de-)stigmatizing force of a specific retraction notice is not only determined by what types of rhetorical strategies and linguistic resources are used and how often they are used, as can be seen from Table 5.74.

The use of rhetorical strategies and linguistic resources and the (de-)stigmatizing force of retraction notices are influenced by four contextual factors (i.e., retraction period, academic discipline, retraction notice authorship, and retraction reason), as evidenced by comparisons between any two of the four retraction notices. To demonstrate context-specific differences, a comparison is conducted between RN-1 and RN-4, which differed in academic discipline (i.e., soft discipline vs. hard discipline), retraction notice authorship (i.e., journal authorities vs. authors of retracted publications), and retraction reason (i.e., honest error vs. questionable conduct). In RN-1, retraction stigma is constructed through three instances of *creating marks*, two instances of *assigning responsibility*, one instance of identifying the agent of retraction-engendering acts, one instance of negative Judgement, and one instance of negative Appreciation , Differently, in RN-4, retraction stigma is constructed through four instances of *creating marks*, one instance of *assigning responsibility*, one instance of agent-identifying

grammatical assignment of agency/responsibility for retraction, and one instance of negative Judgement. In RN-1, retraction stigma is mitigated through refraining from labelling, two instances of manipulating responsibility assignment, one instance of nominalization without an agent marker, and two instances of positive Affect. In RN-4, however, retraction stigma is mitigated through *refraining from labelling*, two instances of *offering correction and remediation*, one instance of agent-obscuring grammatical assignment of agency/responsibility for retraction, and two instances of positive Affect.

In terms of the (de-)stigmatizing nature of retraction notices and contextual influence on it, the results of the holistic descriptive analysis of the mini corpus illustrated, fleshed out, embodied the orchestrated use of rhetorical strategies and linguistic resources to demonstrate how the various features examined came together and materialized in the four chosen retraction notices. Notably, one rhetorical strategy for stigmatizing retraction (i.e., *making labels*) was identified in the quantitative analysis but not in the holistic qualitative analysis, which was also true of one grammatical means (i.e., active agentless ergative construction) and two categories of positive attitudinal evaluation of retraction (i.e., Judgement and Appreciation) for de-stigmatizing retraction. The observed differences could be attributed to the huge gap in sample size between the holistic qualitative analysis and the quantitative study.

5.6 Summary of the Chapter

This first four section of this chapter presented the research findings on retraction stigma construction strategies, retraction stigma management strategies, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction, as well as discussion about those findings. The fifth section of the chapter demonstrated a holistic analysis of four retraction notices to offer a miniatured panoramic view of retraction stigma communication via retraction notices.

CHAPTER VI: CONCLUSION

This chapter concludes the thesis by summarizing the major research findings of the study, highlighting its contributions, pointing out its limitations, and offering suggestions on future research on retraction stigma.

6.1 Major Findings of the Study

Drawing on a primary corpus of 3,296 retraction notices published before 2020 and indexed in the WoS Core Collection, this study examined how retraction stigma is communicated rhetorically and linguistically to (de-)stigmatize authors of retracted publications. Specifically, retraction stigma communication via retraction notices was investigated in four dimensions, namely rhetorical strategies for constructing retraction stigma, rhetorical strategies for managing retraction stigma, grammatical assignment of agency/responsibility for retraction, and explicit attitudinal evaluation of retraction. The study also investigated whether retraction stigma communication is influenced by four contextual factors, namely retraction period (i.e., before 2010 vs. 2010–2019), academic discipline (i.e., hard disciplines vs. soft disciplines), retraction notice authorship (i.e., authors of retracted publications vs. journal authorities), and retraction reason (i.e., blatant misconduct vs. inappropriate conduct vs. questionable conduct vs. honest error).

Qualitative analyses of the corpus identified four categories of retraction stigma construction strategies (i.e., creating marks, making labels, assigning responsibility, and exposing peril), four categories of retraction stigma management strategies (i.e., concealing stigma visibility, refraining from labelling, manipulating responsibility assignment, and offering correction and remediation), three agent-identifying grammatical means (i.e., agent + active voice, passive voice + agent, and nominalization with an agent marker) and four agent-obscuring ones (i.e., passive agentless construction, active agentless ergative construction, active voice with an inanimate subject, and nominalization without an agent marker) for assigning agency/responsibility for retraction, and various evaluative resources inscribing different types of attitude (i.e., Affect, Judgement, and Appreciation) positively and negatively.

Quantitative analyses of the retraction notices revealed that all the four contextual factors influenced retraction stigma communication. The retraction notices published before 2010 were more likely than those published between 2010 and 2019 to construct retraction stigma by creating marks and making labels, to manage retraction stigma by concealing stigma visibility, to identify agents of retraction-engendering acts, and to assign agency/responsibility

more explicitly. The retraction notices in hard disciplines were more likely than those in soft disciplines to construct retraction stigma by assigning responsibility, to manage retraction stigma by manipulating responsibility assignment, and to communicate positive Affect. Conversely, the retraction notices in soft disciplines were more likely than those in hard disciplines to construct retraction stigma by creating marks and exposing peril and to identify agents of retraction-engendering acts. Authors of retracted publications were more likely than journal authorities to construct retraction stigma by assigning responsibility and exposing peril, to manage retraction stigma by offering correction and remediation, to identify agents of retraction-engendering acts, and to assign agency/responsibility more rigorously. Differently, journal authorities were more likely than authors of retracted publications to manage retraction stigma by concealing stigma visibility. Compared with blatant misconduct, inappropriate conduct or questionable conduct, honest error significantly predicted retraction stigma management through assigning responsibility and offering correction and remediation, communication of positive Affect and negative Appreciation, and identification of agents of retraction-engendering acts. However, honest error was less likely than blatant misconduct, inappropriate conduct, and questionable conduct to be associated with retraction stigma construction through creating marks, and so was it than inappropriate conduct and questionable conduct to be associated with more rigorous grammatical assignment of agency/responsibility. In comparison with honest error, blatant misconduct and questionable conduct significantly predicted communication of negative Affect and retraction stigma management by concealing stigma visibility, respectively.

6.2 Contributions of the Study

This study made theoretical, empirical, methodological, and practical contributions.

Theoretically, the study theorized retraction as stigma and expounded the conceptual apparatus of retraction stigma, including its seven core dimensions, functions of retraction stigma at both behavioral and psychological levels, various targets and stakeholders of retraction stigma, the communication of retraction stigma (mainly through retraction notices), and strategic use of retraction stigma power via retraction notices. The investigation into retraction stigma in this study has expanded the scope of stigma research. More importantly, as evidenced by this study, retraction stigma as a theoretic construct enables retraction research to go beyond being purely descriptive and become explanatory. The conceptualization of retraction stigma has good potential to extend our current understanding of the phenomenon of retraction. The concept of retraction stigma communication advanced in this study offers a

useful theoretical framework for future research on retraction and provides fertile ground for the generation of research hypotheses that are well positioned to substantiate a principled explanation of the sociology and psychology of retraction.

Empirically, the study identified a variety of rhetorical strategies and linguistic resources used in retraction notices to manipulate the (de-)stigmatizing force of retraction notices, which could not be found in previous research on retraction. The identification of those rhetorical strategies and linguistic resources provides confirming evidence not only for the conceptualization of retraction stigma but also for the important role that language plays in retraction stigma communication via retraction notices. Therefore, it is expectable that this study would inspire future research into the phenomenon of retraction from a linguistic perspective. The study also explored and confirmed the influence of four contextual factors (i.e., retraction period, academic discipline, retraction notice authorship, and retraction reason) on the use of the identified rhetorical strategies and linguistics resources in the retraction notices. The identification of the context-specificity of retraction stigma communication via retraction notices has advanced our current understanding of retraction as an ethical phenomenon and of retraction notices as a high-stakes academic genre. Expectably, this research finding would better inform and guide retraction stakeholders (especially authors and readers of retraction notices) in their encounter with retractions in different contexts.

Methodologically, the study adopted a parallel convergent design to investigate retraction stigma communication via retraction notices, involving a quantitative investigation and a holistic qualitative analysis, which took place essentially at the same time and served to complement and triangulate each other. It is rarely seen in previous retraction research that retraction notices were analyzed qualitatively and holistically. The study also developed two analytical frameworks for identifying retraction stigma construction and management strategies and adopted another two frameworks from the literature (Hu & Xu, 2020; Martin & White, 2005) to measure grammatical assignment of agency/responsibility for retraction and identify explicit attitudinal evaluation of retraction. All the four analytical frameworks were used to measure the (de-)stigmatizing nature of retraction notices, which can be valuable references for research on courtesy retraction stigma and corpus-based discourse analysis of other types of stigma.

Practically, the research findings of the study indicated a purposeful orchestration of various rhetorical strategies and linguistic resources in retraction notices to stigmatize or de-stigmatize authors of retracted publications to achieve intended communicative purposes, providing the scientific community with valuable implications for handling retraction properly

and effectively. In particular, retraction notice authors can be well-informed by the research findings in their production of retraction notices to better fulfil their prioritized communicative purposes. Accordingly, by drawing on the research findings, policy makers (i.e., journals and publishers) can update their guidelines and regulations on what information to communicate in retraction notices and how it should be communicated to highlight their stance on retraction handling from the perspective of gatekeepers of scientific integrity.

6.3 Limitations of the Study

Despite the contributions highlighted above, this study had a few limitations.

First, the study drew on retraction notices as its only data source. However, data collected from retraction stakeholders could have provided more insights into retraction stigma communication, especially retraction notice authors' motivations and rationales behind their differentiated language use in retraction notices. The lack of this type of data was due to reported difficulties in data collection due to data sensitivity (Ben-Yehuda & Oliver-Lumerman, 2017; de Vrieze, 2020; Xu & Hu, 2018) and limited resources available for this doctoral research project. To facilitate solving this problem, a considerable amount of research funding should be sought, and a research team of resourceful members with personal experiences of handling retractions should be established.

Second, due to time constraint and to ensure the feasibility of the whole doctoral research project, only 29.03% (n = 957) of the primary corpus of 3,296 retraction notices were sampled to construct a secondary corpus to address the research questions on explicit attitudinal evaluation of retraction. The secondary corpus included all the 412 retraction notices issued by authors of retracted publications but only 18.90% (n = 545) of the 2,884 retraction notices produced by journal authorities. Such an unbalanced sampling might have undermined the generalizability of the research findings. To avoid the problem, future research without a tight time constraint can adopt a more balanced sampling method and enlarge the sample size.

Third, the framework for grammatically assigning agency/responsibility for retraction could not capture the (de-)stigmatizing nature of the retraction notices that did not disclose retraction-engendering acts. Accordingly, to fully capture the (de-)stigmatizing nature of retraction notices, future research can update the framework by including non-disclosure of retraction-engendering acts as the lowest-level of assignment of agency/responsibility. Additionally, the study's exclusive focus on explicit attitudinal evaluation of retraction neglected the (de-)stigmatizing nature of the retraction notices that communicated implicit attitudinal evaluation of retraction. Since identification of implicit attitudinal evaluation

heavily relies on appraisers' personal stance and their social-cultural backgrounds (Martin & White, 2005), a research team of members from diverse backgrounds (e.g., academic disciplines, research and publication cultures, and personal experiences of handling retractions) can help minimize the subjectivity in identifying implicit attitudinal evaluation of retraction in retraction notices if all the research team members take part in developing a coding scheme, coding data independently, and resolving coding discrepancies through discussion.

Fourth, the study dichotomized academic disciplines into hard and soft disciplines. If a further division between pure and applied disciplines had been added, the investigation could have yielded research findings on more nuanced cross-disciplinary variations in retraction stigma communication via retraction notices, which could have provided more context-specific implications for handling retractions.

6.4 Directions for Future Research

In addition to addressing the limitations of this study, future research theoretically motived by the conceptualization of retraction stigma can be conducted in the following three directions.

First of all, further scholarly efforts can be made to expand the conceptualization of retraction stigma communication via retraction notices into a full-fledged theory. The model of retraction stigma communication via retraction notices proposed in this study has one important dimension missing, namely how stigmatizers other than retraction notice authors and the stigmatized (i.e., authors of retracted publications) perceive retraction stigma. If this dimension is covered, the model of retraction stigma communication via retraction notices will be complete according to Berlo's (1960) sender-message-channel-receiver model of communication, with retraction notice authors being the sender, retraction notices the message, academic journals the channel, and stigmatizers (except retraction notice authors) and the stigmatized the receiver. Furthermore, future research is needed on how retraction stigma is communicated via media other than retraction notices (e.g., scholarly publications on retraction research and non-academic coverage of retraction events) and how entities other than retraction notice authors exercise their retraction stigma power via media other than retraction notices. Further theorizing of retraction stigma can also be facilitated by empirical research on the psychological and behavioral influences of retraction stigma on its various targets and stakeholders.

A second promising line of future empirical research concerns the stigmatizing force of retraction notices. Future research can seek to develop a multi-dimensional framework for analyzing the stigmatizing force of retraction notices holistically. Such a comprehensive all-

in-one framework is expected to provide retraction notice authors and readers with a fuller picture of the (de-)stigmatizing nature of retraction notices and thus enable them to produce and comprehend retraction notices more effectively and efficiently. Technically, it can be developed by integrating the four analytical frameworks adopted in this study (together with the two missing components described in the preceding section) and some other frameworks not covered in this study, such as authorial engagement in retraction notices and retraction notice authorship. Since retraction notice authorship indicates to what extent authors of retracted publications distance themselves from their retractions and the process of handling them (Xu & Hu, 2018), it can be adopted as an indicator of the stigmatizing force of retraction notices, which is also true of authorial engagement communicated in retraction notices. Furthermore, researchers can investigate how the stigmatizing force of retraction notices is perceived by different groups of retraction notice readers. In this regard, one of the hypotheses worth testing is that different stakeholders of retraction stigma will perceive the stigmatizing force of the same retraction notices differently. Also needed are experimental perception studies that examine whether the use of different rhetorical strategies and linguistic resources has an impact on retraction notice readers' perceptions of the stigmatizing force of retraction notices.

A third direction that future retraction research can take is to identify and explore contextual factors that may influence retraction stigma communication via retraction notices but were not explored by this study. Two contextual factors deserving exploration can be journal authorities' experience of handling retractions and their social-cultural backgrounds. As argued by Xu and Hu (2022b), journal authorities from different social-cultural contexts may use their stigma power differently according to Dijker and Koomen's (2007) theory of deviance. As indicated in the RWDB, academic journal and publishers vary in the absolute number of retractions, and their varied experience of handling retractions may have influenced how they communicate retraction stigma via retraction notices. It is also of theoretical interest to map out contextual factors that can influence the use of retraction stigma power by retraction stakeholders other than retraction notice authors. Retraction stakeholders other than retraction notice authors include retraction researchers and those involved in the coverage of research retractions in non-academic media, and their use of stigma power may be influenced by their proximity and attitudes towards retraction (Xu & Hu, 2022b). Research into these extra contextual factors can advance our understanding of retraction handling and provide practical implications for handling retractions more effectively and efficiently.

Appendix A

Criteria for Identifying Entities Accountable for Retraction

1. Authors of retracted publications

Authors of retracted publications are identified as entities responsible for retraction when the retractions are due to problems with how the retracted research was conducted, reported, or published, or if the retraction notice discloses no explicit reason for the retraction but any of the following seven types of information: 1) Elsevier policy on withdrawal is cited; 2) An Expression of Concern is issued prior to the retraction; 3) Only the authors apologise for the retraction; 4) The retracted publications are revised, resubmitted, and republished; 5) The retraction is requested and/or conducted solely by the authors of retracted publications; 6) The retracted publication is published by journal authorities in good faith in the first place; 7) The retraction follows an investigation by the authors' institutions. Three examples of authors of retracted publications as authors of retraction notices are presented below.

- As a result of problems with the data sets and incorrect atom assignments, 29 papers by Liu et al. are retracted. Full details of all the articles are given in Table 1. (RA-SCIE-3136-RN)
- The article was revised after its original publication in OnlineFirst. The original publication has now been removed, and the final OnlineFirst version of the article can be accessed at http://journals.sagepub.com/doi/full/10.1177/1087054716682337 (RN-SCIE-0660)
- Following an investigation by the Columbia University Office of Research Compliance and Training, the Editorial Board of Clinical Science is upholding the recommendation to retract this paper that has been communicated by the University's Standing Committee on the Conduct of Research. All authors on the paper have been contacted with regard to the retraction. (RN-SCIE-0920)

2. Journal authorities

Journal authorities (i.e., journal editors and publishers) are identified as entities responsible for retraction when the retraction is due to problems with anything that only journal authorities take charge of (e.g., copyediting mistake, production error, accidental publication of a rejected manuscript or one that was requested to be withdrawn or retracted, duplicate publication of an accepted manuscript, etc.). Two examples of journal authorities as authors of retraction notices are presented below.

- This article [1] has been retracted because it was republished in error [2]. The publisher apologizes to the authors and readers for the error and for any inconvenience caused. (RN-SCIE-0630)

- The above paper has inadvertently been published twice having page nos 93–98 and 387–392. We are now retracting the second article having page nos 387–392. The Editorial Office regrets the error. (RA-SCIE-2624-RN)

3. Third parties

Third parties are identified as entities responsible for retraction when the retractions are due to the fault of any identifiable entities other than authors of retracted publications and journal authorities. For instance, the research reported in the retracted publication is based on other people's research which ended up retracted, or the retracted publication included data generated by problematic equipment provided by external entities, as illustrated by the following two examples.

- Given that the authors of 'FMN2 makes perinuclear actin to protect nuclei during confined migration and promote metastasis' … have retracted their paper, I wish to retract this Research Highlight, which discussed the findings reported in that study. (RN-SCIE-0438)
- The Editorial Office was contacted by the author with the request to withdraw this article, while informing the Editor-in-Chief that the manufacturer of a device used in this study had contacted the author to disclose that the data reported in the manuscript had possibly been affected by the failure of the device. (RN-SCIE-0710)

4. Both authors of retracted publications and journal authorities

This applies when the retraction is due to fault committed by authors of retracted publications and journal authorities either separately or jointly. In the following two examples, both authors of retracted publications and journal authorities are identified as being responsible for the retraction.

- Reason for this duplicate publication is that there has been a misunderstanding between the authors and the editors in the course of the review process when the same article was submitted twice with changes in the authors list, text and figures. (RN-SCIE-3824)
- There was technical lapse at the author's as well as the editorial end that resulted in publishing the same article twice. Therefore the 2nd published article is now being retracted. (RA-SCIE-1188-RN)

5. Unidentifiable entities

The entities responsible for retraction cannot be ascertained due to inadequate information provided in the retraction notices. In the following two examples, the entities responsible for retraction are unidentifiable.

- This article1 is hereby retracted by agreement among the authors, the Editor of the Journal of Applied Physics, and the American Institute of Physics. (RN-SCIE-4710)

- Two papers by … are retracted by the journal. This follows investigation by the University of Alabama at Birmingham, Alabama, USA, of structures deposited by H. M. Krishna Murthy. Krishna Murthy has noted that he is not in agreement with the retractions. (RN-SCIE-5335)

6. No entities at fault

The retraction does not involve any human entity who is at fault. For instance, an article by the Editor-in-Chief is retracted as its theme is claimed by the journal to be outdated, and a flawless published article is retracted as the publication model of the journal has changed and allows the authors to withdraw it. In the following two examples, no entities are at fault.

- This review is out of date, and the original authors are no longer available to update it. If you are interested in updating this review, please contact …. At October 2015, a new author team is preparing a replacement review to focus on acute sickle cell crises in adults. (RN-SCIE-3212)
- The retraction has been made as a consequence of a change in the publication model of Geofluids, as a result of which the author is free to submit the article elsewhere. (RN-SCIE-1030)

Appendix B

Definitions of Author-Related Reasons for Retraction

This appendix except the notes is reproduced from Xu and Hu (in press, pp. 22–25). The retraction reasons defined below have been identified solely on the basis of the retraction notices examined in this study and apply to retractions for which only authors of retracted publications are held responsible.

- **Acknowledgment issues**

  Acknowledgment issues take the form of a lack of or a false acknowledgment of the sponsorship that the retracted research has received when no conflict of interest is involved.

- **Authorship issues**

  Authorship issues refer to any of the following eight categories: (1) someone deserving of authorship is not listed as a co-author; (2) someone is listed as a co-author without his/her consent or knowledge or without participating in the research and/or its publication; (3) the retracted publication was published without consent from or knowledge of all the co-authors; (4) the information (e.g., home institution, degree, and e-mail address) of any of the co-authors is falsified or cannot be verified; (5) consensus on the content of the retracted publication is not reached between or among the co-authors; (6) the name of a co-author is added or removed without justification; (7) a dispute over authorship remains unresolved; (8) only very general information (e.g., authorship manipulation and authorship assignment problem) is provided about an authorship issue so that it is impossible to determine which of the aforementioned category it falls into.

- **Citation manipulation**

  This involves citing works unnecessary for or irrelevant to the retracted publication and/or its reported research.

- **Compromised peer review**

  Due to the author's or his/her proxy's manipulation of the peer review process (e.g., by recommending/creating fake reviewers or forging peer review reports), the retracted publication was not reviewed properly or not peer-reviewed at all before its publication.

- **Conflict of interest**

  The affiliation of any author of the retracted publication is disclosed untruthfully when it

may have influenced the reported finding(s).

- **Data fabrication/falsification**

  The research data (e.g., tables, figures, images) are made up, changed, manipulated or reported in a biased manner with the intention of providing fake data or giving a false impression.

- **Ethical issues**

  Ethical issues refer to any IRB-related issue (e.g., lack of IRB approval, revoked or unverified IRB approval, and violations of the approved IRB protocol), showing disrespect for colleagues in writing, and unjustifiable withdrawal of the authorized use of a software license.

- **Honest error**

  Honest error refers to any unintended deviation or a retraction-engendering behavior that is explicitly characterized in the retraction notice as being clear of misconduct. 24

- **Legal issues**

  Legal issues refer to: (1) the publication of copyrighted materials without authorization from their copyright holders, or (2) anything else related to the retracted research that has rendered its researcher(s) involved in an ongoing or concluded lawsuit

- **Misappropriation of data**

  Misappropriation of data refers to the publication of unpublished academic work (e.g., diploma/degree theses, manuscripts, presentations) which are not produced by any author of the retracted publication and consequently constitutes intellectual theft.

- **Misdocumentation of original data**

  The original data, which are supposed to have been well documented/stored for a conventionally expected period of time, cannot be provided to nullify an allegation or suspicion of the unreliability of the reported research data or finding(s).

- **Plagiarism/self-plagiarism**

  Plagiarism refers to unacknowledged use of published text and ideas owned by entities other than any author of the retracted publications. Self-plagiarism refers to unacknowledged use of any text and/or idea previously published by any author of the

retracted publication. Redundant publication (i.e., one manuscript being submitted to and published in more than one journal) is treated as a variant of self-plagiarism.

- **Unauthorized use of data**

  Unauthorized use of data refers to the publication of research based on data with disputed ownership or without permission from all its co-owners and/or its institution(s) when one or more authors of the retracted publication have been involved in the production of the data

- **Unintended publication**

  Unintended publication occurs when: (1) the publication fee is not paid to the journal; (2) the publication is not in the final form approved by all the authors; (3) the submission is published although the publication process is not completed due to the authors' refusal to transform copyright, lack of response to standing queries from the journal authorities, and other reasons; or (4) the accepted submission, which is unproblematic and publishable, is withdrawn at the request of its author(s) before the production process starts.

- **Unreliable data/findings**

  The retraction notice merely discloses concerns over the reported research or states that the research data/finding(s) reported cannot be reproduced or relied on without revealing any research or publication misbehavior that has led to the unreliable data/findings.

- **Unspecified misconduct**

  The retraction notice discloses misconduct as the reason for retraction without explicitly specifying the type of misconduct involved

- **Unspecified reasons**

  The reason for retraction is categorized as unspecified when: (1) the retraction notice is too uninformative or vague in language to identify the reason for retraction, or does not disclose any reason for the retraction; (2) the retraction is due to a violation of journal terms on publication, but the violated journal terms are not specified in the retraction notice; or (3) the reason for the retraction may or may not be disclosed in an external document which could not be retrieved through the search queries adopted in the present study.

Notes:

1. Informed by the Retraction Watch Database (http://retractiondatabase.org), all types of retraction reasons defined hereby are based on a content analysis of all the 7,650 retraction notices examined in this study.
2. Whenever any of the 16 main types of reasons (indicating the categories of reasons) or their semantic variants are used in a retraction notice without specifying a sub-type, the reason for retraction is identified as falling in the main type in question.
3. When the retraction is in place because the retracted research is based on a previously retracted publication authored by any of the authors of the present RP, its reason for retraction is identified as the one for the previous retraction.
4. Since retraction notices are used as the only data source for my study, intentionality of retraction-engendering acts has to be identified semantically. Through a pilot manual coding of all the retraction notices, the following expressions (together with specific contexts of their use) were adopted as criteria for identifying honest error. Retraction reasons are examined for unintentionality only when they are disclosed through expressions containing any of these character strings: "negligen*, ignoran*, unintent*, not intent*, accident*, inadvertent*, not advertent*, oversight, honest, unintend*, not intend*, unknowing*, not knowing*, in good faith, good-faith, unwitting*, not witting*, inattentive*, not attentive*, deliberate*, unwant*, not want*, unwilling*, not willing*, wilfull*, and innocent*". The reason for retraction is identified as honest error, when an allegation of misconduct is disproved through an expression containing any of these words: "misconduct, fraud, fraudulent, fraudulently, deceive, deception, inappropriate, questionable". Notably, when a retraction is attributed to more than one reason, the reason for the retraction is identified as honest error only when unintentionality of all the identified reasons for the retraction is explicitly communicated in the retraction notice.
5. *Dual publication*, *duplicate publication*, and *redundant publication* are an ambiguous form of reason for retraction because they may have resulted from the fault of authors of retracted publications and/or journal authorities. Consequently, they are categorized as self-plagiarism only when the authors of retracted publications are held accountable.
6. Due to the ambiguous connotations of the word *mispresent* and its variants in the context of retraction, *data mispresentation* (or *mispresentation of data*) is not identified as an independent form of reason for retraction. Instead, it is categorized either as *data fabrication or falsification* when the context supports such identification, or as *unreliable data or findings* if it cannot be unambiguously identified as *data fabrication or falsification*.

Appendix C

Criteria for Identifying Retraction Notices by Different Entities

Following Xu and Hu (2018), all the 7,650 retraction notices collected for this study were analyzed textually to ascertain their authorship, which resulted in no new criterion for identifying retraction notices by authors of retracted publications but seven additional ones for identifying retraction notices by journal authorities. In addition to the four types of authorship reported by Xu and Hu (2018), a new type of retraction notice authorship was identified; that is, a few retraction notices could be ascribed to research performing organizations and research integrity-governing bodies. Furthermore, the textual analysis resulted in more detailed classification of retraction notices jointly authored by different entities. Since the retraction notices examined by Xu and Hu (2018) were included in the preliminary dataset of this study, all the authorship identification criteria developed by Xu and Hu (2018) were adopted in this study, except the last criterion for identifying retraction notices by authors of retracted publications. The exclusion of the criterion was on the ground that the present study used retraction notices as its sole data source whereas the excluded criterion was to draw on data sources other than retraction notices to identify retraction notice authorship. As part of it was found unapplicable to the present dataset [29], the eighth criterion for identifying retraction notices by authors of retracted publications was updated. Presented below are all the criteria developed based on the textual analysis of all the 7,650 retraction notices, with those developed by Xu and Hu (2018, pp. 5–8) being reproduced almost verbatim but illustrated by new examples in some cases.

❖ Criteria for identifying retraction notices by authors of retracted publications

1. The retraction notice begins with a salutation to the journal authorities and/or is signed off by any or all authors of the retracted publication.
   - Dear Editorial board,
     It has come to our attention that the paper authored …. (RN-SCIE-1717)

2. A first-person pronoun (e.g., *we* or *I*) is followed by the phrase the authors or the name of any author of the retracted publication as its appositive or in parenthesis.
   - We, the named authors, hereby wholly retract this RSC Advances article. (RA-SCIE-2151-RN)

[29] Neither the exemplary retraction notice cited by Xu and Hu (2018) nor its corresponding retracted publication was indexed in the Web of Science and thus collected for the present study.

3. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice describes and/or clarifies some of the findings presented in the retracted publication.
    - We have discovered that some important data from the in vitro experiments was inadvertently omitted when we performed the statistical analysis …. (RN-SCIE-0493)

4. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice claims to uphold and/or justify some or all findings that are presented in the retracted publication.
    - Despite these errors, we stand by the reproducibility of the experimental data and the conclusion, which has been reached by numerous subsequent studies, that IKK and NF-kB are required for activation of innate immunity. (RN-SCIE-5755)

5. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice expresses apologies to the journal authorities.
    - We would like to apologize to the scientific community, the editors, and the reviewers for this deeply regrettable mistake. (RN-SCIE-9980)

6. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice offers remedies (e.g., to republish corrected data or findings in the same or another journal) or reveals some uncertainty about the reported findings.
    - Therefore, we intend to submit a new manuscript that would address the problems that have occurred in the paper. (RN-SCIE-0300)

7. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice admits having made mistakes, co-authored or published the retracted publication, requests a retraction due to the detected problems with the publication, or announces action on behalf of all other authors or co-authors.
    - Therefore we, on behalf of all of the authors of the PURL, are retracting the PURL, as well. (RN-SCIE-1117)
    - We apologize for these errors and retract this paper due to this data misrepresentation. (RN-SCIE-0507)

8. With *we* or *I* as its logical subject, a phrase or sentence in the retraction notice reveals an attempt to repeat or extend the work reported by the retracted publication.
    - We are in the process of repeating these cell-based studies. (RN-SCIE-2184)
    - We are thus retracting the paper with the intent to perform further investigations regarding the structure of this compound…. (RN-SCIE-1441)

9. A first-person pronoun *our* or *my* is used to indicate affiliation with an institution, ownership of the retracted publication, its findings or conclusions, or confidence in the validity of them.
    - Thus, our conclusions relating to electron-coupled proton transfer involving the heme cofactors are flawed. (RN-SCIE-0005)
    - We have corrected the errors and confirmed that there are no other errors after reviewing our original analysis and findings. (RN-SCIE-0628)

10. The agents of the retraction are the authors of the retracted publication, and their retraction is presented in the present progressive tense and/or contains the word *hereby*.
    - Therefore, the authors are retracting the paper in its entirety although they maintain that these issues did not affect the major conclusions. (RN-SCIE-1152)
    - The corresponding author hereby submit a retraction email of the above articles. (RN-SCIE-5408)

❖ **Criteria for identifying retraction notices by journal authorities**

1. The retraction notice begins with the phrase From the Editor, lists the journal authorities in its by-line, and/or is signed off by the journal authorities.
    - We, the Editor-in-Chief and Publisher of Information Technology for Development, have retracted the following article …. (RN-SSCI-1371)
    - Dr. Derek J. McPhee, Editor-in-Chief, Molecules
      Dr. Shu Kun Lin, Publisher, MDPI (RN-SCIE-6328)

2. The journal authorities act as an independent agent to retract the publication, detect problems with the retracted publication, request the authors' institution to conduct an internal investigation, assume responsibility, accept or approve a request for retraction, and/or express apologies/regrets for the retraction.
    - This article has been retracted by the Editor-in-Chief per the Committee on Publication Ethics (COPE) guidelines on plagiarism. (RN-SCIE-0421)

3. The retraction notice includes apologies/regrets for having failed to detect the retraction-engendering problems in the retracted publication during its submission and/or review process.
    - The Royal Society of Chemistry apologizes for the fact that these concerns were not identified during the peer review process. (RN-SCIE-10870)
    - … apologies are offered to readers of the journal that this was not detected during the submission process. (RN-SCIE-1182)
    - The JASH and Elsevier apologize for the inconvenience caused. (RN-SCIE-2013)

4. The retraction notice indicates that effort has been made to contact all of the authors of the retracted publication and/or their affiliations.
    - A copy of this retraction notice was sent to the last known email addresses for all seven authors. (RN-SCIE-10147)
    - Attempts on the part of the journal office to contact James W. Kaspar were unsuccessful. (RN-SCIE-0765)
    - In attempting to verify the experimental findings presented in the paper, the co-authors we were able to contact were unable to reproduce key results. (RA-SCIE-0870-RN)

5. The retraction notice reveals why the journal authorities have initiated an investigation into the retracted publication, and/or how it has been conducted.
    - After a thorough investigation, the Editor has concluded that the acceptance of this article was based upon the positive advice of two faked reviewer reports. (RN-SCIE-10442)
    - SAGE and the Editor then began a complex investigation into the case during the rest of 2013 and 2014. (RN-SCIE-2916)

6. The retraction notice highlights the upholding of strict scientific standards and the journal authorities' intolerance of violation of them in any form.
    - One of the conditions of submission of a paper for publication is that authors declare explicitly that the paper has not been previously published and is not under consideration for publication elsewhere. (RN-SCIE-11820)
    - *Biopreservation and Biobanking* is dedicated to upholding the highest standards of peer review and does not tolerate any improprieties. (RN-SCIE-11781)

7. The retraction notice makes clear that the retraction is agreed to by none of the authors of the retracted publication.
    - The authors disagree with this retraction. (RN-SCIE-12064)
    - The author of the paper has not admitted to the alleged errors and disagrees with the retraction. (RN-SCIE-0339)

8. The retraction notice announces follow-up actions that can be taken only by the journal authorities, such as announcing whether or not the retracted publication is available on the journal website.
    - A statement from each of the authors agreeing to the retraction of this article is on file at the Rockefeller University Press. (RN-SCIE-7403)
    - The original version has been updated to indicate the retraction, and the correct version is now the version of record. (RN-SCIE-10812)

- The online version of this article contains the full text of the retracted publication as electronic supplementary material. (RN-SCIE-12646)

9. The retraction notice indicates that the published article is retracted for suspected but hard-to-verify problems.
   - Although there is no firm evidence of data falsification, we agree that there is sufficient uncertainty about the originality of the data to justify retraction. (RN-SCIE-5757)
   - This article has been retracted at the request of the editor and authors because the paper appears to be very similar to another paper by the same authors which was published about the same time (RN-SCIE-5938)

10. The retraction notice contains explicit unhedged negative comments on confirmed problems with the retracted article.
    - This short paper resulted in prejudiced texts as well as absurd figures in regard with public information of detecting explosive materials against terrorism. (RN-SCIE-5222)
    - It has come to our attention that the article … was found to involve blameworthy inaccuracies in the way the research was carried out by Dirk Smeesters but not by the coauthors of the work. (RN-SSCI-0251)

11. The retraction notice indicates that the authors of the retracted publication have failed to comply with the journal authorities' requirements.
    - The corresponding author has been asked to provide an acceptable explanation for this duplication but has not been able to do so, neither have the original source files been supplied. (RN-SCIE-10092)
    - The authors confirmed a misstatement in the article and were unable to provide supporting information requested by the editor and publisher. Accordingly, the article has been retracted. (RN-SSCI-0337)

12. The retraction notice includes direct quotations from the authors of the retracted publication and/or their affiliations.
    - The article … has been retracted by the authors, who report the following: "It has come to our attention that …." (RN-SCIE-3472)
    - The authors stated the following: *''It was an unintentional mistake caused by carelessness…."* (RN-SCIE-0021)
    - The authors declared that 'the first author takes full responsibility for all of these errors which were not known to the second author'. (RN-SCIE-0213)

13. First-person pronouns (e.g., *our*) are used to indicate affiliation to the journal and/or adherence to its policy on publication.
    - We cannot allow this fraudulent behavior to occur in either Journal of Mechanics or any other journal. (RN-SCIE-5444)

- The long-standing editorial policy of our journal is not to re-publish material which has already appeared elsewhere. (RN-SCIE-7312)
- We note that we received, peer-reviewed, accepted, and published the article in good faith based on the purported veracity of these representations and warranties. We have been informed in our decision-making by our policy on publishing ethics and integrity and the COPE guidelines on retractions. (RN-SCIE-11767)

14. With the first-person pronoun *we* as its logical subject, a phrase or sentence in the retraction notice talks about the receipt or approval of a request for retraction.
    - We therefore accept Dr. Libby's and Dr. Tan's request that this paper be retracted and acknowledge Dr. Hunton's objection, through his counsel, to the retraction. (RN-SSCI-0171)

15. The retraction is due to journal authorities' fault, as identified by Xu and Hu (2022a)or apologies are extended to authors of retracted publications.
    - The articles were published prematurely, as a result of an oversight, for which Taylor & Francis apologise to the Authors and Editors. (RN-SSCI-0515)
    - The Editors and Cambridge University Press apologise to the author for this mistake and have retracted the duplicate article from New Perspectives on Turkey, 59. (RN-SSCI-1407)

16. A publishing ban is imposed on authors of retracted publications.
    - Due to this case of misconduct, we furthermore impose a ban on submissions from S. Gourgiotis and S. Baratsis for one year, effective July 1, 2007. (RN-SCIE-6259)

17. Authors and/or their home institutions are acknowledged for their cooperation in pre-retraction investigations.
    - The authors have been fully co-operative …. (RN-SCIE-3605)
    - … we are grateful to the dean at Shandong University School of Medicine for the thorough and detailed investigation and professional response to our concerns. (RN-SCIE-5656)

18. The retraction notice reveals availability of retraction-supporting information in another document by journal authorities.
    - See the Editorial by The Oncologist's Editor-in-Chief, Dr. Bruce A. Chabner, on pages 1347–1348 of this issue for a full background and explanation of the retraction. (RN-SCIE-4501)

19. Journal authorities alone or no entities are listed as authors in the retraction notice's *How to Cite* instruction.

- Citation: The PLOS ONE Editors (2014) Retraction: Lycopene Inhibits NF-kB-Mediated IL-8 Expression and Changes Redox and PPARc Signalling in Cigarette Smoke–Stimulated Macrophages. PLoS ONE 9(7): e102411. doi:10.1371/journal.pone.0102411 (RN-SCIE-2882)
- How to cite this article: Retraction Statement: 'Dyeing Behaviour of Low Temperature Plasma Treated Wool' by Kan, C.-W. and Yuen, C.-W. M. Plasma Process Polym. 2017;14:e1770018. https://doi.org/10.1002/ppap.201770018 (RN-SCIE-0242)

20. The authors of the retracted publication are given an opportunity to respond to allegations against them or to resubmit their revised/rectified retracted publication.
    - The authors have been invited to re-do the analysis and submit again to the journal. (RN-SCIE-0250)
    - The authors were given opportunity and time to respond to the concerns, but after careful review it became clear that the problem remains. (RN-SCIE-1654)

21. The retraction notice reveals journal authorities' evaluation of retraction-engendering behaviors or problems with publications or their justification of a retraction decision.
    - The Editors have determined that the values have changed so greatly that the conclusions of the paper can no longer be supported. (RN-SCIE-10801)
    - … it is the Editor's opinion that the paper from Dr Ismaeel demonstrates plagiarism. (RN-SCIE-5679)
    - As a result, the editors deem it appropriate to retract the entire article. (RN-SSCI-0102)

22. The retraction notice discloses journal authorities' evaluation of the publication under consideration of retraction
    - The Editor-in-Chief has therefore determined that the articles failed to meet the ethical standards required by the Journal. (RN-SCIE-1540)

❖ **Criterion for identifying retraction notices by research performing organizations or integrity-governing bodies**

The retraction notice is issued on behalf of the institution where the retracted research was conducted, or the investigation report issued by a research integrity-governing body is used as a retraction notice.

- Because Dr. Thomas has resigned from The University of Alabama at Birmingham, I request on behalf of our institution that these articles be retracted. (RN-SCIE-5993)
- In the whole dataset of 7,650 retraction notices, there is only one case of this kind (i.e., RA-SCIE-4454-RN). Specifically, although the retraction status of a publication is marked in the Web of Science, neither the retraction status is indicated, nor a retraction notice is available on the journal website. However, in the PubMed the publication is linked to an investigatory report issued by a research integrity-governing body (https://pubmed.ncbi.nlm.nih.gov/11150996/).

❖ Criteria for identifying retraction notices authored by more than one entity

Joint authorship refers to a retraction notice being ascribed to any two or more types of entities. According to a preliminary analysis of the whole dataset of 7,650 retraction notices, joint authorship involved only three entities (i.e., journal authorities, authors of retracted publications, and research performing organizations) and is represented in three different forms.

1. The retraction notice is made up of separate notes, which are issued by journal authorities and the authors of the retracted publication independently.
   - Retraction: 'Viral pathogenicity determinants are suppressors of transgene silencing in *Nicotiana benthamiana*'

     …

     Authors' statement … Editors' statement … (RN-SCIE-1997)

2. Joint authorship is indicated through information in the body text of the retraction notice.
   - We, the Authors, Editors and Publishers of Journal of Sport Rehabilitation, have withdrawn the following article in whole …. (RN-SCIE-0710)
   - The Authors and Editors no longer have confidence in the data and are jointly publishing this Retraction notice_to alert readers that the article contains flawed data and the findings and conclusions cannot be relied upon. (RN-SCIE-12783)

3. Both journal authorities and (any) authors of the retracted publication are listed in the retraction notice's by-line.
   - Retraction: Liu, L., et al. Evaluation of Water Resource Security Based on an MIV-BP Model in a Karst Area. *Water* 2018, *10*, 786

     Liu Liying [1,2,] Guan Dongjie [3,4,*] , Yang Qingwei [1] and *Water* Editorial Office [5,*] (RN-SCIE-10048)

❖ Coding reliability

Informed by Multon's (2010) recommendation of achieving test-retest reliability in assessing the consistency of a measure, I recognized intra-rater coding with a long interval of time as substitute inter-rater coding because the interval could make the coder cognitively new and fresh to the same data. Accordingly, I conducted two rounds of coding with an interval of over 13 months to ascertain the authorship of the 6,861 retraction notices, in which authors of retracted publications were identified as sole entities accountable for retraction. Disagreement was found between my two rounds of coding in 4.39% (n = 301) of the retraction notices. A Cohen's kappa test indicated excellent intra-coder agreement (k = .926). A PhD candidate in Applied Linguistics at Fudan University (China) was invited to identify the authorship of the

301 retraction notices. Before the invited coder started her independent coding, I presented to her a think-aloud of my coding of 10 randomly sampled retraction notices, covering only a few criteria developed above for identifying retraction notice authorship. Although provided with the whole set of the authorship identification criteria, the invited coder did not use them, which was beyond my expectation. Consequently, her coding differed from my second round of coding in 27.91% (n = 84) of the retraction notices. All the disagreements were then solved through a discussion between the invited coder and me. Our discussion started with the invited coder's close re-reading of those retraction notices, leading her to proactively revise her previous coding into being identical to mine in most cases. When her revised coding ended up different from mine, I pointed out to her the authorship markers I had located in the retraction notices, which convincingly prompted her to further revise her coding. Eventually, her coding of only 3 retraction notices remained unrevised, with which my coding was corrected to agree. The confirmation and revision of the authorship of all the 84 retraction notices followed the authorship identification criteria developed above.

Appendix D

Definitions of Retraction Stigma Construction Strategies

1. **Creating marks:** Identifying the stigmatized (i.e., authors of retracted publications) and the cause of stigmatization (i.e., retracted publications) and increase their visibility.

   1.1 *Specifying the retracted publication:* The retracted publication is specified through its bibliographic information, which may be located in the title, body text, or reference list of the retraction notice.

   - Retraction: "A Case-Cohort Study of Cadmium Body Burden and Gestational Diabetes Mellitus in American Women" (RN-SCIE-0688)

   1.2 *Identifying authors of the retracted publication:* The authors of the retracted publication are identified by including their names into the title, author list, signatory line, or reference list of the retraction notice.

   - Retraction of: A. Muthuchamy, A. Raja Annamalai and Rishabh Ranka. August 2016. Mechanical and Electrochemical Characterization of Super-Solidus Sintered Austenitic Stainless Steel (316L). Volume 35(7), Pages 643–651. (DOI: 10.1515/htmp-2015-0083) (RN-SCIE-0744)

   1.3 *Distinguishing accountable authors:* Authors accountable for the retraction are identified or distinguished from their innocent co-authors.

   - The authors have agreed to retract this paper because of duplication of the flow cytometry dot plots in Figure 1 … by the first author. (RN-SCIE-5708)

   1.4 *Increasing mark visibility:* Mark visibility can be increased by: 1) emphasizing the availability of the retracted publication; 2) mentioning that the retracted publication will be or has been marked out (e.g., through a watermark like "RETRACTED" across pages of the retraction notice); 3) revealing investigation reports or follow-up (academic and/or non-academic) coverage of the retraction; 4) informing retraction stakeholders of the retraction.

   - The online version of the original article can be found at http://dx.doi.org/10.1007/s12035-016-9784-7 (RN-SCIE-0064)
   - The retracted article will remain online to maintain the scholarly record, but it will be digitally watermarked on each page as "Retracted." (RN-SCIE-0929)
   - The full ORI notice may be viewed online at: https://federalregistergov/a/2015-07896 .... (RN-SCIE-1874)
   - We [journal authorities] have also informed Dr Mei's institution of this incident [the retraction] …. (RN-SCIE-6178)

2. **Making labels**: Referring to retracted publications and all or any of the (accountable) authors of retracted publications negatively to distinguish them from the legitimate literature and their innocent co-authors and researchers without a record of retractions, respectively.
    - The readers should beware that the incriminated authors may have plagiarized from additional sources and not just the one identified here. (RN-SCIE-7147)
    - Needless to say, we have severely admonished the offending authors concerning this breach of the ethical norms. (RN-SCIE-7147)
    - The offending paper [the RP] was published in a special issue of IJMI …. (RN-SCIE-3674)

3. **Assigning responsibility:** Indicating that the authors of retracted publications are held accountable for the retraction, and that they do not make (adequate) efforts to mitigate the negative consequences of their retracted research/publications.

    3.1 *Disclosing reasons for the retraction:* Problems with the retracted research/publication, confirmed or suspected, which have led to the retraction, are disclosed.
    - This article has been retracted at the request of the Editor and approved by the R&R panel as it duplicates significant parts of a paper that had already appeared in Journal of Environmental Management …. (RN-SCIE-5488)

    3.2 *Agreeing to the retraction decision:* All or any of the authors of the retracted publication agree with the retraction decision.
    - As a result of this report, all of the authors of the above-mentioned manuscript have agreed to a complete retraction of the paper. (RN-SCIE-7432)
    - The above article … has been retracted by agreement between the authors, the journal's editors, the Law and Society Association, and Wiley Periodicals, Inc. (RN-SSCI-1345)

    3.3 *Highlighting accountability for the retraction:* All or any of the authors of the retracted publication apologize for retraction-engendering problems, assume responsibility for retraction, or admit to having committed retraction-engendering behaviors.
    - The authors sincerely apologize to the scientific community for the errors in the published article. (RN-SCIE-0143)
    - Sandra C. Lozano takes full responsibility for the need to retract these articles. (RN-SSCI-0512)
    - According to JAMA's retraction statement, the first author of the article admitted to data fabrication following an internal investigation. (RN-SCIE-1117)

3.4 *Lacking cooperation in handling the retraction:* All or any of the authors of the retracted publication are described as uncooperative in a pre-retraction investigation or irresponsive when contacted for their consent to or comment on the retraction decision.

- One author (…) did not respond; the two remaining authors (…) could not be located. (RN-SCIE-9986)
- … [two authors of retracted publications] have modified their accounts of the events several times during the investigation, making it difficult to determine exactly what occurred with respect to the data in question. (RN-SCIE-5143)

3.5 *Revealing a poor record of publishing:* A poor publication history of the retracted publication (i.e., correction and expression of concern) or any of its authors (i.e., allegations under investigation and previous retractions) is revealed.

- Previously, Dr. Slutsky had retracted three articles (Am Heart J 1986;111:623). (RN-SCIE-9099)
- Initially, an Expression of Concern was published concerning this article. (RN-SCIE-6519)
- Following the publication of the Correction, additional concerns were raised regarding figures included in the original article and in the Correction. (RN-SCIE-1367)

3.6 *Imposing tangible punishment:* Journal authorities or other governing entities impose tangible punishment (e.g., publishing ban and position dismissal) on the (accountable) authors of the retracted publication.

- The above article is being retracted from the Indian Journal of Dermatology and the authors are barred from submitting manuscript(s) to IJD in future. (RN-SCIE-2763)
- ZP … has been discharged from administrative duties of the ISWC. (RN-SCIE-6497)

4. Exposing peril: Revealing adverse consequences caused by the retracted publication or research to retraction stakeholders other than to the (accountable) author(s) of the retracted publication.

4.1 *Affecting retraction stakeholders:* The retraction may cause to retraction stakeholders: a) difficulties or harm by inconveniencing, confusing, misleading readers and/or peer researchers, or victimizing non-academics; 2) a waste of time and/or resources; 3) reputational damage

- We deeply regret this error as well as the confusion caused to JAMA, readers, and potentially to physicians. (RN-SCIE-0628)
- We deeply apologize for making such serious and obvious mistakes in this article, which has the potential to mislead individuals working in the field. (RN-SCIE-2474)

- We apologize to the scientific community for any loss of time and resources caused by this publication. (RN-SCIE-3014)
- We sincerely apologize to Drs. Haibin Liu, Robert Mlynski and Stefan Plontke for our fault and the inconvenience and potential damages to their reputation. (RN-SCIE-13032)

4.2 *Violating research and publication norms*: The nature of the retraction is explicitly identified as a violation of respected research and publication ethics and/or journal policies.

- As such this article represents a severe abuse of the scientific publishing system. (RN-SCIE-0007)
- We note the breach of warranties made by the authors with respect to originality and provenance, and of our policy on publishing ethics and integrity. (RN-SCIE-0898)

4.3 *Contaminating the literature:* The integrity of the scientific literature is impaired by the retracted publication.

- We retract this article … to protect the integrity and accuracy of the scientific record. (RN-SCIE-12876)
- … we choose to retract this paper in the interest of maintaining accuracy in the published scientific literature. (RN-SCIE-10470)

4.4 *Causing unspecified adverse consequences:* The adverse consequences of retraction are mentioned but not specified.

- We deeply regret these irregularities and any adverse consequences that may have resulted from the paper's publication …. (RN-SCIE-4835)
- We regret any adverse effects this article may have caused. (RN-SCIE-2351)

Appendix E

Definitions of Retraction Stigma Management Strategies

1. ***Concealing stigma visibility****:* Decreasing the visibility of the retracted publication and its (accountable) authors.

   1.1 *Not specifying the retracted publication*: The retracted publication is not identifiable in the retraction notice.

   - Retraction
     This paper, by … [names of all the authors] has been retracted at the request of authors … [names of two authors]. The retraction has been agreed due to the use of the names of … [two authors] on the article without their knowledge or consent. (RA-SCIE-2517-RN)

   1.2 *Not identifying authors of the retracted publication*: None of the authors of the retracted publication is identifiable in the retraction notice.

   - The authors of "Lectin-deficient Calreticulin Retains Full Functionality as a Chaperone for Class I Histocompatibility Molecules" (Mol. Biol. Cell [2008] 19, 2413–2423; originally published in MBoC In Press as 10.1091/mbc.E07-10-1055) wish to retract their paper. (RN-SCIE-1326)

   1.3 *Not distinguishing accountable authors*: Authors accountable for retraction is not identifiable in the retraction notice either grammatically (i.e., via explicit grammatical markers of agency/responsibility assignment) or non-grammatically (e.g., in cases of single-authored retracted publications).

   - The Editorial Board of Plant and Cell Physiology has retracted the above article due to concerns over the authenticity and reliability of the data presented in this paper – specifically, Figures 6 and 10 show clear evidence of image manipulation. (RN-SCIE-12330)

   1.4 *Decreasing mark visibility:* Mark visibility can be decreased by removing the retracted publication electronically and/or physically or correcting/replacing the authorship list of the retracted publication.

   - Readers should note that pages 207–210 have been removed from the Journal. (RA-SCIE-3628-RN)
   - The article will no longer be made available online by Blackwell Publishing. (RN-SSCI-0574)
   - The author list has been corrected to remove… who were not involved in the preparation or submission of this article and should not have been listed as authors. (RN-SCIE-1833)

2. ***Refraining from labelling****:* Not referring to the retracted publication or any of its authors negatively.

- I have decided to retract the paper "Virus-specific splicing inhibitor extracts from cells infected with HIV-I" by D. Gutman and myself published in the 16 September 1988 issue of Science (volume 241, p. 1492). The data in that paper should no longer be considered reliable. (RN-SCIE-8964)

3. ***Manipulating responsibility assignment****:* Making efforts to reduce responsibility that could be assigned to the (accountable) authors of the retracted publication or to mitigate offensiveness of their retraction-engendering behaviors.

3.1 *Disclosing no reasons for the retraction*: No reasons for the retraction are disclosed in the retraction notice.

- *Development* is retracting this article at the request of the institution. The authors have been notified of this request. Unfortunately, the journal has no further information on the reasons behind this retraction. (RN-SCIE-0146)

3.2 *Objecting to retraction decisions*: All or any of the authors of the retracted publication disagree with the retraction decision.

- The corresponding author notified the journal that all authors disagree with the retraction. (RN-SCIE-12274)

3.3 *Denying retraction-engendering allegations:* All or any of the authors of the retracted publication disagree any accusation that would lead to retraction.

- Dr. Rose denied the allegations of plagiarism and claimed a draft of his article originally appeared on the web in 1998. (RN-SSCI-0574)

3.4 *Displaying cooperation in investigations*: All or any of the authors of the retracted publication are explicitly described as cooperative in an investigation into retraction-engendering allegations against them.

- He [an author] has co-operated as fully as possible at every opportunity available to him throughout the investigation. (RN-SCIE-7872)
- We would like to highlight that the corresponding author has been fully cooperative in this process. (RN-SCIE-1721)
- Dr Christofi [author of the retracted publication] wishes to state … that he has co-operated as fully as possible at every opportunity available to him throughout the investigation. (RN-SCIE-7872)

3.5 *Claiming unintentionality of fault*: Retraction-engendering behaviors of all or any of the authors of the retracted publication are claimed to be unintentional.

- There are some unintentional errors in the paper, and we had not addressed them fully. (RN-SCIE-12959)

3.6 *Downplaying severity and consequences*: The severity and consequences of the retraction-engendering problems are downplayed by 1) fully or partially upholding validity of the retracted research, 2) showcasing value or merit of the retracted research, 3) claiming no negative effect or consequence of the retraction, 4) indicating uncertainty about alleged problems, or 5) confirming non-existence of additional problems.

- The scientific content of the article was found to be valid by the editor and reviewers and is not in question. (RN-SSCI-1437)
- The article is meaningful, but this oversight in methodology might undermine the findings of the meta-analysis. (RN-SCIE-1676)
- … we believe there is no risk that these possibly invalid trial data harmed trial participants or patients with peripheral arterial disease taking ramipril. (RA-SCIE-3596-RN)
- … this retraction should not affect the validity of numerous articles published by other groups relating to the subject matter of the two retracted papers. (RN-SCIE-6409)
- We have also gone back through our analysis in detail to ensure there are no other errors. (RN-SCIE-0232)
- Although our inability to reproduce these results does not mean our conclusions are incorrect, we cannot say with confidence that they are correct. (RN-SCIE-3321)

4 ***Offering correction and remediation****:* Emphasizing what have been or will be done to correct the problems with the retracted publication or reduce its adverse consequences.

4.1 *Requesting or performing the retraction*: All or any of the authors of the retracted publication request or perform retraction voluntarily.

- The following article has been retracted at the request of the first two authors .... (RN-SSCI-1386)
- All authors retract this article. (RN-SSCI-0525)
- We wish to retract our research article entitled ... published in Molecular Medicine Reports 12: 6642 6648, 2015. (RN-SCIE-1468)

4.2 *Self-reporting retraction-engendering problems*: All or any of the authors of the retracted publication proactively report retraction-engendering problems to journal authorities.

- The authors identified some issues and brought them to the attention of the Journal. (RN-SCIE-11761)
- After publication, the authors determined that an error was made in the article…. They first notified *Cancer* of the error.... (RN-SCIE-12666)

4.3 *Rectifying retraction-engendering problems*: All or any of the authors of the retracted publication offer remediations for the retraction (e.g., correcting or rewriting their publications for republication).

- Although the central conclusions of the research are unchanged, a fully corrected version of the paper is forthcoming. (RN-SSCI-1435)
- We reached the consensus that the above paper should be retracted, and that we will resubmit the revised contents as a new paper. (RN-SCIE-0373)

4.4 *Promising no recurrence of the fault*: All or any of the authors of the retracted publication promise to prevent the same retraction-engendering behaviors in the future.

- I am in the beginning of my research carrier, please consider my case, I will not commit such kind of mistake hereafter. (RN-SCIE-5643)
- I fully and unequivocally realize my responsibility and assure you that this egregious error will never be made again. (RN-SCIE-6762)

Appendix F

Code Book for Identifying Markers of Explicit Attitudinal Evaluation of Retraction

This code book was compiled based on the analysis of the retraction notices examined in the secondary corpus of 957 retraction notices and finalized after rounds of refinement through discussion with scholars experienced in coding data on attitudinal evaluation. All the identified categories of explicit attitudinal evaluation of retraction are illustrated with retraction notice excerpts quoted from the secondary corpus.

Positive Happiness: Positive happiness is communicated to show happiness in offering materials that are claimed to confirm unaffected data reported in retracted publications, using the word *happy*.

1. We are happy to provide reagents to anyone who wishes to repeat our experiments …. (RN-SCIE-6464)

Negative Unhappiness: Negative unhappiness is communicated to show authors' apology for the need to retract a publication, the problems with the retracted publication and/or adverse consequences of the problems. The lexis used to express negative happiness include *anguish*, *apologize*, *apology*, *regret*, *regretfully*, and *sorry*.

2. The authors would like to apologize for any inconvenience to readers. (RN-SCIE-0005)
3. All of the authors of this manuscript are anguished to have made this mistake. (RN-SCIE-3494)
4. Sadly, Dr. Balg omitted any reference to the excellent review article previously published by Luckey and coworkers. (RN-SCIE-6789)
5. We are sorry for any inconvenience this has caused. (RN-SCIE-7317)
6. JMB as the publisher regrets for any inconvenience caused by the retraction. (RN-SCIE-0992)

Positive Dis/inclination: Positive dis/inclination is communicated to show an intent to retract a problematic publication, promise no re-occurrence of retraction-engendering problems, and correct the problems or re-submit corrected publications, to discloses unintentionality in making retraction-engendering mistakes, and to reveal dispute over allegations and retraction decisions. The lexis used to express positive dis/inclination include *ask*, *be committed*, *beg*, *beg, decide*, *deliberate*, *expect*, *hope*, *offer*, *please*, *request*, *seek*, *strive*, *unintentional*, *unwitting*, *voluntarily*, and *want.*

7. For that reason, the corresponding author of this publication requests retraction of this article. (RN-SCIE-0002)
8. … the authors have decided to withdraw the article. (RN-SCIE-0014)
9. We regret that the results of this study have been compromised and are committed to correcting the medical literature. (RN-SCIE-1702)
10. Rather, I simply want to offer an explanation for how this happened. (RN-SCIE-2302)

11. I will take this lesson to heart and will strive to not repeat my mistake in the future. (RN-SCIE-2302)
12. He deeply regrets the uncareful publication and hopes to submit again after getting more new valuable results. (RN-SCIE-3108)
13. … the authors voluntarily retract this article. (RN-SCIE-3406)
14. We seek therefore to retract this body of work. (RN-SCIE-5001)
15. The authors wish to point out that all other findings reported in the article are still valid. (RN-SCIE-10885)
16. Please give us a chance to correct our mistakes. (RN-SCIE-10897)
17. We beg to be allowed to retract the article. (RN-SCIE-10897)
18. The first author, Ozgur Tataroglu, declined to sign this retraction. (RN-SCIE-0195)
19. The retraction is due to the unintentional inclusion of erroneous data due to the limitations of the recording system used. (RN-SCIE-1133)
20. The author unwittingly used certain data from a collaboration that he was not entitled to use. (RN-SCIE-3016)
21. Dr Demiroglu disputes the grounds for this retraction. (RN-SCIE-7637)
22. Thus, the Editor has requested that the authors rewrite the paper and resubmit it to the journal. (RN-SCIE-2815)

Negative Inclination: Negative inclination is communicated to show authors' willingness to apologize for retraction-engendering problems with retracted publications and their own retraction-engendering misbehaviors, their admission of responsibility, intentionality in committing retraction-engendering misbehaviors, and non-author entities' intent to request for retraction. The lexis used to express negative inclination include *ask*, *deliberate*, *hope*, *intentional*, *knowingly*, *request*, *want*, *wish*, and *wittingly*.

23. The authors would like to apologize for any inconvenience to readers. (RN-SCIE-0005)
24. The corresponding author Kuruva Praveena wishes to admit sole responsibility …. (RN-SCIE-0134)
25. Regarding our paper, we do not want to publish now. (RN-SCIE-12536)
26. … regrettably found evidence of deliberate manipulation of experimental data by the first author Dr M. Vareille. (RN-SCIE-3421)
27. However it has recently come to light that said warranty and trust were knowingly violated by Professor Cardullo …. (RN-A&HCI-00053)
28. This article has been retracted at the request of the Editors because of concerns about the validity of the results reported in this publication. (RN-SCIE-0148)
29. This Article has been retracted by Scientific Reports at the request of Nanyang Technological University. (RN-SCIE-10438)
30. Upon request from a patent lawyer's office, we checked the references used in our paper for the Information Disclosure Statement (IDS). (RN-SCIE-4732)
31. The correct permission to publish the data reproduced in the tables was not obtained and therefore the article is being retracted at the request of the rights holder. (RN-SSCI-1221)

Positive Satisfaction: Positive satisfaction is shown through authors' gratitude for the opportunity for retraction and their disagreement to retraction decision and journal authorities' recognition of authors' cooperation in handling retraction and their unintentionality of retraction-engendering behaviors. The lexis used to express positive satisfaction include *acknowledge*, *agree*, *appeal*, *applaud*, *appreciate*, *satisfied*, and *thank*.

32. The authors appreciate the opportunity to retract this paper. (RN-SCIE-10334)
33. The editors of Tissue Engineering appreciate the senior author's effort to bring this concern to their attention. (RN-SCIE-12642)
34. The editors applaud the authors for the honest and transparent fashion in which they brought this matter to our attention. (RN-SCIE-1062)
35. Authors Feldheim and Eaton do not agree to this Retraction. (RN-SCIE-1666)
36. We understand that Dr. Angelides has filed a lawsuit against Baylor College of Medicine contesting the charges against him, and has appealed the ORI findings. (RN-SCIE-7967)
37. … the journal acknowledges the full cooperation of the authors. (RN-SCIE-3422)
38. The Editor-in-Chief is satisfied that the author of the retracted article did not wilfully intend to plagiarise the Laryngoscope article, but rather to replicate the original study with a different sample. (RN-SCIE-6286)

Negative Satisfaction: Negative satisfaction is communicated to show concerns about retracted publications and authors' agreement to retraction decisions. The lexis used to convey negative satisfaction include *allegation, complain*, *concerned*, *disappointed*, *inconvenienced*, *let down*, *mislead*, and *puzzled*.

39. All authors agree to this retraction. (RN-SCIE-0224)
40. We feel deeply disappointed and let down by this situation …. (RN-SCIE-1999)
41. Upon follow up with the authors, the editors remain concerned about the following panels in Figure 2: …. (RN-SCIE-1367)
42. … the criticism raised by the Editorial Board is correct. (RN-SCIE-4357)
43. But I am satisfied that his admissions justify the decision to retract. (RN-SCIE-7637)
44. Arising from a complaint by a third party questioning the veracity of the data in this paper …. (RN-SCIE-0148)
45. The investigators of the biomarkers study were puzzled …. (RN-SCIE-3631)
46. I deeply regret that this serious problem occurred, and sincerely apologize to any of my colleagues who may have been misled or inconvenienced by this publication. (RN-SCIE-7556)
47. Thereafter, a committee was constituted by the University to look into these allegations. (RN-SCIE-6064)

Positive Security: Positive security is communicated to confirm merits or no extra defects of retracted publications, to show authors' determination to retract their own publications, and to express certainty about merits of retracted publications and their authors, or uncertainty about their defects. The lexis used to convey positive security include *admit*, *allegation*, *allegedly*,

appear, *assert*, *assure*, *believe*, *conclude*, *conclusive*, *confidence*, *confident*, *confirm*, *confirm*, *confusion*, *convinced*, *determine*, *doubt*, *establish*, *guarantee*, *likely*, *maintain*, *may*, *possibility*, *potential*, *question*, *stand by*, *think*, *uncertainty*, and *not with certainty*.

48. We guarantee the authenticity and validity of the experimental data. (RN-SCIE-6313)
49. We have corrected the errors and confirmed that there are no other errors after reviewing our original analysis and findings. (RN-SCIE-0628)
50. The committee concluded and confirmed that all authors exercised appropriate responsibility and integrity in ensuring the validity of the data. (RN-SCIE-9893)
51. … the authors and Cancer editors determined that the article should be retracted. (RN-SCIE-12666)
52. We would like to acknowledge that the authors have been fully cooperative in this process. (RN-SCIE-12503)
53. It now seems very likely that the results we found were incorrect …. (RN-SCIE-8876)
54. Although I cannot therefore say with certainty that the data were wrongly manipulated …. (RN-SCIE-11920)
55. The Journal of Insect Behavior was notified in December 2012 of the possibility of plagiarism in …. (RN-SCIE-3745)
56. The Editor and Taylor & Francis received and investigated an allegation of misconduct on the part of the Authors …. (RN-SCIE-5853)

Negative Security: Negative security is communicated to show certainty about problems with retracted publications, misbehaviors of their authors, and peril caused by the problems and misbehaviors, and to reveal uncertainty about merits of retracted publications and their authors. The lexis used to convey positive security include *admit*, *allege*, *believe*, *claim*, *conclude*, *confess*, *confidence*, *confirm*, *determine*, *doubt*, *establish*, *guarantee*, *question*, and *uncertainty*.

57. The author (a non-doctor) and his former wife (a doctor who was involved in writing the letter) confessed to the hoax …. (RN-SCIE-5754)
58. The investigative committee of the National University of Singapore concluded that Dr. Melendez committed serious scientific misconduct. (RN-SCIE-3699)
59. This cast doubt on our own interpretation and findings. (RN-SCIE-0515)
60. We believe a major conclusion of the article remains unaffected …. (RN-SCIE-2301)
61. However, the independent expert still questions the reliability of the published images. (RN-SCIE-12053)
62. We apologize to our colleagues for any confusion caused. (RN-SCIE-2293)
63. We deeply regret this error as well as the confusion caused to JAMA, readers, and potentially to physicians. (RN-SCIE-0628)

Positive Capacity: Positive capacity is communicated to show competence of authors of retracted publication in doing commendable things related to their retracted publications. The lexis used to convey positive capacity include *able* and *successfully*.

64. During the first run, anonymized subject identifiers were successfully assigned to both biosamples and clinical data. (RN-SCIE-3494)

65. … they were able to provide to the Journal data from multiple partial repeat experiments performed at the time of the original work …. (RN-SCIE-10696)

Negative Capacity: Negative capacity is communicated to expose incompetence of authors of retracted publications in doing what they are supposed to be able to do during the process of research, publication, and handling retractions. The lexis used to convey negative capacity include *at the infancy of my training*, *cannot*, *error*, *fail*, *inconsistence*, *incorrectly*, *inexperience*, *lack of knowledge*, *mislabel*, *misrepresent*, *mistake*, *misunderstand*, *misuse*, *mix up*, *no prior familiarity*, *oversight*, *poor*, *unable*, and *wrong*.

66. The authors apologise for their mistake and for any subsequent inconvenience to readers. (RN-SCIE-11863)
67. The corresponding author, S. Gonzalez, was unable to supply a complete set of raw data on which the Article is based. (RN-SCIE-0702)
68. As this duplication breaches Frontiers guidelines and could not be sufficiently explained by the authors, the article has been retracted. (RN-SCIE-0391)
69. As a result of the mislabeling of interventions in 1 ICU, the flow diagram and Tables 1, 3, 4, and 5 have changed. (RN-SCIE-0628)
70. The Editor in Chief's decision to retract the article is based upon the authors' misuse and misrepresentation of a peer's scientific data without consent or approval. (RN-SCIE-0675)
71. We sincerely apologize for our misunderstanding…. (RN-SCIE-1038)
72. … they failed to response to editor's further inquiries and concerns in a timely manner. (RN-SCIE-1789)
73. This mistake was made because of my inexperience with the subject matter. I was at the infancy of my training in Aerospace Medicine and unfortunately had no prior familiarity with these topics. (RN-SCIE-2302)
74. All authors of these manuscripts are anguished to have made this mistake …. (RN-SCIE-3631)
75. We mistakenly submitted our paper to the other journal. (RN-SCIE-3880)
76. Unfortunately, I failed to appropriately reference the original work published in the Journal of Pediatric Surgery. (RN-SCIE-4827-Plus)
77. The authors have misrepresented their data as being from 2 separate cell lines. (RN-SCIE-5143)
78. Dr Bowie has been unable to verify that the data collection was carried out in an honest way. (RN-SCIE-7867)
79. … the misuse resulted from a lack of knowledge about publication ethics practices on the author's part rather than a case of deliberate misconduct. (RN-SCIE-12503)

Negative Normality: Negative normality is communicated to expose authors' deviation from normal practices in research and publishing. The lexis used to convey negative normality include *copyright issue*, *deviation from established scientific standards*, *fall well below the standard*, *incident*, *non-adherence*, *not follow proper channels, undeclared conflict of interest*, and *violation*.

80. After careful consideration, we recognize that there was an undeclared conflict of interest on the part of certain of the authors. (RN-SCIE-0497)

81. However, the level of care in figure preparation in Donmez et al. falls well below the standard that we expect …. (RN-SCIE-2846)
82. The article is retracted due to copyright issues that cannot be resolved. (RN-SCIE-4256)
83. After publication, the article was found to have image duplications in Fig. 1, 2, 3, and 8, which represent a major deviation from established scientific standards for publication. (RN-SCIE-0300)
84. This constitutes non-adherence to ethical standards in scientific research. (RN-SCIE-6612)
85. This decision is based solely on the violation of the journal's policy regarding disclosure. (RN-SCIE-6617)
86. As this conflicts with our stated policy on originality …. (RN-SSCI-1437)
87. We admit that we did not follow proper channels to obtain permission. (RN-SCIE-10335)

Positive Tenacity: Positive tenacity is communicated to authors' persistency in examining their alleged publications. The lexis used to convey positive tenacity include *carefully*.

88. We have carefully reviewed our paper …. (RN-SCIE-7614)

Positive Veracity: Positive veracity is communicated to indicate authors' truthful presentation of their research data, using the word *accurately***.**

89. At the time of writing, I believed that we had reported her work accurately. (RN-SCIE-10334)

Negative Veracity: Negative veracity is communicated to expose authors' untruthful presentation of their research data and information needed for peer review. The lexis and their variants used to convey negative veracity include *bias*, *cheat*, *deception*, *fake*, *false*, *fictious*, and *mislead*.

90. The publisher has discovered that the author(s) created and provided false information for the peer-review process. (RN-SCIE-0079)
91. Using a fictitious account, a review was submitted under the name of a known scientist without their knowledge. (RN-SCIE-2709)
92. We also sincerely apologize for cheating reviewers …. (RN-SCIE-13032)
93. … creating faked E-mail accounts of these three "co-authors" …. (RN-SCIE-13032)
94. Apologies are offered to the reviewers whose identities were assumed and to the readers of the journal that this deception was not detected during the submission process. (RN-SSCI-0206)
95. … analyzing data at the individual level, can bias estimates and tests of model fit …. (RN-SSCI-0222)

Positive Propriety: Positive propriety is communicated to highlight commendable behaviors committed by authors of retracted publication during the process of conducting research and handling retractions. The lexis used to convey positive propriety include *co-operate*, *cooperation*, *exercise appropriate responsibility*, *honest*, *appropriate*, *integrity*, *respect the highest standards*, *responsible*, *to one's credit*, and *transparent*.

96. The principal conclusions in Tian et al., 2005 are supported by appropriate documentation. (RN-SCIE-6767)

97. … all authors exercised appropriate responsibility and integrity in ensuring the validity of the data. (RN-SCIE-9893)
98. The editors applaud the authors for the honest and transparent fashion in which they brought this matter to our attention. (RN-SCIE-1062)
99. … we consider it appropriate to retract both papers. (RN-SCIE-2883)
100. … the authors are voluntarily withdrawing the article to respect the highest standards of transparency and reliability of research. (RN-SCIE-0275)
101. … the journal acknowledges the full cooperation of the authors. (RN-SCIE-3422)
102. To their credit the authors volunteered this information to the Journal and requested retraction of the articles. (RN-SCIE-6900)

Negative Propriety: Negative propriety is communicated to expose retraction-engendering misbehaviors committed by authors of retracted publications, such as plagiarism, data fabrication/falsification, and other violations of research and publication norms. The lexis used to convey positive propriety include *breach of warranties, ethical violation, fabricate, falsify, fraud, manipulate, misconduct,* and *plagiarize.*

103. The authors have plagiarized parts of a number of previously published papers. (RN-SCIE-3626)
104. We, the named authors wholly retract this RSC Advances article due to the inappropriate copying of figures from other published papers. (RN-SCIE-0849)
105. I have learned that Fig. 3 was fabricated by the first author. (RN-SCIE-7556)
106. We, the named authors, hereby wholly retract this RSC Advances article due to inappropriate alterations made to the TEM image presented in Fig. 2. (RN-SCIE-1771)
107. It was also discovered that the author inappropriately added dozens of references to works written by him to the References list during revisions and after acceptance. (RN-SCIE-0048)
108. However it has recently come to light that said warranty and trust were knowingly violated by Professor Cardullo …. (RN-A&HCI-00053)
109. After publication of the paper, we have become aware of the ethical violation in collecting the samples from some patients. (RN-SCIE-0281)

Positive Composition: Positive composition is communicated to positively reflect on completeness and consistency of retracted publications and data reported in them. The lexis used to convey positive composition include *consistent* and *complete*.

110. The newly obtained XRD pattern is shown in Fig.1a (black line) and is consistent with the raw data collected in our original study (prior to peak removal). (RN-SCIE-0515)
111. While the description of the method is complete …. (RN-SCIE-6588)

Negative Composition: Negative composition is communicated to negatively reflect on the constituents, completeness, consistency, texture, legibility, clearness, and clarity of retracted publications and data reported in them. The lexis used to convey negative composition include

ambiguity, *clear*, *difficult*, *evenly adjusted*, *illegible*, *image discrepancy*, *inadequa*te, *incomplete referencing*, *irregularity*, *lack*, *of low resolution*, *redundancy*, and *too much contrast or brightness*.

112. In addition, there were irregularities in the Western blot shown in Fig. 4C. (RN-SCIE-0273)
113. However, the measured raw data were not exactly in agreement with ref. 21, the raw data displayed three additional small peaks. (RN-SCIE-0515)
114. In Fig. 6C, the contrast is not evenly adjusted. (RN-SCIE-0724)
115. All authors retract this article because of inconsistencies that have been identified in data presented in several of the figures within the article …. (RN-SCIE-3093)
116. … the described meta-analysis lacked certain key search terms. (RN-SCIE-1676)
117. The retraction has been agreed due to image discrepancies …. (RN-SCIE-10383)
118. Fig 5C and 5D where too much contrast or brightness was used …. (RN-SCIE-2369)
119. This article has been retracted at the request of the author because of incomplete referencing leading to substantial similarities to numerous previously published papers. (RN-SCIE-4398)
120. Having been retracted by the authors based on inaccurate and incomplete description of the methodology, the paper and erratum should not be cited. (RN-SCIE-5418)
121. The collection, description, analysis and presentation of the behavioural data in Figure 3 is inadequate …. (RN-SCIE-12411)
122. … the images were of low resolution …. (RN-SCIE-13023)
123. … the text in the images was illegible. (RN-SCIE-13023)
124. … leading to the unexpected ambiguities …. (RN-SCIE-4969)
125. … the legal context is insufficiently clear …. (RN-SSCI-0259)

Negative Reaction: Negative reaction is communicated to expose negative emotions, cognitions, or happening aroused by retracted publications and research. The lexis used to convey negative reaction include *astonishing*, *embarrassing*, *harm*, *inconvenience*, *misconception*, *mislead*, *misunderstanding*, *regrettable*, *suspicious*, *unfortunate*, and *unsatisfactory*.

126. The authors would like to apologize for any inconvenience to readers. (RN-SCIE-0005)
127. Unfortunately, we have found that the material used in this study was inadvertently contaminated by an Arabidopsis transgenic line expressing GFP-fused EB1b. (RN-SCIE-0224)
128. The other authors (X.W., Y.Z., and S.D.C.) are not responsible in any way for this regrettable situation. (RN-SCIE-1370)
129. Their statements misled our reviewers, editors, and readers. (RN-SCIE-6900)
130. We sincerely apologize to the scientific community for any misunderstanding that these errors may have caused. (RN-SCIE-3801)
131. Prof. Cisterna and Dr. Ezpeleta express their deep and sincere apologies … for this embarrassing situation. (RN-SCIE-4807)

132. In the course of investigating suspicious patterns of experimental results in the laboratory …. (RN-SCIE-5001)
133. We deeply regret any scientific misconceptions that have resulted from the publication of our article. (RN-SCIE-5914)
134. Biased amplification due to a SNP so close to the 50 end of an amplification primer is astonishing …. (RN-SCIE-6507)

Positive Valuation: Positive valuation is communicated to disclose validity/reliability, unethicality, usefulness, and other positive aspects of retracted research. The lexis used to convey positive valuation include *correct*, *efficient*, *important*, *independent*, *integrity*, *meaningful*, *new*, *original*, *promising*, *reliable*, *reproducibility*, *reusable*, *true*, *useful*, *valid*, and *validate*.

135. Therefore, we believe that all other results remain reliable …. (RN-SCIE-0224)
136. Although in principle the reported results are correct …. (RN-SCIE-4836)
137. This alone validates the use of ramipril in patients with intermittent claudication. (RN-SCIE-1117)
138. The article is meaningful …. (RN-SCIE-1676)
139. Although the authors claimed the data were original …. (RN-SCIE-1789)
140. We believe a major conclusion of the article remains unaffected …. (RN-SCIE-2301)
141. We considered that this re-analysis with high-sensitivity troponin was important …. (RN-SCIE-4255)
142. Moreover, since several studies on the biomarker pair copeptin/troponin from our team and others are promising …. (RN-SCIE-4255)
143. We believe that the alcohol-ablation technique described is a useful procedure in selected patients with hypertrophic cardiomyopathy …. (RN-SCIE-7388)
144. The authors acknowledge that whilst the data in the article are unique and true …. (RN-SCIE-3829)

Negative Valuation: Negative valuation is communicated to disclose invalidity/unreliability, unethicality, or unusefulness of retracted publications, and peril of retracted research. The lexis used to convey positive valuation include *abuse of the scientific publishing system*, *accidentally mislabelled*, *clear violation of publishing ethics*, *compromised*, *contamination of data*, *error*, *exaggerated*, *faked*, *falsified*, *fictious*, *flaw*, *flawed*, *forged signature, hoax*, *inaccurate*, *inappropriate duplication* or *manipulation*, *inappropriately edited*, *incorrect*, *invalidate*, *mistakenly used*, *oversight in approach*, *plagiarised*, *premature*, *problem*, *questionable*, *unrealistic*, and *verbatim reproduction or repetition*.

145. The Retraction has been agreed due to the identification of large amount of plagiarised content present in the article. (RN-A&HCI-00010)
146. After the publication of the article it has been identified that there are a number of flaws in the results presented. (RN-SCIE-1728)

147. …data used in Figs. 4 and 6B were inappropriately manipulated, fabricated, and/or falsified. (RN-SCIE-10113)
148. … the peer review process was compromised …. (RN-SCIE-0048)
149. In fig. S8A, the dot blots were mislabeled and not properly adjusted for contrast. (RN-SCIE-0207)
150. This overlap represents verbatim repetition that was not identified during the submission of the manuscript. (RN-SCIE-0646)
151. Additionally we note that the names of the authors of the same article were incorrectly referenced. (RN-SCIE-1287)
152. This represents an abuse of the scientific publishing system and a clear violation of publishing ethics. (RN-SCIE-0148)
153. Therefore, the retracted article represents a serious improper usage of the scientific publishing system. (RN-SCIE-2077)
154. Our paper (Pediatrics 1986; 78:338) was seriously flawed by unintentional errors…. (RA-SCIE-4668-RN)
155. Using a fictitious account, a review was submitted under the name of a known scientist without their knowledge. (RN-SCIE-2709)
156. The clinical conclusions conveyed in the article are inaccurate and premature. (RN-SCIE-5569)
157. … apologize for the consequences. (RN-SCIE-4255)
158. … our findings may not be sufficient to guide clinical practice. (RN-SCIE-0800)

Appendix G

Four Retraction Notices Selected for a Holistic Analysis

1. RN-1: SSCI–0517

Global Public Health

Vol. 5, No. 1, January 2010, 113

Statement of Retraction

The following article is being withdrawn from publication in Global Public Health.

Effectiveness of research training workshop taught by traditional and video-teleconference methods in a developing country

By S. Dodani, K.A. Kazmi, R.E. Laporte & J.P. Wilson

DOI: 10.1080/17441690801950543

Global Public Health, 4, January 2009, 82Á95

This is due to an earlier and fundamentally similar version of the article having been published in the Elsevier journal Public Health. The duplicate publication appears to have been caused by an oversight by the authors at the submission stage.

The Editors of Global Public Health accepted the article in good faith, and welcome this opportunity to restore the copyright of the Royal Society for Public Health.

ISSN 1744-1692 print/ISSN 1744-1706 online

DOI: 10.1080/17441690903334588 http://www.informaworld.com

2. RN-2: SSCI–0574

International Studies Quarterly (2006) 50, 1

Retraction

The Editors of International Studies Quarterly retract and rescind the article ‘‘**From Punitive to a Bargaining Model of Sanctions: The Case of Iraq**,’’ authored by Euclid A. Rose, published in International Studies Quarterly (2005) 49, 459–479. The article contains improperly appropriated and referenced materials. These plagiarized usages include instances of borrowing, without proper scholarly citation, of ideas, organization, sequencing of arguments and, in some cases, exact wording from David Cortright and George Lopez’s The Sanctions Decade: Assessing UN Strategies in the 1990s. Boulder, CO: Lynne Rienner Publishing, 2000. The Editors of International Studies Quarterly have made this decision following a thorough investigation.1

In August 2005, the Editors of International Studies Quarterly were notified by Drs. Cortright and Lopez that portions of their book were allegedly plagiarized by Dr. Rose in his article. Dr. Rose denied the allegations of plagiarism and claimed a draft of his article originally appeared on the web in 1998. ISQ requested a copy of the 1998 draft that Rose failed to provide. The earliest draft provided by Rose was written sometime after 2000.

Since the allegations were brought forth, ISQ has not disseminated or published additional copies of Dr. Rose's article. The article will no longer be made available online by Blackwell Publishing. ISQ relies on the integrity and voluntary cooperation of all who participate in the scholarly enterprises for the maintenance of high standards of professional probity. ISQ was assured by Dr. Rose in a signed release prior to publishing the article that the article was his original work and that it contained no violation of copyright law. ISQ relied on Dr. Rose's work and did not knowingly publish a work that involved plagiarism and/or copyright infringement.1 It is not possible to publish here a full presentation of the results of our investigation, to which we devoted hundreds of hours of our time over the course of four months. Our full report and several accompanying appendices are available from the International Studies Association, upon request, by e-mail at isa@u.arizona.edu. A committee made up of Editors of the other International Studies Association journals also read and considered carefully our report and accompanying documents on the matter, and unanimously supported our conclusion.

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3. RN-3: SCIE–4010

Korean J Physiol Pharmacol
Vol 16: 367－367, October, 2012 http://dx.doi.org/10.4196/kjpp.2012.16.5.367

Retraction: **A Novel Carbamoyloxy Arylalkanoyl Arylpiperazine Compound (SKL-NP) Inhibits Hyperpolarization-Activated Cyclic Nucleotide-Gated (HCN) Channel Currents in Rat Dorsal Root Ganglion Neurons**

Gehoon Chung 1, Tae-Hyung Kim 1, Hyewon Shin 2, Eunhee Chae 2, Hanju Yi 2, Hongsik Moon 2, Hyun Jin Kim 4, Joong Soo Kim 1, Sung Jun Jung 3, and Seog Bae Oh 1
1 National Research Laboratory for Pain, Dental Research Institute and Department of Neurobiology and Physiology, School of Dentistry, Seoul National University, Seoul 110-749,
2 SK Biopharmaceuticals, Inc., Daejeon 305-712,
3 Department of Physiology, College of Medicine, Hanyang University, Seoul 133-791,
4 Department of Physiology, Sungkyunkwan University School of Medicine, Suwon 440-746, Korea

To Editor in Chief:

We would like to request a retraction of our paper [1] entitled, “A novel carbamoyloxy arylalkanoyl arylpiperazine compound (SKL-NP) inhibits hyperpolarization-activated cyclic nucleotide-gated (HCN) channel currents in rat dorsal root ganglion neurons” by Gehoon Chung, Tae-hyung Kim, Hyewon Shin, Eunhee Chae, Hanju Yi, Hongsik Moon, Hyun Jin Kim, Joong Soo Kim, Seog Bae Oh, from The Korean Journal of Physiology & Pharmacology. Vol 16 (4) 237-241, 2012.

We regret to inform that the published paper included a few parts that disclosed confidential information which should have been protected under patent law. We admit that the request for retraction is due to the indiscretion of the authors, and confirmed that editorial committee of KJPP have not conducted any fault in publishing the paper.

Chung G, Kim TH, Shin H, Chae E, Yi H, Moon H, Kim HJ, Kim JS, Jung SJ, Oh SB.

A novel carbamoyloxy arylalkanoyl arylpiperazine compound (SKL-NP) inhibits hyperpolarization-activated cyclic nucleotide-gated (HCN) channel currents in rat dorsal root ganglion neurons. *Korean J Physiol Pharmacol.* 2012;16:237-241.

4. RN-4: SCIE–11928

Heart, Lung and Circulation (2019) 28, e152 1443-9506/04/$36.00
https://doi.org/10.1016/j.hlc.2019.08.007
RETRACTION NOTICE

Retraction Notice to ‘‘**Peripheral ‘‘Right to Right” Extracorporeal Membrane Oxygenation for Right Heart Failure Following Left Ventricular Assist Device Insertion**” [Heart Lung Circ 2019;28(Suppl. 3):S129]

Yashutosh Joshi, Jean-Michel Grinda, Marie-Cecile Bories, Christian Latremouille, Jerome Jouan
Georges Pompidou European Hospital, Paris, France

This article has been retracted: please see Elsevier Policy on Article Withdrawal (https://www.elsevier.com/about/our-business/policies/article-withdrawal).

This article has been retracted at the request of the Authors. This abstract has been published due to a miscommunication in the ANZSCTS ASM conference supplement. It needs to be retracted as we the authors wish to submit a full length paper with updated material.

DOI of original article: https://doi.org/10.1016/j.hlc.2019.02.183

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