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**SYNAESTHESIA, METAPHOR
AND COGNITION:
A CORPUS-BASED STUDY ON
SYNAESTHETIC ADJECTIVES
IN MANDARIN CHINESE**

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Synaesthesia, Metaphor, and Cognition: A
Corpus-Based Study on Synaesthetic Adjectives in
Mandarin Chinese

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A thesis submitted in partial fulfillment of the
requirements for the degree of Doctor of
Philosophy

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ZHAO Qingqing

Abstract

Linguistic synaesthesia involving description of one sensory modality in terms of concepts from another sensory modality, such as *sweet voice* and 冷色 *leng3 se4* ‘cold color’, is employed across discourse types (i.e., poetic and ordinary), time periods (i.e., synchronic and diachronic), and language families (e.g., Indo-European, Sino-Tibetan, and Semitic). The kind of language use has, however, not received much attention in linguistic research, although manifesting as mapping from one bodily domain to another bodily domain would pose challenges to Conceptual Metaphor Theory and the theory of embodiment. This thesis thus aimed to conduct a systematic and comprehensive lexical semantic study on linguistic synaesthesia of Mandarin sensory adjectives from a corpus-based approach, to explore the tendencies of Mandarin synaesthesia, and to examine the theoretical implications of linguistic synaesthesia.

This study proposed a linguistic synaesthesia identification procedure (LSIP) to extract synaesthetic data for Mandarin sensory adjectives from the Sinica corpus, which was adapted from Pragglejaz Group (2007)’s well-established metaphor identification procedure (MIP). The proposed identification procedure for linguistic synaesthesia was demonstrated to be also applicable to other languages from other corpora. Based on the distribution of the collected synaesthetic usages of Mandarin sensory adjectives, the study found that Mandarin synaesthesia exhibited directionality mapping from more embodied senses to less embodied ones,

analogous to the attested patterns of linguistic synaesthesia in Indo-European, Hebrew, and Indonesian languages. The directionality of Mandarin synaesthesia is, however, tendencies-based. In addition, Mandarin synaesthesia was attested to show language-specific characteristics when compared to the established tendencies of English synaesthesia, hence inconsistent with the proposal of cross-lingual universality of synaesthetic patterns.

The distribution and directionality of Mandarin synaesthesia demonstrated that neither the embodiment account nor the biological association account of linguistic synaesthesia could be fully supported. The thesis thus suggested an incorporated theoretical model containing both embodiment mechanisms and biological mechanisms, to account for the synaesthetic tendencies of Mandarin sensory adjectives and the language-specific characteristics of linguistic synaesthesia in Mandarin Chinese. Besides, this study has shown that linguistic synaesthesia is a type of metaphor as a linguistic realization of conceptual metaphors, which should be taken into consideration by Conceptual Metaphor Theory. The thesis therefore argued for a finer-grained account of embodiment covering the notions of the degree of embodiment and the type of embodied events, to refine Conceptual Metaphor Theory and the theory of embodiment.

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Table of contents

Abstract.....	ii
Acknowledgements	iv
List of figures.....	xi
List of tables.....	xii
List of abbreviations	xiii
Chapter 1: Linguistic synaesthesia.....	1
1.1 Linguistic synaesthesia and metaphor	4
1.1.1 Transfer models of linguistic synaesthesia	4
1.1.2 Theoretical accounts for underlying mechanisms of linguistic synaesthesia.....	8
1.1.3 Differences between linguistic synaesthesia and metaphor.....	11
1.2 Linguistic synaesthesia in Chinese	14
1.3 Research gaps in linguistic synaesthesia and hypotheses of the thesis	18
1.4 Structure of the thesis.....	20
Chapter 2: A corpus-based approach to identification of linguistic synaesthesia	23
2.1 LSIP: A linguistic synaesthesia identification procedure	24
2.1.1 Identification of the basic sensory meaning.....	25
2.1.2 Classification of human sensory modalities	32
2.1.3 Data collection for Mandarin synaesthetic expressions.....	33

2.2 Overview of extracted data	36
2.2.1 Distributions of synaesthetic data for Mandarin sensory adjectives.....	36
2.2.2 Synaesthetic participation of Mandarin sensory adjectives	38
2.2.3 Sensory associations in Mandarin synaesthetic adjectives	42
2.3 Summary of the chapter	45
Chapter 3: Linguistic synaesthesia of Mandarin tactile adjectives.....	47
3.1 Data distributions of synaesthetic uses of Mandarin tactile adjectives	48
3.2 Tactile adjectives of intensity	49
3.3 Tactile adjectives of quality	54
3.3.1 Temperature	55
3.3.2 Hardness.....	62
3.3.3 Sharpness	67
3.3.4 Dampness.....	71
3.3.5 Smoothness	74
3.3.6 Physical force.....	78
3.3.7 Pain	82
3.3.8 Summary.....	85
3.4 Summary of synaesthetic tendencies of Mandarin tactile adjectives.	86
Chapter 4: Linguistic synaesthesia of Mandarin gustatory adjectives .	88
4.1 Gustatory adjectives of intensity.....	89
4.2 Gustatory adjectives of quality	92

4.3 Summary of synaesthetic tendencies of Mandarin gustatory adjectives	98
4.4 Directionality between touch and taste in Mandarin synaesthesia ..	100
Chapter 5: Linguistic synaesthesia of Mandarin visual, auditory, and olfactory adjectives	103
5.1 Visual adjectives	104
5.1.1 Color	105
5.1.2 Dimension	111
5.1.3 Visual situation	115
5.1.4 Summary of synaesthetic tendencies of Mandarin visual adjectives.....	118
5.1.5 Directionality among touch, taste, and vision in Mandarin synaesthesia.....	119
5.2 Auditory adjectives	120
5.2.1 Synaesthetic tendencies of Mandarin auditory adjectives	120
5.2.2 Directionality among touch, taste, vision, and hearing in Mandarin synaesthesia	122
5.3 Olfactory adjectives	124
5.3.1 Synaesthetic tendencies of Mandarin olfactory adjectives	124
5.3.2 Directionality among touch, taste, vision, hearing, and smell in Mandarin synaesthesia	125
5.4 Embodiment of five senses in Mandarin synaesthesia	130
Chapter 6: Linguistic synaesthesia of Mandarin compound adjectives combining different sensory modalities	134

6.1 Synaesthetic patterns of Mandarin compound adjectives combining different senses.....	135
6.2 Mandarin compound adjectives combining touch, taste, and vision	142
6.3 Adjectives combining different senses and adjectives involving one sense in Mandarin synaesthesia	145
Chapter 7: From linguistic synaesthesia to conceptual metaphor theory and embodiment.....	149
7.1 Mandarin synaesthetic tendencies and competitive theoretical models	150
7.1.1 Directionality and perceived similarity.....	150
7.1.2 Cross-lingual universality and biological connections	154
7.1.3 An incorporated theoretical model for linguistic synaesthesia.	157
7.2 Linguistic synaesthesia as a sub-type of metaphor	160
7.3 A finer-grained account of embodiment.....	164
7.4 Summary of theoretical implications of linguistic synaesthesia.....	167
Chapter 8: Conclusion.....	170
Appendix 1. Distributions of synaesthetic uses of Mandarin tactile adjectives in the Sinica corpus.....	173
Appendix 2. Distributions of synaesthetic uses of Mandarin gustatory adjectives in the Sinica corpus	181
Appendix 3. Distributions of synaesthetic uses of Mandarin visual adjectives in the Sinica corpus	184

Appendix 4. Distributions of synaesthetic uses of Mandarin auditory adjectives in the Sinica corpus	195
Appendix 5. Distributions of synaesthetic uses of Mandarin olfactory adjectives in the Sinica corpus	196
References.....	197

List of figures

Figure 1: A linear model for linguistic synaesthesia	5
Figure 2: A transfer hierarchy for linguistic synaesthesia (Williams 1976: 463).....	7
Figure 3: Directional tendencies between touch and taste in Mandarin synaesthesia.....	101
Figure 4: Directional tendencies among touch, taste, and vision in Mandarin synaesthesia	120
Figure 5: Directional tendencies among touch, taste, vision, and hearing in Mandarin synaesthesia.....	123
Figure 6: The general hierarchy of five senses in Mandarin synaesthesia.....	128

List of tables

Table 1: Distributions of synaesthetic data for Mandarin sensory adjectives.....	37
Table 2: Synaesthetic participation rates of Mandarin sensory adjectives for five senses	40
Table 3: Synaesthetic participation rates of the top 10% of the most frequent Mandarin sensory adjectives for five senses	41
Table 4: Sensory associations in Mandarin synaesthetic adjectives ...	43
Table 5: Sub-types of touch for Mandarin tactile synaesthetic adjectives.....	49
Table 6: Sub-types of vision for Mandarin visual synaesthetic adjectives.....	105
Table 7: A summary of synaesthetic transfers between five senses in Mandarin synaesthesia	126
Table 8: Data distributions of synaesthetic uses of Mandarin compound adjectives combining different sensory modalities ..	136
Table 9: Synaesthetic distributions of Mandarin compound adjectives combining touch, taste, and vision.....	144

List of abbreviations

ASP	Aspect
AUX	Auxiliary
CL	Classifier
CMT	Conceptual Metaphor Theory
GEN	Genitive
LSIP	Linguistic synaesthesia identification procedure
MED	Middle English Dictionary
MIP	Metaphor identification procedure
MIPVU	Metaphor identification procedure VU University Amsterdam
NEG	Negation
NOM	Nominalization
OED	Oxford English Dictionary
PAR	Particle
PL	Plural

Chapter 1: Linguistic synaesthesia

Synaesthesia (with an alternative spelling as *synesthesia*), based on the etymological roots *syn* ‘together’ and *aisthesia* ‘perception’ in Greek, describes a situation where perceptions in different sensory modalities are associated in both perceptual experiences and verbal expressions (Cytowic 1993; Popova 2005; Shen and Eisenman 2008).^{1, 2}

Synaesthesia in cognitive perceptions, named neurological synaesthesia alternatively, is a phenomenon in which specific individuals manifest a capacity to experience sensations in one modality when another modality stimulated or to have a percept in one sub-modality elicited by the stimulus belonging to another sub-modality, such as tasting shapes, perceiving colors from black-printed graphemes, and so on (see Cytowic 1993; Cytowic 2002 [1989]; Ronga et al. 2012). Neuroscientists, such as Ramachandran and

1 It is interesting to note that the preference for the spellings of synaesthesia varies across different regions and disciplines. For instance, the spelling with *a* (i.e., *synaesthesia*) is used frequently by European scholars, such as Ullmann (1957), while the spelling without *a* (i.e., *synesthesia*) is preferred by American researchers, such as Marks et al. (1987). In addition, the former spelling is generally chosen by linguists (e.g., Williams 1976), whereas the latter one is utilized more frequently by neuroscientists (e.g., Ramachandran and Hubbard 2001). The thesis, focusing on the linguistic realizations of synaesthesia, will use the with-*a* spelling that is orthographically closer to the etymological origin of the term hereinafter.

2 With respect to the two kinds of synaesthetic phenomena, the thesis will devote more effort to the synaesthetic realizations in languages. Nevertheless, it will also show what the patterns of synaesthesia in verbal expressions would inform for synaesthesia in perceptions.

Hubbard (2001) and Hubbard and Ramachandran (2005), proposed that synaesthesia in perceptions is a neural disorder caused by defective pruning of connections between brain regions. More recent studies, such as Ward et al. (2006), Marks and Mulvenna (2013a), and Banissy et al. (2014), however, have considered neurological synaesthesia a special cognitive condition, which recruits cross-modal mechanisms perceptually and cognitively common to all human beings rather than special neural pathways absent for most people.

Synaesthesia in verbal expressions, also called linguistic synaesthesia and synaesthetic metaphor, involves the use of lexical items for perception in one sensory modality to describe perceptions in other modalities (Preminger et al. 1974 [1965]). Researchers, such as Ullmann (1966 [1963]) and Viberg (1983), have found that the kind of linguistic expression is employed across different languages. For instance, English gustatory adjective *sweet* can be used to describe an auditory perception, as in the phrase *sweet voice*, and Mandarin tactile adjective 冷 *leng3* ‘cold’ can modify a visual perception, as in the expression 冷色 *leng3 se4* ‘cold color’.³

Extensive studies have been conducted on neurological synaesthesia for further understanding of human perception and cognition (see Cytowic 2002 [1989]; Simner and Hubbard 2013; Banissy et al. 2015). By contrast, less attention has been given to linguistic synaesthesia, especially synaesthetic

³ It is on the controversy whether synaesthesia in linguistic expressions is a metaphor or not (see Shen 1997; Rakova 2003), which this study attempts to resolve. Thus, I will use the more neutral term “linguistic synaesthesia” throughout the thesis.

usages in ordinary languages, which have been demonstrated to be widespread in human languages and would pose challenges to Conceptual Metaphor Theory (CMT) and the theory of embodiment (see Lakoff and Johnson 1980; Lakoff and Johnson 1999) (Zhao et al. 2018b, in press). In addition, there is increasing research suggesting the important role of linguistic synaesthesia in investigating neurological synaesthesia and the interaction of neuro-cognitive activities with linguistic conceptualizations (Cacciari 2008; Marks and Mulvenna 2013b; Caballero and Paradis 2015). This thesis thus aims to examine linguistic synaesthesia in an ordinary language systematically by adopting a corpus-based approach. Specifically, based on distributions of synaesthetic expressions in the corpus, I will examine: (1) what tendencies linguistic synaesthesia in Mandarin Chinese exhibit, and how these tendencies can be explained and predicted; (2) whether Mandarin synaesthesia shares the same tendencies with English synaesthesia. To put it in another way, whether the hypothesis of cross-lingual universality of synaesthetic patterns proposed by Williams (1976), can be supported by linguistic synaesthesia in Mandarin; and (3) whether linguistic synaesthesia can be subsumed under metaphor as a linguistic realization of conceptual metaphors following embodiment principles.

In what follows, this chapter will firstly present the research background of linguistic synaesthesia, including previous studies on linguistic synaesthesia in general (i.e., Section 1.1) and on Chinese synaesthesia in particular (i.e., Section 1.2). Section 1.3 will propose the hypotheses of this study and the last section will show the organization of the thesis.

1.1 Linguistic synaesthesia and metaphor

Previous research on linguistic synaesthesia mainly focused on the transfer tendencies and the underlying mechanisms of synaesthetic mappings. More recent studies, such as Strik Lievers (2017), however, have started to examine the nature of linguistic synaesthesia, i.e., the relationship between linguistic synaesthesia and metaphor. This section will present the research background about these three issues concerning linguistic synaesthesia.

1.1.1 Transfer models of linguistic synaesthesia

Studies on linguistic synaesthesia reported are mainly based on Indo-European languages, demonstrating that linguistic synaesthesia follows directionality tendencies (Ullmann 1957; Williams 1976; among others). Such tendencies have been described in two different transfer models in the literature.

The first model originated from research on linguistic synaesthesia in poetic languages by Ullmann (1945, 1957, 1966 [1963]). Based on around 2,000 synaesthetic examples collected from English, French, and Hungarian poems in the nineteenth century, Ullmann (1957) found that over 80% of the synaesthetic expressions conformed to the directional tendency described by the model in Figure 1.

Touch → Taste → Smell → Hearing → Vision

Figure 1: A linear model for linguistic synaesthesia

Shen (1997) confirmed this linear model (i.e., Figure 1) for Hebrew poetry. Besides, Shen and his colleagues (Shen 1997; Shen and Cohen 1998; Shen and Eisenman 2008; Shen and Gadir 2009) also demonstrated the validity of the model with various experimental studies on ordinary Hebrew and English, which involve tasks such as interpretation generation, recall, naturalness judgements, and so forth. For example, they showed that synaesthetic expressions that follow a directional tendency (e.g., *stinking paleness*) are easier to recall and are judged as more natural than the expressions that violate the tendency (e.g., *pale stink*). Shen and Gil (2008) conducted both the corpus-based and the experimental studies on linguistic synaesthesia in Indonesian, showing that the directionality principle in Figure 1 holds for Indonesian synaesthesia as well. It should be noted, however, that all these studies by Shen's team are generally based on a small sample size, in terms of both the corpus data for generalization of directional tendencies and the testing stimuli utilized in experiments.

Strik Lievers (2015) employed a large data sample extracted automatically from the ukWaC and itWaC corpora through a computational approach, to test the linear transfer model for linguistic synaesthesia (cf. Figure 1) in ordinary English and Italian. The study verified the model for both English synaesthesia and Italian synaesthesia, and further claimed that the directional tendencies of linguistic synaesthesia should be interpreted as frequency rather than as absolute constraints. Therefore, Strik Lievers' (2015)

research would suggest that the directionality of linguistic synaesthesia is more likely to be tendencies-based, where synaesthetic mappings with one direction occur more frequently than those with the reverse direction, rather than the mappings with the reverse direction cannot be found in real languages. One methodological concern with respect to this corpus-based study, however, raised by Winter (2016a), is that the research did not take into consideration the distinction between the types and the tokens of synaesthetic transfers, both of which should be considered to figure out the mapping directionality in linguistic synaesthesia.

The second transfer model of linguistic synaesthesia was proposed by Williams (1976), as shown in Figure 2. By referring to the citation dates in OED (Oxford English Dictionary) and MED (Middle English Dictionary), Williams generalized the model by focusing on adjectives used for more than one sensory domain in the history of English. Williams (1976) assumed that English sensory adjectives would follow this model when they changed their meanings among sensory modalities, and that if synaesthetic transfers violated the pattern, the resultant sensory meanings tended to become obsolete in the language. For instance, the study illustrated that the tactile meaning of the adjective *eager* was not retained in Standard English, although the adjective was attested to have a tactile meaning as the result of a transfer from taste to touch in the history of English (see Williams 1976: 476). Furthermore, Williams (1976) also claimed that the hierarchy described in Figure 2 should be applicable to any language in the world, given the universality of the biological nature of human sensory modalities.

Lehrer's (1978) synchronic study on English sensory adjectives corroborated this model (cf. Figure 2), but challenged the exclusive reliance on citations in dictionaries by Williams (1976), in consideration of the lack of written materials of earlier periods of English. She added that some unpredicted transfers by the model in Figure 2 could still be used in English, such as the dimension item *fat* (belonging to vision) employed for taste (Lehrer 1978: 120).

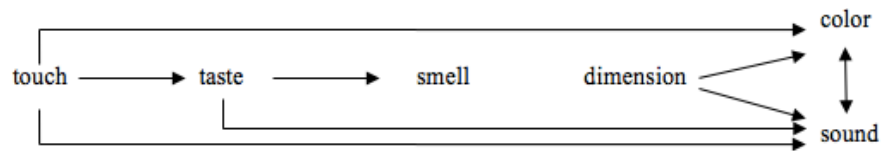


Figure 2: A transfer hierarchy for linguistic synaesthesia (Williams 1976: 463)

The two transfer models of linguistic synaesthesia assign identical directionality involving touch, taste, and smell, as seen in Figures 1 and 2. The main difference between the two models is the relationship between vision and hearing: while hearing precedes vision in Figure 1, both directions between hearing and vision are attested in Figure 2. The discrepancy is not, strictly speaking, contradictory, as Williams' (1976) model in Figure 2 classified vision into two different domains: dimension and color. Since both are models of directional tendencies that do not claim to be strict rules, the same set of data could be consistent in both models. In sum, studies on linguistic synaesthesia in Indo-European, Hebrew, and Indonesian languages have confirmed that tendencies of directionality in synaesthetic transfers are shared by different languages.

1.1.2 Theoretical accounts for underlying mechanisms of linguistic synaesthesia

There is a debate on mechanisms underlying linguistic synaesthesia. One theoretical model for linguistic synaesthesia was proposed in the framework of Cognitive Linguistics, which has generally treated linguistic synaesthesia as a specific type of metaphor (Geeraerts 2010). The explanatory model claimed that linguistic synaesthesia, similar to other types of metaphor, is also grounded in what and how our bodies experience the world, i.e., the perceived similarity of intensity and subjective evaluation, which thus follows the tendency mapping from more embodied domains to less embodied ones (Shen 1997; Popova 2005; among others). As the source domain and the target domain of linguistic synaesthesia are both bodily sensory modalities, Shen (1997) argued that additional features should be introduced to differentiate the degrees of embodiment of different sensory perceptions. For example, the study pointed that touch and taste necessarily involve physical contact between sensory organs and perceived objects, while the other three modalities (i.e., vision, hearing, and smell) do not require such physical contact. In addition, Shen (1997) also suggested that tactile perceptions, unlike other senses, do not require a specialized sensory organ, but instead have receptors all over the body. Therefore, the study claimed that touch is the most embodied sense, and taste follows, while vision, hearing, and smell are less embodied. Furthermore, Shen (1997) has also contended that directions of linguistic synaesthesia described in Figure 1 (cf. pp. 5) are

constrained by such embodiment principles, i.e., mapping from more embodied modalities to less embodied ones. Similarly, Popova (2005: 416) also suggested that embodiment is realized “at its strongest in touch,” since scalarity and subjective evaluations of sensory stimuli dominate the perceptual experiences of touch (including taste), but not those of vision and hearing. Hence, she assumed that the conceptualization of perceptual properties in vision and hearing in terms of concepts from touch and taste, illustrated the move from the more embodied to the less embodied.

The embodiment account for linguistic synaesthesia, however, has been criticized for its disregard of neural associations in the brain, as well as earlier occurrences of linguistic synaesthesia in the speech of young children compared to other types of metaphor, which might indicate that biological factors are at work (see Gardner 1974; Keil 1986; Marks et al. 1987; Seitz 1997; Seitz 2005). For instance, Ramachandran and Hubbard (2001: 18) have proposed that linguistic synaesthesia is the same as neurological synaesthesia, as both are shaped by “anatomical constraints” that permit “certain types of cross-activation, but not others,” while Seitz (2005: 90) pointed out that linguistic synaesthesia is an “inborn metaphorical association” “pre-wired” in brains. Linguistic studies, such as Williams (1976) and Rakova (2003), also followed the biological association account to search for linguistic synaesthesia. For example, Rakova (2003) has suggested that the tactile meaning and the gustatory meaning of English adjective *hot* are associated because of the same neural pain-detecting mechanism (i.e., VR1, Caterina et al. 1997), rather than through metaphorical mappings. Besides, Rakova (2003: 64) assumed that neurological synaesthesia is a “strong synaesthesia” and

linguistic synaesthesia is a “weak synaesthesia,” both of which, however, are analogous with respect to the innate nervous associations between senses. This biological association account of linguistic synaesthesia, nevertheless, has also been challenged. For instance, Day (1996) compared types of neurological synaesthesia documented in Cytowic (2002 [1989]) with linguistic synaesthesia collected from English and German novels, and found that the two kinds of synaesthetic phenomena did not share the same patterns. The study demonstrated, for example, that colored sounds are the most common for neurological synaesthesia, while tactile sounds are the most frequent for linguistic synaesthesia. Another criticism of the biological association account for linguistic synaesthesia is that the theory does not provide any explicit explanation for the directional tendency of linguistic synaesthesia, as pointed out by Popova (2005).

Zhao et al. (2018b, in press) tested the two rival theoretical models of linguistic synaesthesia, based on their different predictions of synaesthetic tendencies in languages, i.e., directionality of mapping from the more embodied to the less embodied suggested by the embodiment account and cross-lingual universality of synaesthetic patterns predicted by the biological association account. The study found that the distribution of synaesthetic uses of gustatory adjectives in both Mandarin and English could not be explained or predicted by either single theory. Zhao et al. (2018b, in press) has thus argued that linguistic synaesthesia is motivated by the interaction of neuro-cognitive activities with linguistic conventions of conceptualizations.

To summarize, the embodiment account and the biological association account of linguistic synaesthesia have both been challenged. Besides, it has

also been demonstrated that neither single theory can predict all synaesthetic regularities in human languages.

1.1.3 Differences between linguistic synaesthesia and metaphor

Theoretical controversies cannot only be found on mechanisms underlying linguistic synaesthesia, but also on the nature of linguistic synaesthesia as noted by Strik Lievers (2017). Within the rhetorical tradition of metaphor, linguistic synaesthesia was regarded as a type of metaphor, as a kind of language use describing one entity in terms of another on the basis of similarity (Osgood et al. 1978 [1957]; Viberg 1983; Qian 1985; Geeraerts 2010). In the framework of Cognitive Linguistics, particularly within CMT, linguistic synaesthesia has also been considered a specific type of metaphor, as it involves mappings of concepts from one domain to another domain (Shen 1997; Yu 2003; Popova 2005). However, as pointed by Rakova (2003) and Peng and Bai (2008), linguistic synaesthesia is not the same with typical metaphorical expressions that generally map from bodily domains to non-bodily domains (Steen 1999; Gibbs 2011). It is therefore arguable whether linguistic synaesthesia can be properly analyzed as a sub-type of metaphor. Before answering the question, it would be better to figure out the differences between linguistic synaesthesia and typical metaphors.

Following CMT, metaphor is not only a matter of words, but also a conceptual mechanism structuring human thoughts and actions, of which

systematic metaphorical expressions using the concrete to describe the more abstract, such as journeys for love and wars for arguments, are crucial supporting evidence for metaphors in conceptual systems (Lakoff and Johnson 1980; Johnson 1987). Unlike such typical metaphorical expressions whose source domains exhibit an evident contrast with target domains concerning embodiment and concreteness, linguistic synaesthesia has source domains and target domains that are both embodied and concrete sensory modalities.

Linguistic synaesthesia also shows different characteristics from the prototypical metaphorical expressions with respect to the directional tendencies. Strik Lievers' (2015) corpus-based study has attested that linguistic synaesthesia does not follow absolute directionality of mappings from the more embodied to the less embodied, as transfers violating the directional tendency can also be found. For example, although the transfers from touch to hearing occupy 23.2% of all English synaesthetic examples collected by Strik Lievers (2015), there are still 0.2% of such total examples found to exhibit the transfer direction from hearing to touch (Strik Lievers 2015: 80). This pattern, however, has not been reported for the typical metaphorical expressions mapping from the concrete to the abstract (see Lakoff and Johnson 1980; Sweetser 1990; Lakoff and Johnson 1999 etc.). Furthermore, more recent studies, such as Zhao et al. (2018b, in press) and Zhao and Huang (2018), have established that the tendencies of linguistic synaesthesia cannot be accounted for or predicted completely by the embodiment mechanism. On the contrary, the mechanism has been widely recognized to underlie typical metaphors conceptualizing non-bodily

experiences in terms of bodily experiences (Lakoff and Johnson 1980; Sweetser 1990; Gibbs 2011).

It should also be noted that methodologies adopted to examine linguistic synaesthesia and metaphors are not the same. Specifically, studies on metaphorical expressions mainly begin with the concepts expressed by lexical items (Steen 1999), based on which conceptual domains and mapping directions are determined subsequently (e.g., Clausner and Croft 1999; Paradis 2001; Grady 2005; Lien 2005; Ou 2014; among many others). Take the expression *my mind just isn't operating today* for example (see Lakoff and Johnson 1980: 27), the contextual meaning of *operating* can be figured out to express a concept related to the mind in the first place, which, however, has a literal meaning concerned with machines. The lexical item can thus be analyzed to illustrate the mapping from the conceptual domain of MACHINE to the conceptual domain of MIND in the example. Research on linguistic synaesthesia generally begins with sensory domains, based on which transfers of sensory items involving more than one sensory domain are then determined (e.g., Ullmann 1957; Williams 1976; Shen 1997; Strik Lievers 2015; among others). For instance, Williams (1976: 476) distinguished six sensory domains firstly, and then figured out the adjective *sweet* with the original sensory domain of taste, which can have an auditory use in contemporary English, such as *sweet voice*. The study thus generalized the transfer direction for the adjective from the sensory domain of taste to the sensory domain of hearing. It is interesting to mention that there have been studies on conceptual metaphors to utilize the domain-based, rather than the concept-based approach, to examine the interaction between established ontological

knowledge and conceptual mappings, such as Ahrens (2002) and Chung et al. (2013).

Linguistic synaesthesia manifesting itself as mapping from one bodily experience to another bodily experience, therefore, exhibits distinct characteristics from typical metaphors, with respect to the contrast of embodiment between source domains and target domains as well as the directional tendencies of mappings. Besides, theoretical explanations and research methods for these two kinds of linguistic expressions are not identical as well. Given the differences between linguistic synaesthesia and typical metaphors, the thesis will explore whether the unique characteristics of linguistic synaesthesia suffice to treat linguistic synaesthesia as a distinctive linguistic construction essentially different from metaphors; if not, how such characteristics of linguistic synaesthesia can be captured by CMT.

1.2 Linguistic synaesthesia in Chinese

Linguistic synaesthesia in Chinese has not received as much attention as in Indo-European languages (Zhao et al. 2018b, in press). Most earlier studies on Chinese synaesthesia mainly focused either on specific Chinese counterparts of English synaesthetic uses (e.g., Li 1996; Wang 2002; Wang and Xu 2002; Yang and Zhang 2007; Peng and Bai 2008; Wang 2008), or on synaesthetic usages in poetic Chinese (e.g., Qian 1985; Yu 2003). One exception is Lien's (1994) study on linguistic synaesthesia in the Chinese dialect of Southern Min, where a unidirectional transfer hierarchy of

synaesthetic words has been proposed. In the Lien's (1994) model, dimension is the lowest sense generally acting as the source domain in synaesthetic transfers, while smell is the highest modality normally as the target domain of linguistic synaesthesia, which is thus different from the transfer models generalized for linguistic synaesthesia in Indo-European, Hebrew, and Indonesian languages (cf. Section 1.1.1).

More recent research on Chinese synaesthesia has begun to examine language-specific characteristics of linguistic synaesthesia in Chinese, such as Xiong and Huang (2015), Zhao and Huang (2015), Zhao et al. (2015), Zhao and Huang (2018), Zhao et al. (2018b, in press), and Zhao et al. (2018c, in press). These studies have shown that Chinese synaesthesia does exhibit different tendencies when compared to English synaesthesia. For instance, Xiong and Huang (2015) found that the gustatory adjective 苦 *ku3* 'bitter' in Mandarin Chinese could be used for the olfactory domain, while the gustatory adjective *bitter* in English did not show the transfer. Similarly, Zhao and Huang (2015) also attested that the synaesthetic tendencies of Mandarin tactile, gustatory, and olfactory adjectives are not consistent with the hierarchy generalized by Williams (1976) for English sensory adjectives. Besides, Zhao et al. (2018b, in press) employed a corpus-based approach to examine linguistic synaesthesia of Mandarin and English gustatory adjectives. The study also confirmed that Mandarin and English did not share the same synaesthetic tendencies on gustatory adjectives, where vision preceded hearing on the synaesthetic hierarchy for Mandarin gustatory adjectives, while vision followed hearing on the synaesthetic hierarchy for English gustatory adjectives. Based on Mandarin sensory adjectives with more than

one sensory meaning in 現代漢語詞典 *Xian4-dai4 han4-yu3 ci2-dian3* ‘Contemporary Chinese Dictionary’, Zhao and Huang (2018) generalized a synaesthetic hierarchy for Mandarin sensory adjectives, where, for example, touch and taste could be source domains for each other in synaesthetic mappings, which is hence different from English synaesthesia in accordance with Williams (1976).⁴ In addition, Zhao and Huang (2018) also proposed that the salience of sensory modalities in the human sensory system, in addition to the physical contact, is a factor to motivate the transfer directions of linguistic synaesthesia. While all these studies have established that Mandarin shows language-specific characteristics in linguistic synaesthesia, they are mainly based on a small sample of synaesthetic examples, i.e., either on linguistic synaesthesia for specific lexical items and sensory domains or on synaesthetic adjectives from the dictionary. Thus, a large-scale empirical data from corpora is still needed for the general tendencies of Mandarin synaesthesia.

Another perspective concerning research on Chinese synaesthesia is to examine the distribution and function of linguistic synaesthesia in Chinese. Studies such as Xiong and Huang (2016) and Huang and Xiong (2018, in

⁴ Please note that the sensory adjectives that Zhao and Huang (2018) employed have their different sensory meanings differentiated into distinct sememe entries in the dictionary, which are thus so-called polysemous words. By contrast, this study will explore a larger sample of Mandarin sensory adjectives, which show different sensory distributions in the corpus rather than are annotated as polysemous with respect to sensory meanings in the dictionary. For more information about polysemy in lexical semantics, please see Ibarretxe-Antuñano (1999).

press) have shown that linguistic synaesthesia cannot only occur in diverse genres of Chinese texts (e.g., poems, novels, Chinese translation texts of Buddhism, and ordinary Mandarin), but also function in multiple levels of Chinese including semantic compositions of Chinese characters, words, and phrases. Besides, Zhao et al. (2018c, in press) demonstrated that linguistic synaesthesia with systematic distributions in both poetic and ordinary Chinese would be a significant research topic from both the linguistic and the inter-disciplinary perspectives. For instance, the study claimed that Chinese synaesthesia would pose a challenge to the hypothesis of the cross-lingual universality of a synaesthetic mapping model in human languages, and could provide implications for the embodiment theory in cognitive science and for neurological synaesthesia in brain science.

It is also remarkable that Mandarin Chinese, as a Sino-Tibetan language (Chen 1999), is typologically distinct from Indo-European, Hebrew, and Indonesian languages. A systematic and comprehensive study on linguistic synaesthesia in Mandarin Chinese would thus establish more meaningful correlations between linguistic behaviors in general and theoretical accounts for linguistic synaesthesia in human languages. As shown by Strik Lievers (2015) and Winter (2016a) that linguistic synaesthesia is productive in sensory adjectives, this study will also focus on the distribution of the synaesthetic expressions of Mandarin synaesthetic adjectives (i.e., adjectives

used for more than one sense) in the corpus, to explore the general tendencies and the theoretical explanations for Mandarin synaesthesia.⁵

1.3 Research gaps in linguistic synaesthesia and hypotheses of the thesis

There are notable gaps of research on linguistic synaesthesia in two levels: one is linguistic synaesthesia in human languages generally, and the other is linguistic synaesthesia in Mandarin Chinese particularly.

Studies on linguistic synaesthesia in Indo-European, Hebrew, and Indonesian languages have shown similar patterns of synaesthetic tendencies, thus providing few implications to support or disprove the two rival theoretical accounts of linguistic synaesthesia. In other words, neither the directionality of linguistic synaesthesia predicted by the embodiment account, nor the cross-lingual universality of synaesthetic patterns assumed by the biological association account, has been confuted. On the other hand, both explanatory models have been established to only account for a part of synaesthetic uses when taken into consideration exclusively (Zhao et al. 2018b, in press), which might indicate the necessity of more and finer-grained

⁵ One more recent study, i.e., Strik Lievers and Winter (2018), has found that different sensory modalities are encoded differently across lexical categories including nouns, verbs, and adjectives in English. Thus, it would be interesting to examine whether linguistic synaesthesia used frequently among adjectives, rather than among verbs or nouns, is related to the lexical patterns of human senses, which will be left for future studies.

constructs for either of the theoretical models. Therefore, more comprehensive data covering typologically diverse languages, is sorely needed for both the transfer tendency and the theoretical explanation for linguistic synaesthesia.

The general research gaps of linguistic synaesthesia would be likely to be filled up by examining synaesthetic tendencies of Mandarin Chinese, which is a member of the Sino-Tibetan language family (Chen 1999), typologically distinct from Indo-European, Hebrew, and Indonesian languages. Given that both general transfer patterns and theoretical explanations for Mandarin synaesthesia call for closer and deeper examination (see Section 1.2), the thesis thus aims to conduct a systematic and comprehensive lexical semantic study on Mandarin synaesthesia, by focusing on the corpus distribution of Mandarin synaesthetic adjectives.

As elaborated in Section 1.2, previous studies such as Zhao and Huang (2015), Zhao and Huang (2018), Huang and Xiong (2018, in press), Zhao et al. (2018b, in press), and Zhao et al. (2018c, in press) employed a somewhat small sample of data to demonstrate that Mandarin synaesthesia showed different directional tendencies from linguistic synaesthesia in Indo-European, Hebrew, and Indonesian languages, which could not be accounted for by the embodiment model or the biological association model exclusively. My corpus-based study hypothesizes that: (1) Mandarin synaesthesia would also exhibit directional tendencies, but show language-specific characteristics when compared to English synaesthesia, when a large-scale sample of synaesthetic data considered. In other words, linguistic synaesthesia would be subject to cultural differences; (2) linguistic synaesthesia would be the

least likely to be grounded in one single mechanism, i.e., the embodiment motivation or the biological association. Instead, I will argue for an incorporated theoretical model suggesting multiple underlying mechanisms for linguistic synaesthesia; and (3) linguistic synaesthesia would be a type of metaphor as a kind of linguistic realizations of conceptual metaphors by its very nature, despite displaying differences from typical metaphors. My study will suggest a finer-grained account of embodiment to enrich CMT and the embodiment theory, to ensure that the characteristics of linguistic synaesthesia can be captured and predicted by the two theories.

1.4 Structure of the thesis

Chapter 2 will propose a linguistic synaesthesia identification procedure (LSIP) to extract Mandarin synaesthetic adjectives, based on which data collection and analysis will be elaborated. In this chapter, I will also present an overview of the extracted synaesthetic data, to give a brief impression that sensory associations between different modalities in Mandarin expressions (i.e., Mandarin synaesthesia) are not random, but instead conform to certain patterns.

Chapters 3 and 4 will focus on transfer patterns and underlying mechanisms of linguistic synaesthesia of Mandarin tactile and gustatory adjectives respectively, as touch and taste are the two most predominant sensory modalities involving linguistic synaesthesia based on the collected Mandarin synaesthetic data. In these two chapters, it will be shown that

although most synaesthetic transfers of Mandarin tactile and gustatory adjectives can be predicted by the embodiment account, there are notable synaesthetic uses of the adjectives supporting the biological association account. In addition, the two chapters will also establish that linguistic synaesthesia of Mandarin tactile and gustatory adjectives can be grounded in multiple mechanisms, including the perceived similarity, the sensory integration, and the biological association. Another interesting pattern that will be demonstrated in the chapters is that the predominant synaesthetic directionality mapping from touch to taste reported in Indo-European languages (see Ullmann 1957; Williams 1976) cannot be attested in Mandarin.

Linguistic synaesthesia of Mandarin visual, auditory, and olfactory adjectives will be discussed in one chapter, namely, Chapter 5, as vision, hearing, and smell are not as frequent source domains as touch and taste in Mandarin synaesthesia. Moreover, given that vision, hearing, and smell have been suggested to be less embodied than touch and taste (Shen 1997), Chapter 5 will not only test the assumption of the higher degree of embodiment of tactile and gustatory sensations among five senses, but also figure out the embodiment degrees among vision, hearing, and smell in Mandarin Chinese.

Chapter 6 will present additional evidence to support that Mandarin synaesthesia exhibits directional tendencies and human senses manifest themselves with different degrees of embodiment, by focusing on the synaesthetic patterns of Mandarin compound adjectives combining different sensory modalities.

Chapter 7 will figure out the theoretical implications of linguistic synaesthesia, where an incorporated theoretical model will be proposed to

account for linguistic synaesthesia. In this chapter, I will also argue for a finer-grained account of embodiment covering the notions of the degree of embodiment and the type of embodied events, which should be included by CMT and the embodiment theory.

Chapter 8 will summarize the findings of this study and propose the future work.

Chapter 2: A corpus-based approach to identification of linguistic synaesthesia

This thesis focuses on a systematic and comprehensive corpus-based study on Mandarin synaesthetic adjectives for general tendencies and underlying mechanisms of linguistic synaesthesia in Mandarin Chinese. Therefore, this chapter will elaborate the way how the data of Mandarin synaesthesia was collected from a balanced corpus (i.e., the Sinica corpus⁶, Chen et al. 1996) and analyzed for this study. Specifically, Section 2.1 will propose a linguistic synaesthesia identification procedure (LSIP) to extract synaesthetic uses of Mandarin sensory adjectives in the corpus, which includes identification of the basic sensory meanings of Mandarin sensory adjectives, classification of human sensory modalities, and collection of synaesthetic expressions from the Sinica corpus. Following this, Section 2.2 will present an overview of the extracted synaesthetic data based on LSIP, where the data distribution of Mandarin synaesthetic adjectives in the Sinica corpus, synaesthetic participation rates of Mandarin sensory adjectives from five senses, and sensory associations in Mandarin synaesthetic adjectives will be generalized. Section 2.3 will summarize the content of this chapter.

⁶ The Sinica corpus (The Academia Sinica Balanced Corpus) is a balanced corpus for Modern Chinese with part-of-speech tagging (see Chen et al. 1996). The version used in the current study (i.e., the 4th edition) contains 10 million word tokens, which can be accessed at <http://lingcorpus.iis.sinica.edu.tw/modern/>.

2.1 LSIP: A linguistic synaesthesia identification procedure

Linguistic synaesthesia involves mapping from the source domain to the target domain, just like other types of metaphor. Hence, it is reasonable to assume that established procedures for identification of metaphor can be adapted for identification of linguistic synaesthesia.⁷ This study thus adopted and modified the well-established metaphor identification procedure (MIP) proposed by Pragglejaz Group (2007)⁸ and its updated version, i.e., MIPVU, extended by Steen et al. (2010), to identify synaesthetic usages of Mandarin sensory adjectives in the Sinica corpus. The linguistic synaesthesia identification procedure, however, should be applicable to other languages from other corpora.

⁷ Please note that LSIP was adapted from procedures of metaphor identification, as linguistic synaesthesia shares the same characteristic with metaphor with respect to mapping from one domain to another domain. Nevertheless, it is still arguable whether linguistic synaesthesia is a kind of metaphor by its very nature, since linguistic synaesthesia does show differences from prototypical metaphors, including, for instance, the contrast of embodiment between source domains and target domains as well as directional tendencies of mappings (see Section 1.1.3).

⁸ A variety of applications as well as extensions of such a metaphor identification procedure can be found in the literature. For instance, Semino's (2010) study based the description of English pain metaphors on the procedure, and Burgers et al. (2011) extended the procedure to identify verbal irony in discourse. Besides, for the identification of conceptual metaphors specifically, please see Steen (1999).

Both MIP and MIPVU have proposed that it is fundamental for identification of metaphors to determine whether a lexical item “has a more basic contemporary meaning in other contexts than the one in the given context” (Pragglejaz Group 2007: 3). They, therefore, assumed that basic meanings of lexical items are generally “more concrete” (i.e., the evoked entities are easier to imagine, see, hear, feel, smell, and taste), “related to bodily action”, “more precise”, and “historically older” (Pragglejaz Group 2007: 3). With respect to linguistic synaesthesia, both the source domain and the target domain are bodily sensory modalities (Shen 1997; Yu 2003), which thus poses a challenge to MIP and MIPVU on how to determine one sensory use of a lexical item is more basic than another sensory use of it. In other words, apart from the historical information, meanings in source domains and meanings in target domains for sensory items in linguistic synaesthesia would not be likely to show sharp differences concerning the concreteness, relatedness to bodily actions, or preciseness. Thus, to adapt MIP and MIPVU for identification of linguistic synaesthesia, one key point is to find feasible criteria to determine the basic sensory meanings of sensory words.

2.1.1 Identification of the basic sensory meaning

Williams (1976) utilized the historical clue (i.e., citation dates in dictionaries) to decide that the earliest cited sensory meaning of a sensory word is the basic sensory meaning, and that the sensory modality the basic sensory meaning belonging to is the source domain of synaesthetic transfers for the sensory

word. As relying on exclusive evidence by Williams (1976) has been criticized (see Lehrer 1978), this study made use of multiple linguistic clues to ensure more reliable decisions on the basic sensory meanings and the source domains for Mandarin sensory words in linguistic synaesthesia.

Firstly, etymological origins of sensory items in Chinese etymology dictionaries and specific uses of these items in Classic Chinese (particularly in pre-Qin texts) were both taken into consideration, to ensure that the correct etymology was identified. Specifically, I consulted both 說文解字 *Shuo1-wen2 jie3-zi4* ‘Explaining Graphs and Analyzing Characters’ (Xu 1963 [156]) and 說文解字注 *Shuo1-wen2 jie3-zi4 zhu4* ‘Commentary on Explaining Graphs and Analyzing Characters’ (Duan 2007 [1735–1815]) that are two well-established Chinese etymology dictionaries through the online interface of 漢典 *Han4-dian3* ‘Zdic.net’.⁹ In addition, 漢語大字典 *Han4-yu3 da4 zi4-dian3* ‘Great Compendium of Chinese Characters’ (Xu 2010 [1986]) was also consulted to double-check the original meanings of sensory items and to identify the original meanings of sensory items that are not included in 說文解字 *Shuo1-wen2 jie3-zi4* and 說文解字注 *Shuo1-wen2 jie3-zi4 zhu4*. In terms of earlier usages of sensory items in Classic Chinese, I referred to the Classic Chinese database of 漢達文庫 *Han4-da2 wen2-ku4* ‘Chinese Ancient Texts Database (CHANT)’ (D.C. Lau Research Centre 2005).¹⁰

⁹ Accessed at: <http://www.zdic.net/>.

¹⁰ Accessed at: <http://www.chant.org/>.

It is important to note that the philological information of Chinese characters can also provide etymological evidence for lexical items (Wang 1996; Huang and Hsieh 2015), upon which this study also relied to figure out the basic sensory meanings of Mandarin sensory adjectives. For example, the radical 舌 ‘tongue’ in the Mandarin adjective 甜 *tian2* ‘sweet’ (see Xu 1963 [156]) can be considered an additional piece of evidence, to indicate the gustatory origin of the adjective etymologically, since the radical conceptualized the sensory organ which humans normally use to obtain gustatory perceptions. Though glyphic composition information of Chinese characters is an orthographical rule, rather than necessarily the lexical representation of lexical units, the conceptual motivation of the radical in a specific lexical unit would provide a commonly accepted way to conventionalize the basic meaning of the unit, as suggested in various Chinese philological studies, such as Xu (1963 [156]), Wang (1996), and Huang and Hsieh (2015). To put it differently, the original meaning of the lexical unit would be the most likely to be equal to or closely related to the conceptual motivation of the radical. Furthermore, the philological information of characters was employed together with other evidence, rather than exclusively, to attest etymology, which would thus enhance the likelihood to identify the correct etymology for Mandarin sensory words in this study. Take Mandarin adjective 美 *mei3* ‘tasty/beautiful’ for example, it is composed of 羊 + 大 ‘sheep + big’, where the former glyph conceptualized an edible object and the latter one conceptualized a visual perception (Xu 1963 [156]). The original meaning of the adjective was paraphrased as ‘tasty’

in 說文解字 *Shuo1-wen2 jie3-zi4*, and one of its uses in pre-Qin texts is 膾炙與羊棗孰美 *kuai4-zhi4 yu3 yang2-zao3 shu2 mei3* ‘which is more tasty, the toasted shredded meat, or the black oval jujube?’ in 孟子 *Meng4-zi3* (around the 3rd century BC). Therefore, together with the paraphrasing and the earlier usage, the gustatory concept of the character could be motivated rather than the visual concept. It is thus concluded that the adjective 美 *mei3* had an original meaning of ‘tasty’ (taste) but later was developed the meaning of ‘beautiful’ (vision) through linguistic synaesthesia. In general, this study relied on the online interface of Hantology (Chou and Huang 2010)¹¹ for the philological information of Chinese characters.

There are Mandarin sensory words, whose etymological origins cannot be figured out based on the information in historical texts or the orthographical composition of characters. For example, the adjective 濃 *nong2* can be used to describe both the intense taste (taste), such as 濃茶 *nong2 cha2* ‘strong tea’, and the intense color (vision), such as 濃綠 *nong2 lv4* ‘deep green’, which correspond to 醜 *nong2* ‘strong wine’ and 濃 *nong2* ‘dense dew’ in 說文解字 *Shuo1-wen2 jie3-zi4* respectively. Thus, the gustatory modality and the visual modality are both possible source domains for the adjective 濃 *nong2* in linguistic synaesthesia. However, 濃 *nong2* shows a close relation with the adjective 淡 *dan4* ‘not salty/of mild taste’ in Mandarin, both in meaning (i.e., antonymy) and in orthography (i.e., with the

¹¹ Accessed at: <http://hantology.ling.sinica.edu.tw/>.

radical conceptualizing water). This study thus assumed that 濃 *nong2* and 淡 *dan4* should belong to the same sensory modality originally. With respect to the etymology of 淡 *dan4*, its gustatory origin can be attested, as it has the paraphrasing of ‘thin taste’ in 說文解字 *Shuo1-wen2 jie3-zi4*, and one of its earlier uses is 甘苦鹹淡辛酸奇味以口異 *gan1 ku3 xian2 dan4 xin1 suan1 qi2-wei4 yi3 kou3 yi4* ‘sweetness, bitterness, the salty taste, the mild taste, the hot taste, sourness, and the special taste are differentiated by the mouth’ in 荀子 *Xun2-zi3* (around the 3rd century BC). Therefore, 濃 *nong2* was assigned to the gustatory domain with the basic sensory meaning as ‘of intense taste’. Through this comparison analysis, all sensory items without explicit etymological evidence for the source domains in linguistic synaesthesia, were assigned a specific basic sensory meaning in this study.

Another challenging issue, concerning the identification of the basic sensory meanings for Mandarin sensory adjectives, is related to compound words. In principle, this study relied on the etymological meanings of morphemes to determine the basic sensory domains of compound words. Specifically, Mandarin sensory compounds comprising morphemes with the same etymology with respect to the sensory modality, have been considered with the same basic sensory domains as their constituent morphemes. In terms of sensory words composed of morphemes with different sensory modalities etymologically, they have been annotated to be combinations of different sensory modalities. For instance, 甘甜 *gan1-tian2* ‘sweet’ was determined to have taste as its basic sensory domain, since both 甘 *gan1* ‘sweet’ and 甜 *tian2* ‘sweet’ were attested to be gustatory items originally, while 苦澀 *ku3-*

se4 ‘bitter’ was annotated as ‘TASTE + TOUCH’, based on the gustatory origin of 苦 *ku3* ‘bitter vegetable’ and the tactile origin of 澀 *se4* ‘not flowing smoothly’ etymologically. The dealing with the latter kind of sensory compounds is on the consideration that some of such sensory words involve linguistic synaesthesia within the word boundary, and the whole words are concerned with one single sense (Huang and Xiong 2018, in press), such as the sensory adjective 鮮豔 *xian1-yan4* ‘bright in colors’ in which 鮮 *xian1* originally meaning ‘a kind of fish’ underwent a synaesthetic transfer from taste to vision in the compound. Some other sensory adjectives composed of morphemes with different sensory origins, however, are juxtapositions of different sensory morphemes, and the whole adjectives denote more than one piece of sensory information. For example, the Mandarin adjective 細軟 *xi4-ruan3* means ‘thin and soft’ as in the phrase 細軟的頭髮 *xi4-ruan3 de tou2-fa4* ‘the thin and soft hair’, which is related to both vision and touch. The thesis focuses on the synaesthetic uses of Mandarin sensory adjectives, and will not explore linguistic synaesthesia in semantic compositions for words in depth. Thus, the annotation of combination patterns of senses for sensory adjectives consisting of morphemes with different sensory origins is sufficient for discussion in this study. In other words, if these adjectives can be identified to be used for senses nothing related to the senses of constituent morphemes, they can be considered to involve synaesthetic usages. For instance, 苦澀 *ku3-se4* ‘bitter’ in the expression 苦澀的異國香味 *ku3-se4 de yi4-guo2 xiang1wei4* ‘the bitter and exotic fragrance’ was identified as a synaesthetic usage, as it was employed to describe an olfactory perception,

hence involving neither taste nor touch to which the constituent morphemes belong.

To summarize, this study has relied on multiple linguistic clues to identify the basic sensory meanings for Mandarin sensory adjectives, which include the etymological origins paraphrased in Chinese etymology dictionaries, earlier usages of sensory items in Classic Chinese texts, philological composition information of Chinese characters, and the comparison analysis between attested items and unattested items.

It should be mentioned, however, that there have been studies employing experimental methods to decide the accessibility of sensory concepts encoded in sensory items. For instance, Lynott and Connell (2009) and Lynott and Connell (2013) asked participants to rate the perceptual strengths of English sensory words in five sensory modalities (i.e., touch, taste, vision, hearing, and smell). Similarly, Chen et al. (2017) utilized the rating task for Mandarin sensory words. One should acknowledge that specific sensory words might be assigned different basic sensory meanings based on this experimental method from those based on the diachronic approach that this study employed (Winter 2016a). For instance, the Mandarin adjective 澀 *se4* ‘not flowing smoothly’ has been given the highest score on the gustatory meaning (Chen et al. 2017), while it should be regarded as a tactile item originally based on the etymological clues. These two methods, however, are not strictly contradictory, as linguistic facts discovered through them are different. That is, what can be found through the experimental method is the contemporary accessibility of different concepts represented by sensory words, which might be influenced by multiple factors, such as frequency of word usages and

familiarity of words for human subjects (Gibbs 2011). In addition, the accessibility of different sensory concepts in sensory items might only reflect the contemporary endpoint of synaesthetic transfers diachronically. On the contrary, what can be found from the diachronic approach is the mapping course between senses. Furthermore, the diachronic approach has been widely made use of in previous research on linguistic synaesthesia. Thus, an analogous method adopted by this study to that by most reported studies would facilitate the comparison between linguistic synaesthesia in Mandarin Chinese investigated in this thesis and that in other languages in the literature.

2.1.2 Classification of human sensory modalities

Classification of human sensory modalities is also important for the identification of linguistic synaesthesia, as transfer patterns of linguistic synaesthesia would differ, if different classification frameworks of human senses are adopted.

There has not been a consensus on the definition and classification of human senses in the scientific field. For instance, Miller and Johnson-Laird (1976) divided human senses into vision, audition, taste, olfaction, and touch, of which tactile sensations include temperature, pressure, pain, and so forth. Purves et al. (2001 [2000]) proposed a much finer-grained classification for human sensory modalities with multiple layers than Miller and Johnson-Laird (1976) did. Specifically, the study classified human senses into five categories: somatic sensation, which includes perceptions experienced from

mechanical stimuli (e.g., light touch, pressure, cutaneous tension, etc.), painful stimuli, and temperature; vision; audition; vestibular sensation; and chemical sensation, which is associated with the nose and the mouth. Studies on linguistic synaesthesia, however, have widely followed the classification of human senses based on different sensory organs proposed by Aristotle, such as Williams (1976), Strik Lievers (2015), and Zhao et al. (2018b, in press), as the sensory model has been demonstrated to be intuitive to and compatible with linguistic uses (see Miller and Johnson-Laird 1976). It is intriguing that such a sensory organ-based classification of human senses has also been proposed in Buddhism (see Karunadasa 2014; Karunadasa 2015), which is quite a different culture and philosophy from Aristotelianism. With respect to the sensory classification model based on sensory organs in these two philosophies, there have been little evidence to show the inherited relation. Thus, this study also followed the sensory organ-based classification of human sensory modalities, taking the perceptions experienced by eyes for vision, ears for hearing, the tongue for taste, the nose for smell, and the skin, hands, and muscles for touch. Take Mandarin sensory adjectives for example: 亮 *liang4* ‘bright’ is a visual adjective, 響 *xiang3* ‘loud’ is an auditory adjective, 鹹 *xian2* ‘salty’ is a gustatory adjective, 臭 *chou4* ‘smelly’ is an olfactory adjective, while 軟 *ruan3* ‘soft’, 冷 *leng3* ‘cold’, and 痛 *tong4* ‘painful’ are all tactile adjectives.

2.1.3 Data collection for Mandarin synaesthetic expressions

The following steps were employed to collect synaesthetic examples of Mandarin sensory adjectives from the Sinica corpus.

1. Strik Lievers et al. (2013) and Strik Lievers and Huang (2016) proposed a corpus-based approach for extraction of linguistic synaesthesia, which includes three steps: compiling perception-related lexical items, searching for sentences containing at least two perception-related items from two different senses, and manually checking the extracted expressions to select linguistic synaesthetic usages. Following the method, I extracted Mandarin sensory adjectives automatically from two Chinese lexical thesauri, namely, 哈工大信息检索研究中心同义词词林扩展版 HIT-CIR Tongyici Cilin (Extended) (Che et al. 2010) and 知網 HowNet (Dong and Dong 2003).
2. Six lists of Mandarin sensory adjectives were compiled, based on the basic sensory meanings of these adjectives. Five of these word lists are adjectives composed of morphemes with the same etymology in terms of sensory modalities (i.e., one list for one human sense, including touch, taste, vision, hearing, and smell), and one list is adjectives consisting of morphemes with different sensory origins.
3. The adjectives in the compiled lists were searched one by one in the Sinica corpus, and were manually checked whether they were used for senses other than their basic sensory modalities. The identification of synaesthetic uses for Mandarin sensory adjectives in this study included two categories:

- (i) For adjectives composed of morphemes with the same sensory origin, the synaesthetic usage of one adjective was marked, when the usage is related to one sensory modality different from the basic sensory domain of the adjective. For example, the tactile adjective 柔軟 *rou2-ruan3* ‘soft’, consisting of the tactile morphemes 柔 *rou2* ‘soft’ and 軟 *ruan3* ‘soft’, was considered a synaesthetic use in the expression 柔軟的童音 *rou2-ruan3 de tong2-yin1* ‘the soft voice of children’, since the adjective was employed to describe an auditory perception rather than the tactile perception.¹²
- (ii) For adjectives composed of morphemes with different sensory origins, the synaesthetic use was marked, when the sensory usage of an adjective is different from both the sensory modalities of constituent morphemes of the adjective. For instance, the olfactory use of the adjective 濃烈 *nong2-lie4* ‘strong’ in the expression 濃烈刺鼻的油漆味 *nong2-lie4 ci4-bi2 de you2-qi1 wei4* ‘the strong and pungent smell of paint’ was regarded as an instance of linguistic synaesthesia, as the constituent morpheme 濃 *nong2* ‘of intense taste’ is related to

¹² This study followed the word segmentation in the Sinica corpus to avoid the unnecessary dispute, thus, for instance, treating 柔軟 *rou2-ruan3* ‘soft’ as a compound adjective instead of a phrase containing two monosyllabic adjectives. For more information about the word segmentation, please see Chen et al. (1996).

taste and the morpheme 烈 *lie4* ‘scorching’ is concerned with temperature in touch, neither of which belong to smell.

Therefore, the linguistic synaesthesia identification procedure (LSIP) designed for extracting Mandarin synaesthetic data can be summarized as following steps, which should be applicable to identifying linguistic synaesthesia in other languages:

- 1) Extracting perception-related items for a specific language;
- 2) Classifying sensory modalities;
- 3) Determining the basic sensory domains for the extracted sensory items;
- 4) Compiling sensory lists based on the basic sensory domains of the extracted sensory items;
- 5) Extracting usages of the sensory items in the compiled lists from corpora;
- 6) Manually checking whether the extracted usages of sensory items are related to sensory modalities that are not the basic sensory domains of the items;
- 7) If yes, marking the usages as instances of linguistic synaesthesia.

2.2 Overview of extracted data

2.2.1 Distributions of synaesthetic data for Mandarin sensory adjectives

There are 260 Mandarin sensory adjectives, which have been identified with synaesthetic uses in the Sinica corpus, based on the proposed LSIP, as shown in Table 1.

Table 1: Distributions of synaesthetic data for Mandarin sensory adjectives

	Lexical types		Lexical tokens	
	Number	Percentage	Number	Percentage
TOUCH	73	28.1%	2,695	31.3%
TASTE	21	8.1%	2,291	26.6%
VISION	99	38.1%	3,034	35.2%
HEARING	4	1.5%	30	0.3%
SMELL	2	0.8%	32	0.4%
OTHERS*	61	23.4%	538	6.2%
TOTAL	260	100%	8,620	100%

* OTHERS = Compound adjectives combining different sensory modalities

Visual adjectives, tactile adjectives, and compound adjectives composed of morphemes with different sensory origins (i.e., the adjectives grouped in OTHERS in Table 1), are the top three in the extracted synaesthetic data in terms of lexical types, with the percentages of 38.1% (99/260), 28.1% (73/260), and 23.4% (61/260) respectively. By contrast, olfactory and auditory adjectives are the two least attested with linguistic synaesthesia by lexical type, with the respective percentages of 0.8% (2/260) and 1.5% (4/260).

There are 8,620 synaesthetic instances of the Mandarin synaesthetic adjectives having been collected from the Sinica corpus, of which the synaesthetic examples of Mandarin visual and tactile adjectives occupy the two largest proportions with 35.2% (3034/8,620) and 31.3% (2,695/8,620) respectively, as illustrated in Table 1.

2.2.2 Synaesthetic participation of Mandarin sensory adjectives

Strik Lievers (2015) proposed that the lexical differentiation of sensory modalities (i.e., the number of lexicalized words for a specific sense), especially the richness of adjectives in the vocabulary in the language, could predict the possibility of sensory words used for linguistic synaesthesia. In other words, if one sensory modality has more lexicalized adjectives in the language, sensory words belonging to the sensory modality would be more likely to be employed in linguistic synaesthesia, in accordance with Strik Lievers (2015). Winter (2016a) added three factors, including frequency, affective valence, and iconicity of lexical items, to predict whether a sensory item is likely to be involved in synaesthetic uses. This study focuses more on how sensory words are used in linguistic synaesthesia, than on whether sensory words in general are likely to be involved in linguistic synaesthesia. Nevertheless, a brief look at what kinds of Mandarin sensory items tend to involve synaesthetic uses (i.e., synaesthetic participation, Zhao et al. 2018b,

in press) would facilitate a general understanding of motivations underlying linguistic synaesthesia.

Table 2 below shows the rates of adjectives identified with synaesthetic usages in the compiled Mandarin sensory adjectives for five senses (see Section 2.1.3). It can be seen from Table 2 that vision has the most lexicalized adjectives in Mandarin, the same as that in English (Strik Lievers 2015; Winter 2016a). The synaesthetic participation of visual adjectives (i.e., 14.9% [99/664]) is, however, much less than that of gustatory and tactile adjectives in Mandarin, with the rates of 84% (21/25) and 61.3% (73/119) respectively (see Table 2), although visual adjectives are the most identified to involve linguistic synaesthesia. With respect to tactile sensations in Mandarin, both the lexical differentiation of adjectives (i.e., with 73 adjectives) and the synaesthetic participation (i.e., with the rate of 61.3% [73/119]) are high. Thus, the lexical differentiation would not be a good predictor for Mandarin sensory adjectives in terms of the synaesthetic participation, if the percentage is taken into account rather than the absolute number of lexical types.

It is interesting to note that the two sensory modalities with high synaesthetic participation rates (i.e., greater than 50%) are touch and taste (see Table 2). These two senses, necessarily involving physical contact between sensory organs and perceived objects, have been recognized to be more embodied than other three modalities (i.e., vision, hearing, and smell), which generally act as source domains in linguistic synaesthesia (Shen 1997; Zhao and Huang 2018). The specific synaesthetic tendencies of these two modalities in Mandarin will be explored in detail in the following two chapters, i.e., Chapters 3 and 4 for touch and taste respectively.

Table 2: Synaesthetic participation rates of Mandarin sensory adjectives for five senses

	Synaesthetic adjectives (lexical types)	Sensory adjectives (lexical types)¹³	Synaesthetic participation
TOUCH	73	119	61.3%
TASTE	21	25	84%
VISION	99	664	14.9%
HEARING	4	13	30.8%
SMELL	2	10	20%

Following Winter (2016a), this study also examined the synaesthetic participation of the top 10% of the most frequent Mandarin sensory adjectives for each sense based on the Sinica corpus. As illustrated in Table 3, among these adjectives for each sensory modality, over 40% of them have been attested to involve synaesthetic usages, hence supporting Winter’s (2016a) prediction that more frequent sensory items are more likely to participate in

13 Although the sensory adjectives for five senses collected for Mandarin cannot be considered exhaustive, they could still provide a general picture of the lexical differentiation for five sensory modalities in Mandarin. As noted by Strik Lievers (2015) and Zhao et al. (2018c, in press), the lexical differentiation of five senses might be related to the characteristics of human perception and cognition, where, for instance, vision with the most lexicalized adjectives is consistent with the most predominance of visual experiences in the human perception system, while smell having the least lexicalized adjectives is concerned with the intimacy between tasting and smelling that grounds to generally use gustatory adjectives to describe olfactory experiences in the language.

cross-modal mappings. One exception to such a prediction was found in Mandarin auditory adjectives, where none adjective was attested with synaesthetic uses among the top 10% of the most frequent auditory adjectives. The exception can, however, be explained, as hearing has demonstrated to rarely be source domains in synaesthetic transfers (see Ullmann 1957; Williams 1976; Zhao and Huang 2018).¹⁴

Table 3: Synaesthetic participation rates of the top 10% of the most frequent Mandarin sensory adjectives for five senses

	Synaesthetic adjectives (lexical types)	Sensory adjectives (lexical types)	Synaesthetic participation
TOUCH	10	11.9 (≈ 12)	83.3%
TASTE	3	2.5 (≈ 3)	100%
VISION	29	66.4 (≈ 66)	43.9%
HEARING	0	1.3 (≈ 1)	0
SMELL	1	1	100%

It can thus be concluded that the lexical differentiation would not be a good predictor on whether a specific Mandarin sensory adjective is likely to be involved in synaesthetic uses. The word frequency of Mandarin sensory adjectives, however, can function effectively to predict the synaesthetic participation.

¹⁴ The predictors of lexical valence and iconicity for synaesthetic participation proposed by Winter (2016a) cannot be tested by the corpus data in this study. Thus, I leave it for future research.

2.2.3 Sensory associations in Mandarin synaesthetic adjectives

Studies on the sensory lexicon in languages, have shown the interrelation between different sensory modalities. For instance, Lynott and Connell (2009), Lynott and Connell (2013), Winter (2016a), and Winter (2016b) demonstrated that there are significant correlations between vision and touch, between taste and smell, and between vision and hearing, based on the statistical analysis of the perceptual ratings on English sensory words. Chen et al. (2017) confirmed these connections between five senses in Mandarin sensory adjectives. All these studies concerned with the multimodality of sensory items in the language, did not take into consideration the directionality of associations between senses. On the contrary, not only the interrelations, but also the directional patterns of associations between senses can be observed in Mandarin synaesthetic adjectives identified based on the Sinica corpus.

It can be seen from Table 4 that Mandarin tactile adjectives are the most likely to be used for vision, with the probability of 84.9% (62/73) in terms of lexical types, which is consistent with the observation of the significant correlation between touch and vision by the experimental studies. Such an association between touch and vision, however, are not bi-directional, as visual adjectives for touch, i.e., with the probability of 18.2% (18/99), are not as productive as tactile adjectives for vision, as illustrated in Table 4.

The association between taste and smell among Mandarin synaesthetic adjectives is similar to that between touch and vision. Specifically speaking, gustatory adjectives are the most likely to be associated with smell, and olfactory adjectives are the most likely to be associated with taste in Mandarin. Gustatory adjectives for smell, however, are more frequent than olfactory adjectives for taste, with the probabilities of 76.2% (16/21) and 50% (1/2) by lexical type respectively (see Table 4).

Table 4: Sensory associations in Mandarin synaesthetic adjectives

Source domains	Target domains					Total
	TOUCH	TASTE	VISION	HEARING	SMELL	
TOUCH	--	7	62	41	15	73
	--	9.6%	84.9%	56.2%	20.5%	--
TASTE	5	--	12	11	16	21
	23.8%	--	57.1%	52.4%	76.2%	--
VISION	18	10	--	87	13	99
	18.2%	10.1%	--	87.9%	13.1%	--
HEARING	0	0	4	--	0	4
	0	0	100%	--	0	--
SMELL	0	1	1	0	--	2
	0	50%	50%	0	--	--
Total	23	18	79	139	44	--

It is remarkable that the association between vision and hearing in Mandarin synaesthetic adjectives is different from those between touch and

vision and between taste and smell. That is, the probability of visual adjectives for hearing, is close to that of auditory adjectives for vision in Mandarin synaesthetic adjectives, i.e., with 87.9% (87/99) and 100% (4/4) respectively, as shown in Table 4.

The ratios of synaesthetic sources to synaesthetic targets for each sensory modality can also be calculated with respect to the lexical types, from the largest to the smallest: TOUCH (3.17 [73/23]) > VISION (1.25 [99/79]) > TASTE (1.17 [21/18]) > SMELL (0.05 [2/44]) > HEARING (0.03 [4/139]). Such a ratio rank can be regarded as an indication that touch, taste, and vision are more likely to be sources in sensory associations, while smell and hearing are more likely to be the target domains.¹⁵

Hence, the significant integrations between five senses found in experimental studies, have also been attested in the empirical data from the corpus, including the associations between touch and vision, between taste and smell, and between vision and hearing. Nonetheless, the corpus data would also imply that most associations between senses tend to follow

15 One should acknowledge that there might be a risk to generalize the tendencies of Mandarin synaesthesia based on the limited numbers of auditory and olfactory adjectives collected (i.e., four and two respectively). The limited data for hearing and smell, however, is likely to result from the characteristics of human cognition (see Footnote 13). Besides, for a corpus-based study, word types and tokens are generally considered in research on linguistic synaesthesia, such as Strik Lievers (2015) and Zhao et al. (2018b, in press). Therefore, I will leave how to interpret the limited data for the synaesthetic tendencies of Mandarin Chinese more appropriately for future studies.

directional tendencies, which will be discussed in depth in the following chapters.

2.3 Summary of the chapter

This chapter has proposed a linguistic synaesthesia identification procedure (LSIP) and presented an overview of the extracted data of Mandarin synaesthesia. Within LSIP, I discussed identification of the basic sensory meanings for Mandarin sensory adjectives, classification of human senses, and extraction of synaesthetic uses of Mandarin sensory adjectives from the Sinica corpus. Besides, specific steps of LSIP have also been summarized, which would facilitate the application of the procedure to linguistic synaesthesia in other languages.

The overview of the extracted synaesthetic data has shown that visual adjectives and tactile adjectives are the two most involved in linguistic synaesthesia, with respect to both lexical types and lexical tokens. However, tactile and gustatory adjectives have been demonstrated to exhibit much higher synaesthetic participation rates than visual, auditory, and olfactory adjectives in Mandarin. In addition, the associations between touch and vision, between taste and smell, and between vision and hearing reported by experimental studies, have also been attested in the collected corpus data. Furthermore, the corpus data has also indicated that the associations between senses would not be likely to be random, but instead exhibit directional tendencies.

The following chapters will explore the directional tendencies of sensory associations reflected in linguistic expressions (i.e., linguistic synaesthesia) for Mandarin Chinese in detail. The next chapter will focus on the tendencies and underlying mechanisms of linguistic synaesthesia of Mandarin tactile adjectives, which have been established to be productive involving synaesthetic usages, in terms of the adjective type, the token example, and the synaesthetic participation.

Chapter 3: Linguistic synaesthesia of Mandarin tactile adjectives

Shen (1997) and Popova (2005) both suggested that touch is the most embodied sensory modality among human senses based on its perceptual nature, which includes necessarily involving physical contact between sensory organs and perceived objects, generally producing affective contents, and being able to be experienced through multiple sensory organs (e.g., hands, skins, and muscles). Following this, it would be predicted that tactile words in the language could be involved in synaesthetic uses for all other four senses.

The biological association account of linguistic synaesthesia, on the contrary, did not provide any explicit prediction on directionality of synaesthetic transfers between senses. The theory, however, demonstrated crucial physiological connections between different perceptions to account for linguistic synaesthesia, such as the association between the sharp taste and the high temperature in pungency (Hirasa and Takemasa 1998; Zhao et al. 2018b, in press), the neural connection between the spicy taste and pain (Caterina et al. 1997; Rakova 2003), and the co-activation of touch and vision for perceiving shapes (Amedi et al. 2002).

This chapter will figure out the transfer tendencies of linguistic synaesthesia of Mandarin tactile adjectives, based on the distribution of synaesthetic uses of these adjectives in the Sinica corpus. Besides, the explanatory power of the different theoretical accounts will also be examined

for linguistic synaesthesia in Mandarin tactile adjectives. Specifically, Section 3.1 will present the data distribution of synaesthetic usages of Mandarin tactile adjectives, which will be followed by Section 3.2 concentrating on Mandarin adjectives for the tactile intensity and Section 3.3 on Mandarin adjectives for specific tactile perceptions. The last section is a summary of the synaesthetic tendencies of Mandarin tactile adjectives.

3.1 Data distributions of synaesthetic uses of Mandarin tactile adjectives

There are 73 Mandarin tactile adjectives identified with synaesthetic uses in the Sinica corpus, of which 2,695 token examples have been extracted (cf. Table 1 in Chapter 2).

Most of these adjectives conceptualized specific tactile perceptions including temperature, hardness, sharpness, and so forth (e.g., 冷 *leng3* ‘cold’, 硬 *ying4* ‘hard’, and 鋒利 *feng1-li4* ‘sharp’), based on the ontological categories in 哈工大信息檢索研究中心同義詞詞林擴展版 HIT-CIR Tongyici Cilin (Extended) and 知網 HowNet. There are only three adjectives, denoting the tactile intensity rather than the specific tactile quality, such as 強 *qiang2* ‘strong’ and 弱 *ruo4* ‘weak’, as shown in Table 5. These Mandarin adjectives for different sub-types of touch will be discussed separately one by one, given their different transfer patterns and interpretations in linguistic

synaesthesia. A more detailed data summary of the distribution of synaesthetic uses for each tactile adjective can be found in Appendix 1.

Table 5: Sub-types of touch for Mandarin tactile synaesthetic adjectives

Tactile sub-types	Numbers of adjectives	Examples
Intensity	3	強 <i>qiang2</i> ‘strong’
		弱 <i>ruo4</i> ‘weak’
Quality	21	冷 <i>leng3</i> ‘cold’
		暖 <i>nuan3</i> ‘warm’
	16	軟 <i>ruan3</i> ‘soft’
		硬 <i>ying4</i> ‘hard’
	9	鈍 <i>dun4</i> ‘blunt’
		鋒利 <i>feng1-li4</i> ‘sharp’
	7	濕 <i>shi1</i> ‘wet’
		乾燥 <i>gan1-zao4</i> ‘dry’
	7	滑 <i>hua2</i> ‘smooth’
		粗糙 <i>cui1-cao1</i> ‘rough’
6	重 <i>zhong4</i> ‘heavy’	
	輕 <i>qing1</i> ‘light (in weight)’	
4	麻 <i>ma2</i> ‘trembling’	
	刺 <i>ci4</i> ‘stabbing’	

3.2 Tactile adjectives of intensity

The three Mandarin synaesthetic adjectives for the tactile intensity were found to have distributions in taste, vision, hearing, and smell in the Sinica corpus, as predicted by the embodiment account. Specifically, one of them, i.e., 強烈 *qiang2-lie4* ‘strong’, was used to characterize the intensity of gustatory perceptions, as illustrated in example (1).¹⁶

(1) Tactile adjectives of intensity used for taste

伏特加 <i>fu2-te4-jia1</i>	的 <i>de</i>	<u>強烈</u> <i>qiang2-lie4</i> _[TOUCH/SOURCE]
vodka	GEN	strong-scorching
<u>味道</u> <i>wei4-dao</i> _[TASTE/TARGET]		穿過 <i>chuan1-guo4</i>
flavor-path		pass-through
喉頭 <i>hou2-tou2</i>		
throat-head		
‘The intense taste of vodka passes through the throat.’		

All the three tactile intensity adjectives were found to have distributions in vision. Following Williams (1976: 476), adjectives originally for visual color/light (termed as “color”) and adjectives for dimension/shape (termed as “dimension”) were distinguished from other visual types, which were named as “visual situation” collectively for discussion in this study. Examples (2) and (3) show that the three adjectives can all be used for colors and visual

¹⁶ For readability, the part-of-speech information tagged in synaesthetic examples from the Sinica corpus was deleted, which seems not directly relevant to this research.

situations for the perceptual intensity, while none exhibits synaesthetic uses for the visual dimension.

(2) Tactile adjectives of intensity used for the color (vision)

- a. 光線 *guang1-xian4*_[VISION/TARGET]
light-line
越來越 *yue4-lai2-yue4* 強 *qiang2*_[TOUCH/SOURCE]
increasingly-ASP-increasingly strong
‘The light becomes stronger and stronger.’
- b. 用色 *yong4-se4*_[VISION/TARGET] 強烈 *qiang2-lie4*_[TOUCH/SOURCE]
use-color strong-scorching
鮮豔 *xian1-yan4*
tasty-colorful
‘The color used is strong and bright.’
- c. 幽幽 *you1-you1* 的 *de* 弱 *ruo4*_[TOUCH/SOURCE]
faint-faint NOM weak
光 *guang1*_[VISION/TARGET]
light
‘the faint and weak light’

(3) Tactile adjectives of intensity used for the visual situation (vision)

- a. 線條感 *xian4-tiao2-gan3*_[VISION/TARGET] 強 *qiang2*_[TOUCH/SOURCE]
line-line-perception strong
‘the visual perception of lines is strong.’
- b. 強烈 *qiang2-lie4*_[TOUCH/SOURCE] 而 *er2* 深刻 *shen1-ke4*
strong-scorching and deep-carving

的 *de* 視覺 *shi4-jue2* 影像 *ying3-xiang4*_[VISION/TARGET]

NOM vision-sense image-image

‘the strong and impressive visual image’

c. 眼 *yan3* 中 *zhong1* 的 *de*

eye center GEN

電芒 *dian4-mang2*_[VISION/TARGET] 逐漸 *zhu2-jian4*

electricity-light gradually-gradually

減 *jian3* 弱 *ruo4*_[TOUCH/SOURCE]

reduce weak

‘The gleam in the eyes becomes weak gradually.’

These three tactile intensity adjectives were also attested to have distributions in hearing for the auditory intensity, as illustrated in example (4).

(4) Tactile adjectives of intensity used for hearing

a. 鼾聲 *han1-sheng1*_[HEARING/TARGET] [...]

snore-sound [...]

漸 *jian4* 強 *qiang2*_[TOUCH/SOURCE]

gradually strong

‘The sound of snoring becomes strong gradually.’

b. 強烈 *qiang2-lie4*_[TOUCH/SOURCE] 的 *de*

strong-scorching NOM

節奏 *jie2-zou4*_[HEARING/TARGET]

rhythm-rhythm

‘the strong rhythm’

c. 她 *ta1* 聽 *ting1*_[HEARING/TARGET] 瓦耳拉齊 *wa3-er3-la1-qi2*

she listen Waerlaqi
 的 *de* 氣息 *qi4-xi1*_[HEARING/TARGET] 漸 *jian4*
 GEN air-breath gradually
弱 *ruo4*_[TOUCH/SOURCE]
 weak
 ‘She heard the breath of Waerlaqi becoming weak gradually.’

There is only one tactile intensity adjective with synaesthetic distributions in the olfactory domain, i.e., 強烈 *qiang2-lie4* ‘strong’ characterizing the strong perceptual intensity of smell, as shown in example (5).

(5) Tactile adjectives of intensity used for smell

一股 *yi1-gu3* 強烈 *qiang2-lie4*_[TOUCH/SOURCE] 的 *de*
 one-CL strong-scorching NOM
香味 *xiang1-wei4*_[SMELL/TARGET]
 fragrant-flavor
 ‘a strong fragrance’

The synaesthetic uses of Mandarin tactile intensity adjectives are thus consistent with the prediction of the embodiment account of linguistic synaesthesia, where distributions of the tactile adjectives in taste, vision, hearing, and smell were all attested. In terms of the interpretation of these intensity adjectives in linguistic synaesthesia, the preservation of the intensity concept and the scalar polarity (Lehrer and Lehrer 1982; Lehrer 1985;

Kennedy 1999; Kennedy and McNally 2005; Kennedy and McNally 2009), also suggests the perceived similarity of intensity grounding associations of perceptions in different sensory modalities proposed by the embodiment account. For instance, 強 *qiang2* ‘strong’ and 強烈 *qiang2-lie4* ‘strong’ originally conceptualizing the positive polar of the intensity scale were still used to characterize the strong intensity perceived by the gustatory sense illustrated in (1), by the visual sense in (2a), (2b), (3a), and (3b), by the auditory sense in (4a) and (4b), and by the olfactory sense in (5). Similarly, the adjective 弱 *ruo4* ‘weak’ originally on the negative polar of the tactile intensity scale was used to denote the weakness of visual perceptions and auditory perceptions, as in (2c), (3c), and (4c).

It is interesting to note that the Mandarin tactile adjectives of intensity identified were not found to have synaesthetic uses for the dimension in the visual modality, which will be discussed after the general tendency of Mandarin tactile adjectives in linguistic synaesthesia is figured out.

3.3 Tactile adjectives of quality

The distribution of Mandarin tactile quality adjectives also supports the prediction of the embodiment account of linguistic synaesthesia, as the synaesthetic transfers from touch to taste, from touch to vision, from touch to hearing, and from touch to smell were all found in the Sinica corpus. The theory, however, has not predicted that Mandarin adjectives in different tactile sub-types differ with respect to their transfer patterns (especially

mapping to different visual sub-domains) and interpretations in synaesthetic usages. The following content will be concentrated on the insufficiency of the embodiment account for linguistic synaesthesia, by demonstrating the specific transfer tendencies and interpretations of Mandarin tactile adjectives for temperature, hardness, sharpness, dampness, smoothness, physical force, and pain.

3.3.1 Temperature

Mandarin tactile adjectives for temperature were identified to be involved most frequently in linguistic synaesthesia in terms of the lexical types (i.e., with 21 adjectives), as shown in Table 5.

Only one of the adjectives was found to have distributions in taste, i.e., 烈 *lie4* ‘scorching’, which was used to characterize the wine with a strong taste, as shown in example (6). The perceived similarity of intensity between the high temperature of fire and the strong taste of wine could be regarded as an underlying basis for the sensory association between touch and taste, as suggested by the embodiment account. Nevertheless, the gustatory use of the adjective 烈 *lie4* ‘scorching’ is related to the perceptual intensity of gustation rather than a specific taste comparable with sweetness, bitterness, and so forth, which thus does not retain the concept of quality represented in touch.

(6) Tactile adjectives of temperature used for taste

又 *you4* 香 *xiang1* 又 *you4* 烈 *lie4*_[TOUCH/SOURCE]

additionally	fragrant	additionally	scorching
的 <i>de</i>	美 <i>mei3</i>	酒 <i>jiu4</i> _[TASTE/TARGET]	
NOM	tasty	wine	

‘the fragrant, strong, and tasty wine’

There are 20 Mandarin temperature adjectives found to have distributions in vision, of which ten adjectives were used to characterize colors and 17 adjectives were employed to describe visual situations, while none was attested to have synaesthetic uses for the visual dimension.

The ten Mandarin temperature adjectives with synaesthetic uses for colors are 寒 *han2* ‘chilling’, 冷 *leng3* ‘cold’, 冰冷 *bing1-leng3* ‘ice-cold’, 凉 *liang2* ‘cool’, and 刺冽 *ci4-lie4* ‘chilling’ for lower temperature, and 暖 *nuan3* ‘warm’, 温暖 *wen1-nuan3* ‘warm’, 灼灼 *zhuo2-zhuo2* ‘scorching’, 熾烈 *chi4-lie4* ‘scorching’, and 热 *re4* ‘hot’ for higher temperature. Based on the color theory, colors related to sunlight and fire, such as red and yellow, are warm, while colors related to ice and water, such as blue and green, tend to be cold (see Wyszecki and Stiles 1967). It is intriguing that the linguistic conceptualization of color perceptions in Mandarin Chinese is in line with the perceptual fact observed in the color theory (see Wyszecki and Stiles 1967). As demonstrated in examples (7a) and (7b), Mandarin temperature adjective 暖 *nuan3* ‘warm’ was used to describe the yellow color, and the adjective 凉 *liang2* ‘cool’ was employed to characterize the grayish blue. The correspondence between linguistic patterns and perceptual patterns would thus indicate a sensory integration basis for linguistic synaesthesia. That is,

the recurrent associations between colors and temperature sensations in specific objects, such as the yellow color and the warm sensation of sunlight and the green color and the cool sensation of water, would be the most likely to motivate the linguistic conceptualization of colors in terms of temperature concepts.^{17, 18} By contrast, the perceived similarity assumed by the embodiment account would be less obvious in the interpretations of synaesthetic uses of Mandarin temperature adjectives for colors, as neither the correspondence concerning the perceptual intensity or the affective evaluation between temperature sensations and color sensations could be established for these adjectives when employed for colors.

(7) Tactile adjectives of temperature used for the color (vision)

- | | | |
|----|---|---|
| a. | <u>暖</u> <i>nuan3</i> _[TOUCH/SOURCE] | <u>黄</u> <i>huang2</i> _[VISION/TARGET] |
| | warm | yellow |
| | ‘the warm yellow’ | |

17 It can be expected why the conceptualization of color sensations using temperature concepts has been realized in the language, but not the other way around, if the different degrees of embodiment of touch and vision are taken into consideration. That is, the conceptualization of colors in terms of temperature is consistent with the cognitive principle generally mapping from the more embodied (i.e., touch) to the less embodied (i.e., vision).

18 Paradis and Eeg-Olofsson (2013: 38) described this kind of linguistic conceptualizations as “synesthetic metonymization”. This study did not follow the term, as the term did not capture the nature of the linguistic usages, but instead added unnecessary confusion to the alternative term of linguistic synaesthesia, i.e., synaesthetic metaphor. Thus, these linguistic expressions, whose most remarkable characteristic is their indication for a sensory integration basis for synaesthetic transfers, were not given a specialized linguistic label in this research.

- b. 薄 *bao2* 涼 *liang2*_[TOUCH/SOURCE] 的 *de*
 thin cool NOM
- 灰藍色 *hui1-lan2-se4*_[VISION/TARGET]
 grey-blue-color
 ‘the thin and cool grayish blue’¹⁹

Mandarin temperature adjectives with synaesthetic uses for visual situations, however, did show the perceived similarity basis for linguistic synaesthesia as predicted by the embodiment account. That is, Mandarin adjectives conceptualizing higher pleasant temperature were generally used to denote positive visual sensations, such as (8a) for smiling, while adjectives conceptualizing lower unpleasant temperature were employed to characterize negative visual sensations, such as (8b) for sneering. This tendency was also found for nine Mandarin temperature adjectives used for hearing, as illustrated in example (9), where 溫暖 *wen1-nuan3* was used to describe a pleasant auditory feeling of songs, while 冰冷 *bing1-leng3* ‘ice-cold’ was employed to modify the angry voice.

¹⁹ The color usage of the adjective 涼 *liang2* ‘cool’ is much less frequent than that of the adjective 暖 *nuan3* ‘warm’ in the Sinica corpus (i.e., with one and 22 instances respectively), which thus roughly correspond to creative and conventional types of linguistic synaesthesia. As the Sinica corpus contains both fictional and non-fictional texts (Chen et al. 1996), this study did not differentiate the types of linguistic synaesthesia with respect to the degree of conventionalization. Nevertheless, it would be an interesting topic to explore whether there are differences on transfer tendencies and underlying mechanisms between the two types of linguistic synaesthesia in future studies.

(8) Tactile adjectives of temperature used for the visual situation (vision)

- a. 溫暖 *wen1-nuan3*_[TOUCH/SOURCE] 的 *de*
lukewarm-warm NOM
笑容 *xiao4-rong2*_[VISION/TARGET]
smile-appearance
'the warm smile'
- b. 一絲 *yi1-si1* 冷 *leng3*_[TOUCH/SOURCE] 笑 *xiao4*_[VISION/TARGET]
one-CL cold smile
'a hint of the cold smile'

(9) Tactile adjectives of temperature used for hearing

- a. 溫暖 *wen1-nuan3*_[TOUCH/SOURCE] 的 *de*
lukewarm-warm NOM
歌聲 *ge1-sheng1*_[HEARING/TARGET]
song-sound
'the warm song'
- b. 冰冷 *bing1-leng3*_[TOUCH/SOURCE] 憤怒 *fen4-nu4* 的 *de*
ice-cold angry-angry NOM
聲音 *sheng1-yin1*_[HEARING/TARGET]
sound-voice
'the ice-cold and angry voice'

The synaesthetic transfer from touch to smell was attested in four Mandarin tactile adjectives of temperature, which are 溫暖 *wen1-nuan3*

‘warm’, 熱 *re4* ‘hot’, and 熾熱 *chi4-re4* ‘scorching’ conceptualizing higher temperature, and 冷 *leng3* ‘cold’ denoting lower temperature.

It is intriguing that, for the olfactory uses of Mandarin temperature adjectives, the correspondence between temperature and smell is difficult to figure out, with respect to both the perceptual intensity and the affective evaluation. For instance, both 冷 *leng3* ‘cold’ (on the lower part of the temperature scale) and 熱 *re4* ‘hot’ (on the higher part of the temperature scale) were found with synaesthetic uses for the positive olfactory perception, i.e., 香 *xiang1* ‘fragrance’, in the Sinica corpus.

A closer look at the contextual information, however, could provide suggestive clues. This study has found that all synaesthetic expressions of Mandarin temperature adjectives for smell co-occur with temperature-related items in the context, where the temperature-related items encode temperature information congruent with the synaesthetic adjectives in question. For example, the olfactory use of 溫暖 *wen1-nuan3* ‘warm’ was attested to co-occur with 烈日 *lie4-ri4* ‘the scorching sun’ implying the high temperature, as shown in (10a), while the olfactory use of 冷 *leng3* ‘cold’ was found to have the co-occurrence with 冬 *dong1* ‘winter’ generally concerned with low temperature, as illustrated in (10b). Such a distributional pattern of Mandarin temperature adjectives used for smell thus also suggests that linguistic synaesthesia cannot only be grounded in the perceived similarity, but also can be motivated by the sensory integration perceptually, which has been demonstrated by various neural and psychological studies (e.g., Marks 1978; Amedi 2002; Spence 2011; Winter 2016a; among many others). In other

words, the olfactory uses of Mandarin temperature adjectives, accompanied by the conceptualization of the congruent temperature perceptions in the context, could be considered linguistic realizations of sensory integrations caused by the perceptual “spatiotemporal congruency” (Spence 2011: 971). It will be seen later in this thesis that there are other synaesthetic uses of Mandarin sensory adjectives indicating the sensory integration basis for linguistic synaesthesia as well, rather than showing the perceived similarity basis or the biological association basis.

(10) Tactile adjectives of temperature used for smell

- a. 那 *na4* 腐臭 *fu3-chou4* 發酵 *fa1-jiao4* 的 *de*
 that rotten-smelly get-fermented NOM
溫暖 *wen1-nuan3*_[TOUCH/SOURCE] 一股 *yi1-gu3*
 lukewarm-warm one-CL
 烈日 *lie4-ri4* 下 *xia4* 的 *de* 肥油 *fei2-you2*
 scorching-sun below NOM fat-oil
氣味 *qi4-wei4*_[SMELL/TARGET]
 air-flavor
 ‘the rotten, smelly, fermented, and warm odor, which is an odor of fat oil in the scorching sun’
 (the co-occurring temperature-related item is: 烈日 *lie4-ri4* ‘the scorching sun’)
- b. 入冬 *ru4-dong1* 後 *hou4* 該 *gai1* 像 *xiang4*
 enter-winter after should like
 溫哥華 *wen1-ge1-hua2* 那樣 *na4-yang4* 散發 *san4-fa1*

Vancouver	that-sample	emit-emit
著 <i>zhe1</i>	一地 <i>yi1-di4</i>	的 <i>de</i> 銀光 <i>yin2-guang1</i>
ASP	one-land	NOM silver-light
與 <i>yu3</i>	<u>冷</u> <i>leng3</i> _[TOUCH/SOURCE]	<u>香</u> <i>xiang1</i> _[SMELL/TARGET]
and	cold	fragrance

‘There should be massive silver light and cold fragrance after winter comes just as in Vancouver.’

(the co-occurring temperature-related item is: 冬 *dong1* ‘winter’)

3.3.2 Hardness

Mandarin adjectives for tactile hardness were found to have distributions in vision, hearing, and smell, but not in taste.

There are 12 tactile hardness adjectives identified with synaesthetic usages for vision in the Sinica corpus, of which three were employed to describe colors, i.e., 柔 *rou2* ‘soft’, 柔軟 *rou2-ruan3* ‘soft’, and 輕柔 *qing1-rou2* ‘soft’. It should be noted that these adjectives were utilized not only for warm colors, such as yellow in (11a), but also for cold colors, such as green in (11b), which is different from the color usages of Mandarin temperature adjectives discussed above. In addition, the interpretation of synaesthetic expressions of the three tactile adjectives for colors supports the perceived similarity basis for synaesthetic transfers, as their synaesthetic usages generally imply the colors with pleasant properties, which are consistent with the positive hardness sensations conceptualized by these adjectives in touch (Winter 2016a).

(11) Tactile adjectives of hardness used for the color (vision)

- a. 柔 rou2_[TOUCH/SOURCE] 黃 huang2_[VISION/TARGET]
 soft yellow
 ‘the soft yellow’
- b. 柔 rou2_[TOUCH/SOURCE] 綠 lv4_[VISION/TARGET]
 soft green
 ‘the soft green’

One interesting pattern emerging from Mandarin adjectives of tactile hardness is that there is one adjective (i.e., 爛 *lan4* ‘tender’) with synaesthetic uses for the visual dimension. The distribution has, however, not been attested among Mandarin tactile intensity adjectives or among Mandarin temperature adjectives. As shown in (12), the synaesthetic expression of the adjective 爛 *lan4* ‘tender’ for the dimension conceptualizes the visual fragmented property of physical objects on the surface. This usage is in line with the neural finding that there is a specialized cortical region (i.e., LOtv) in the brain associating touch and vision with a response preference on graspable visual objects for shape perceptions (Amedi et al. 2002). Therefore, it would be expected that tactile perceptions that can be experienced typically by grasping of hands (such as hardness, but not temperature) are easier than other tactile perceptions, to be associated with the visual perception of dimensions physiologically. Mandarin adjectives of tactile hardness (but not adjectives of temperature) identified with synaesthetic uses for the visual dimension would thus be the linguistic realization of the neural association. Therefore, the synaesthetic use of Mandarin tactile hardness adjective 爛 *lan4* ‘tender’ for

the visual dimension suggests the biological association basis for linguistic synaesthesia proposed by the biological association account.

(12) Tactile adjectives of hardness used for the dimension (vision)

<u>屁股</u> <i>pi4-gu3</i> _[VISION/TARGET]	烫 <i>tang4</i>
flatus-thigh	burn
<u>烂</u> <i>lan4</i> _[TOUCH/SOURCE]	了 <i>le</i>
tender	ASP
‘The ass was burned broken.’	

There are 12 Mandarin adjectives for tactile hardness identified with synaesthetic uses for visual situations. Some of the interpretations of synaesthetic expressions of these adjectives support the perceived similarity basis for synaesthetic transfers. As illustrated in (13a) for 僵硬 *jiang1-ying4* ‘stiff’, there is a correspondence concerning a negative evaluation of perceptions between the tactile sensation of strong hardness (Winter 2016a) and the visual sensation of unpleasant facial expressions. However, other synaesthetic transfers of Mandarin tactile hardness adjectives suggest the sensory integration basis for linguistic synaesthesia when used for visual situations. Example (13b) demonstrates that the visual usage of 硬 *ying4* ‘hard’ for hair is more likely to be grounded in the perceptual experience that thick hair generally exhibits an associating property of strong tactile hardness, which thus motivates conceptualization of visual situations of hair in terms of tactile concepts.

(13) Tactile adjectives of hardness used for the visual situation (vision)

- a. 面部 *lian3-bu4* 表情 *biao3-qing2*_[VISION/TARGET]
face-part surface-emotion
- 僵硬 *jiang1-ying4*_[TOUCH/SOURCE]
stiff-hard
'The facial expression is stiff.'
- b. 一頭 *yi1-tou2* 顯得 *xian3-de*_[VISION/TARGET]
one-CL display-ASP
- 粗 *cu1* 硬 *ying4*_[TOUCH/SOURCE] 的 *de*
rough hard NOM
- 灰白 *hui1-bai2* 頭髮 *tou2-fa4*_[VISION/TARGET]
grey-white head-hair
'the greyish white hair which seems to be thick and hard'

The ten Mandarin adjectives of tactile hardness with synaesthetic distributions in hearing, however, all support the perceived similarity basis for linguistic synaesthesia, with respect to interpretations. As shown in example (14), concepts for pleasant tactile perceptions, such as 脆 *cui4* 'crisp', were generally employed to characterize positive auditory perceptions, while concepts for unpleasant tactile perceptions, such as 僵硬 *jiang1-ying4* 'stiff', were utilized to conceptualize negative properties of auditory sensations.

(14) Tactile adjectives of hardness used for hearing

- a. 一聲 *yi1-sheng1* 脆 *cui4*_[TOUCH/SOURCE]
one-CL crisp

響 *xiang3*_[HEARING/TARGET]

sound

‘a crisp sound’

b. **音色** *yin1-se4*_[HEARING/TARGET]

sound-color

較 *jiao4* **為** *wei2*

relatively be

僵硬 *jiang1-ying4*_[TOUCH/SOURCE]

stiff-hard

‘The sound is relatively stiff.’

There are three adjectives among Mandarin adjectives of tactile hardness employed to describe olfactory perceptions, which are 軟 *ruan3* ‘soft’, 柔軟 *rou2-ruan3* ‘soft’, and 輕柔 *qing1-rou2* ‘soft’. In terms of the interpretation, all the olfactory usages of these three adjectives were found to characterize the pleasant odor, such as the adjective 軟 *ruan3* ‘soft’ utilized for 香氣 *xiang1-qi4* ‘fragrance’ in example (15). The interpretation pattern, thus, supports the perceived similarity basis for synaesthetic transfers between senses suggested by the embodiment account, as the tactile sensations of weak hardness that the three adjectives originally represent are also perceptually pleasant for humans (Popova 2005; Winter 2016a).

(15) Tactile adjectives of hardness used for smell

散發 <i>san4-fa1</i>	出 <i>chu1</i>	甜 <i>tian2</i>	軟 <i>ruan3</i> _[TOUCH/SOURCE]
emit-emit	out	sweet	soft
甘 <i>gan1</i>	滑 <i>hua2</i>	與 <i>yu3</i>	果熟 <i>guo3-shu2</i>
sweet	smooth	and	fruit-mature

的 *de* 香氣 *xiang1-qi4*_[SMELL/TARGET]
 NOM fragrant-air
 ‘the emitting sweet, soft, smooth, and ripe fragrance’

3.3.3 Sharpness

There are nine Mandarin adjectives of tactile sharpness identified with synaesthetic distributions, only in vision and hearing, but not in taste or smell.

Two Mandarin adjectives for tactile sharpness were attested with synaesthetic usages for visual colors, of which 鈍 *dun4* ‘blunt’ was employed for the weakness of light, whereas 犀利 *xi1-li4* ‘sharp’ for the strongness of light, as shown in example (16). The interpretations of the synaesthetic expressions of these two adjectives, thus, support the perceived similarity basis for synaesthetic transfers from touch to vision, of which the correspondence between the tactile sharpness and the visual perception of light for the adjectives lies in the perceptual intensity. In addition, it is noteworthy that the concepts of the adjectives 鈍 *dun4* ‘blunt’ and 犀利 *xi1-li4* ‘sharp’ changed to be concerned with intensity rather than quality in their synaesthetic uses for light, similar to Mandarin temperature adjective 烈 *lie4* ‘scorching’ used for taste (see Section 3.3.1).

(16) Tactile adjectives of sharpness used for the color (vision)

a.	那層 <i>na4-ceng2</i>	紅潤 <i>hong2-run4</i>
	that-CL	red-moist

- | | | | |
|----|--|--------|----------------------------------|
| | <u>光澤</u> <i>guang1-ze3</i> _[VISION/TARGET] | 在 | <i>zai4</i> |
| | light-lustre | | ASP |
| | <u>鈍</u> <i>dun4</i> _[TOUCH/SOURCE] | 下去 | <i>xia4-qu4</i> |
| | blunt | | down-go |
| | ‘The red moist lustre is becoming weak.’ | | |
| b. | <u>犀利</u> <i>xi1-li4</i> _[TOUCH/SOURCE] | 而 | <i>er2</i> 冰冷 <i>bing1-leng3</i> |
| | sharp-sharp | and | ice-cold |
| | <u>曦光</u> <i>xi1-guang1</i> _[VISION/TARGET] | 中 | <i>zhong1</i> 的 <i>de</i> |
| | morning sunlight-light | center | NOM |
| | 背脊 <i>bei4-ji3</i> | | |
| | back-backbone | | |
| | ‘the back in the sharp and ice-cold morning sunlight’ | | |

Four Mandarin adjectives of tactile sharpness were found with synaesthetic uses for the visual dimension, which are 尖 *jian1* ‘sharp’, 尖銳 *jian1-rui4* ‘sharp’, and 銳利 *rui4-li4* ‘sharp’ for high sharpness, and 鈍 *dun4* ‘blunt’ for low sharpness. Analogous to the adjective 爛 *lan4* ‘tender’ used for the visual dimension, the synaesthetic distributions of these tactile sharpness adjectives in the visual dimension could also be explained by the neural association, as sharpness is also one kind of tactile perceptions that can be experienced typically by grasping. Example (17) shows that the adjective 尖 *jian1* ‘sharp’ was utilized to describe the shape of physical objects in the Sinica corpus.

(17) Tactile adjectives of sharpness used for the dimension (vision)

尖 *jian1*_[TOUCH/SOURCE]

塔 *ta3*_[VISION/TARGET]

sharp

tower

‘the acuminate tower’

The contrast concerning affective evaluations emerged among the six Mandarin adjectives of tactile sharpness in synaesthetic uses for the visual situations. That is, concepts for positive high sharpness (Winter 2016a) were used to describe pleasant visual perceptions, such as 銳利 *rui4-li4* ‘sharp’ describing eye expressions in (18a). Concepts for negative low sharpness (Winter 2016a), however, were employed for unpleasant visual sensations, such as 鈍鈍 *dun4-dun4* ‘blunt’ characterizing the numb and foolish smiles in (18b). Such a contrast is thus consistent with the perceived similarity basis for linguistic synaesthesia proposed by the embodiment account.

The contrast, however, did not appear in the synaesthetic expressions of Mandarin tactile sharpness adjectives for hearing. As demonstrated in example (19), both 尖銳 *jian1-rui4* ‘sharp’ for positive high sharpness and 鈍 *dun4* ‘blunt’ for negative low sharpness were used to conceptualize the unpleasant properties of auditory perceptions. In addition, there is little evidence (to my knowledge) to suggest that these synaesthetic transfers are grounded in the sensory integration or the neural association, which have to be left for future studies. Nevertheless, the omission of explanations for the underlying mechanism of these synaesthetic expressions would not affect the general tendency of Mandarin synaesthesia investigated by this study, since

the synaesthetic examples were attested to be infrequent in the Sinica corpus (i.e., six adjectives with 145 token examples).

(18) Tactile adjectives of sharpness used for the visual situation (vision)

- a. 銳利 *ruì4-lì4*_[TOUCH/SOURCE] 的 *de*
 sharp-sharp NOM
目光 *mu4-guang1*_[VISION/TARGET]
 eye-light
 ‘the sharp eye expression’
- b. 木 *mu4* 鈍鈍 *dun4-dun4*_[TOUCH/SOURCE] 的 *de*
 numb blunt-blunt NOM
傻 *sha3* 笑 *xiao4*_[VISION/TARGET]
 foolish smile
 ‘the numb, blunt, and foolish smile’

(19) Tactile adjectives of sharpness used for hearing

- a. 尖銳 *jian1-ruì4*_[TOUCH/SOURCE] 的 *de*
 sharp-sharp NOM
笛音 *di2-yin1*_[HEARING/TARGET]
 flute-sound
 ‘the sharp sound of the flute’
- b. 鈍 *dun4*_[TOUCH/SOURCE] 重 *zhong4* 沈悶 *chen2-men4*
 blunt heavy deep-bored
 的 *de* 碰撞聲 *peng4-zhuang4-sheng1*_[HEARING/TARGET]
 NOM crash-crash-sound
 ‘the blunt, heavy, and depressing sound of crashing’

3.3.4 Dampness

Mandarin adjectives of tactile dampness were found to be employed for vision, hearing, and smell, but not for taste.

There are six Mandarin tactile dampness adjectives identified with synaesthetic uses for vision, where three of them were used for colors and six for visual situations, while none for the visual dimension. With respect to the interpretation, the tactile dampness adjectives used for both colors and visual situations suggest the sensory integration basis for linguistic synaesthesia. For instance, the synaesthetic use of 溫潤 *wen1-run4* ‘moist’ for the color, exemplified in (20), would be likely to be grounded in the recurrent sensory association between the tactile moist texture and the gentle color of chinaware. Similarly, the adjective 濕潤 *shi1-run4* ‘moist’ used for the visual situation of the lip in example (21), would also be motivated by the visual perception of an amount of water on the surface of specific physical objects, generally associated with high tactile dampness. By contrast, the perceived correspondences between the tactile dampness and the color, and between the tactile dampness and the visual situation, are more difficult to be figured out in the synaesthetic examples of Mandarin tactile dampness adjectives.

(20) Tactile adjectives of dampness used for the color (vision)

<u>溫潤</u> <i>wen1-run4</i> _[TOUCH/SOURCE]	的 <i>de</i>	<u>色澤</u> <i>se4-ze2</i> _[VISION/TARGET]
warm-moist	NOM	color-lustre
‘the gentle color’		

(in the chinaware context)

(21) Tactile adjectives of dampness used for the visual situation (vision)

<u>眼看</u> <i>yan3-kan4</i> _[VISION/TARGET]	她 <i>ta</i>	微張 <i>wei1-zhang1</i>
eye-look	she	slight-open
而 <i>er2</i>	<u>濕潤</u> <i>shi1-run4</i> _[TOUCH/SOURCE]	的 <i>de</i>
and	damp-moist	NOM
<u>紅唇</u> <i>hong2-chun2</i> _[VISION/TARGET]		
red-lip		

‘looking at her slightly-open and moist lip’

Synaesthetic expressions of three Mandarin adjectives of tactile dampness for hearing are, nevertheless, consistent with the perceived similarity basis for linguistic synaesthesia. As shown in example (22), the adjective for pleasant high tactile dampness (i.e., 柔潤 *rou2-run4* ‘soft-moist’) was used for a positive auditory perception, while the adjective for unpleasant low tactile dampness (i.e., 乾乾 *gan1-gan1* ‘dry’) was employed for a negative auditory perception.

(22) Tactile adjectives of dampness used for hearing

a.	溫和 <i>wen1-he2</i>	<u>柔潤</u> <i>rou2-run4</i> _[TOUCH/SOURCE]
	warm-harmonious	soft-moist
	的 <i>de</i>	<u>聲音</u> <i>sheng1-yin1</i> _[HEARING/TARGET]
	NOM	sound-voice

‘the warm, soft, and moist voice’

- b. 聲音 *sheng1-yin1*_[HEARING/TARGET]
 sound-voice
乾乾 *gan1-gan1*_[TOUCH/SOURCE] 的 *de*
 dry-dry PAR
 ‘The voice is dry.’

There are three Mandarin tactile dampness adjectives used for smell. One of the most interesting patterns is that Mandarin tactile dampness adjectives showed the same tendency with Mandarin temperature adjectives, with respect to olfactory usages (see Section 3.3.1). Specifically, Mandarin adjectives of tactile dampness used for smell were also attested to co-occur with lexical items encoding congruent perceptions of dampness in the context, such as 濕 *shi1* ‘damp’ co-occurring with 雨後 *yu3-hou4* ‘after raining’ in (23a) and 乾燥 *gan1-zao4* ‘dry’ with 秋 *qiu1* ‘autumn’ in (23b). These co-occurrences would thus also suggest the sensory integration basis for synaesthetic transfers from tactile dampness to smell.

(23) Tactile adjectives of dampness used for smell

- | | | | |
|----|-------------------------|--|---------------------|
| a. | 雨後 <i>yu3-hou4</i> | 的 <i>de</i> | 天氣 <i>tian1-qi4</i> |
| | rain-after | NOM | sky-air |
| | 特別 <i>te4-bie2</i> | 涼爽 <i>liang2-shuang3</i> , | 室內 <i>shi4-nei4</i> |
| | particularly-especially | cool-bright | room-in |
| | 到處 <i>dao4-chu4</i> | 泛 <i>fan4</i> | 著 <i>zhe1</i> |
| | arrive-place | float | ASP |
| | 濃 <i>nong2</i> | <u>濕</u> <i>shi1</i> _[TOUCH/SOURCE] | 的 <i>de</i> |

of intense taste damp NOM

霉味 *mei2-wei4*_[SMELL/TARGET]

mildew-flavor

‘The weather after raining is fairly cool, and there is an intense and damp smell of mildew floating in the room.’

(the co-occurring dampness-related item is: 雨後 *yu3-hou4* ‘after raining’)

b. 秋收 *qiu1-shou1* 結束 *jie2-shu4* 的 *de*

autumn-harvest tie-bind NOM

稻田 *dao4-tian2* 瀰漫 *mi2-man4* 著 *zhe1*

rice-field pervade-pervade ASP

乾燥 *gan1-zao4*_[TOUCH/SOURCE] 的 *de*

dry-dry NOM

香味 *xiang1-wei4*_[SMELL/TARGET]

fragrant-flavor

‘The dry fragrance pervades the rice field after the autumn harvest finished.’

(the co-occurring dampness-related item is: 秋 *qiu1* ‘autumn’)

3.3.5 Smoothness

There are seven Mandarin adjectives for tactile smoothness identified with synaesthetic usages based on the Sinica corpus, of which one was attested with the synaesthetic distribution in taste, five in vision and hearing, and two in smell.

The only Mandarin tactile smoothness adjective used for the gustatory perception is 澀 *se4* ‘rough’ describing an unpleasant taste, as shown in example (24). The interpretation of the adjective used in linguistic synaesthesia is, thus, consistent with the perceived similarity basis, as low tactile smoothness conceptualized by the adjective is generally perceptually unpleasant as well (see Winter 2016a).

(24) Tactile adjectives of smoothness used for taste

煮 *zhu3* 去 *qu4* 澀 *se4*_[TOUCH/SOURCE]

boil remove rough

味 *wei4*_[TASTE/TARGET]

flavor

‘removing the astringent taste by boiling’

The visual usages of Mandarin tactile smoothness adjectives were found for the dimension and the visual situation, but not for the color. As illustrated in example (25), the tactile smoothness adjective 粗 *cu1* ‘rough’ was employed to conceptualize the visual dimension. It should be noted here that tactile smoothness is also one of tactile perceptions that can be experienced typically through grasping of hands. Thus, the synaesthetic usages of Mandarin tactile smoothness adjectives for the visual dimension would also be grounded in the neural association between touch and vision for shape perceptions, which is analogous to the associations of tactile hardness and sharpness with the visual dimension discussed above (see Section 3.3.2 and Section 3.3.3).

(25) Tactile adjectives of smoothness used for the dimension (vision)

<u>粗</u> <i>cu1</i> _[TOUCH/SOURCE]	細 <i>xi4</i>	<u>線條</u> <i>xian4-tiao2</i> _[VISION/TARGET]
rough	thin	line-line
‘the thick and thin lines’		

Some Mandarin tactile smoothness adjectives used for visual situations demonstrated the sensory integration basis, while others showed the perceived similarity basis for synaesthetic transfers. As illustrated in example (26a), the synaesthetic use of the adjective 粗糙 *cu1-cao1* ‘rough’ for the visual situation of 水泥 *shui3-ni2* ‘cement’ is likely to be grounded in the sensory association between vision and touch, since the cement mixed with sands and stones is generally rough when touched. Nevertheless, (26b) shows that the synaesthetic use of the adjective 粗糙 *cu1-cao1* ‘rough’ for the visual situation can only be related to a negative evaluation, where the correspondence of an unpleasant sensation between the low tactile smoothness and the crude visual situation could be figured out for the adjective in touch and vision.

(26) Tactile adjectives of smoothness used for the visual situation (vision)

a.	<u>眼中</u> <i>yan3-zhong1</i> _[VISION/TARGET]	的 <i>de</i>	風景	<i>feng1-jing3</i>
	eye-center		NOM	wind-scenery
	是 <i>shi4</i>	混著	<i>hun4-zhe1</i>	沙石
	be	mix-ASP		<i>sha1-shi2</i> 的 <i>de</i>
				sand-stone NOM
	<u>粗糙</u> <i>cu1-cao1</i> _[TOUCH/SOURCE]		<u>水泥</u> <i>shui3-ni2</i> _[VISION/TARGET]	
	rough		water-mud	

‘The scenery exposed to eyes is the rough cement mixed with sands and stones.’

- b. 不是 *bu4-shi4* 建築師 *jian4-zhu4-shi1* 的 *de*
 NEG-be build-build-expert NOM
 人們 *ren2-men1* 設計 *she4-ji4* 的 *de*
 people-PL design-design NOM
建築 *jian4-zhu4*_[VISION/TARGET], 它們 *ta2-men2* 的 *de*
 build-build it-PL
形式 *xing2-shi4*_[VISION/TARGET] 粗糙 *cu1-cao1*_[TOUCH/SOURCE]
 shape-mode rough

‘The appearance of the buildings which were not designed by architects is rough.’

The five Mandarin tactile smoothness adjectives with synaesthetic distributions in hearing all conceptualized low smoothness, whose auditory usages were all found to be concerned with the negative evaluation, such as 乾澀 *gan1-se4* ‘dry-rough’ characterizing the sorrow sound of howling in example (27). It can thus be concluded that the synaesthetic transfers from tactile smoothness to hearing for Mandarin adjectives support the perceived similarity basis for linguistic synaesthesia.

(27) Tactile adjectives of smoothness used for hearing

- a. 乾澀 *gan1-se4*_[TOUCH/SOURCE], 壓抑 *ya1-yi4*
 dry-rough press-press
 的 *de* 哀嚎 *ai1-hao2*_[HEARING/TARGET]

NOM

sorrow-howl

‘the dry-rough, depressing, and sorrow sound of howling’

澀 *se4* ‘rough’ and 滑 *hua2* ‘smooth’ are the two Mandarin tactile smoothness adjectives demonstrated with the distribution in smell, the former of which was used to describe an unpleasant odor, while the latter to modify a pleasant odor, as shown in example (28). Thus, the interpretations of the synaesthetic expressions of the two adjectives also suggest the perceived similarity basis for linguistic synaesthesia, as tactile roughness has been established to be perceptually negative for humans, while tactile smoothness to be generally pleasant (see Winter 2016a).

(28) Tactile adjectives of smoothness used for smell

- a. 霉 *mei2* 澀 *se4*_[TOUCH/SOURCE] 氣息 *qi4-xi1*
 mildew rough air-breath
 ‘the mildewed and rough smell’
- b. 散發 *san4-fa1* 出 *chu1* 甜 *tian2* 軟 *ruan3*、
 emit-emit out sweet soft
 甘 *gan1* 滑 *hua2*_[TOUCH/SOURCE] 與 *yu3* 果熟 *guo3-shu2*
 sweet smooth and fruit-mature
 的 *de* 香氣 *xiang1-qi4*_[SMELL/TARGET]
 NOM fragrant-air
 ‘the emitting sweet, soft, smooth, and ripe fragrance’

3.3.6 Physical force

Six Mandarin adjectives conceptualizing physical force were identified with synaesthetic uses in the Sinica corpus, of which three were found to have distributions in taste, six in vision, four in hearing, and two in smell.

It is interesting to note that Mandarin adjectives of physical force were all attested to conceptualize the perceptual intensity when used for the gustatory perception, the color in the visual domain, the auditory perception, and the olfactory perception. As shown in example (29), 強勁 *qiang2-jing4* ‘of strong force’ was employed to denote the strongness of the taste of tea, while 輕 *qing1* ‘light (in weight)’ was utilized to conceptualize the weakness of the spicy taste. Similarly, 重 *zhong4* ‘heavy’ for the high physical force was used for the high perceptual intensity experienced by the visual sense for colors as in (30a), by the auditory sense as in (31a), and by the olfactory sense as in (32a). Concepts for low physical force, such as 輕 *qing1* ‘light (in weight)’, were utilized for the low perceptual intensity, as illustrated in examples (30b), (31b), and (32b). The interpretation patterns of Mandarin adjectives of physical force in synaesthetic usages, thus, support the perceived similarity basis for linguistic synaesthesia, as suggested by the embodiment account.

(29) Tactile adjectives of physical force used for taste

- | | | |
|----|---|---|
| a. | <u>茶湯</u> <i>cha2-tang1</i> _[TASTE/TARGET] | <u>強勁</u> <i>qiang2-jing4</i> _[TOUCH/SOURCE] |
| | tea-soup | strong-strength |
| | ‘The taste of tea is strong.’ | |
| b. | <u>輕</u> <i>qing1</i> _[TOUCH/SOURCE] | <u>辣</u> <i>la4</i> _[TASTE/TARGET] |

light (in weight) hot (in taste)
'the light spicy'

(30) Tactile adjectives of physical force used for the color (vision)

- a. 髮色 *fa4-se4*_[VISION/TARGET] 也 *ye3* 不能 *bu4-neng3*
hair-color too NEG-AUX
太 *tai4* 重 *zhong4*_[TOUCH/SOURCE]
too heavy
'The color of hair cannot be too heavy.'
- b. 灌木 *guan4-mu4* 叢 *cong2* 的 *de*
bush-wood bosk NOM
輕 *qing1*_[TOUCH/SOURCE] 綠 *lv4*_[VISION/TARGET]
light (in weight) green
'the light green of the bosk'

(31) Tactile adjectives of physical force used for hearing

- a. 重重 *zhong4-zhong4*_[TOUCH/SOURCE] 的 *de*
heavy-heavy NOM
琴音 *qin2-yin1*_[HEARING/TARGET]
lyre-sound
'the heavy sound of the lyre'
- b. 輕 *qing1*_[TOUCH/SOURCE] 聲 *sheng1*_[HEARING/TARGET] 喊 *han3*
light (in weight) sound shout
起來 *qi3-lai2*
up-come
'to shout using a light voice'

(32) Tactile adjectives of physical force used for smell

- a. 煤味 *mei2-wei4*_[SMELL/TARGET] 太 *tai4* 重 *zhong4*_[TOUCH/SOURCE]
coal-flavor too heavy
‘The smell of coal is too heavy.’
- b. 輕 *qing1*_[TOUCH/SOURCE] 淡 *dan4*
light (in weight) of mild taste
- 香氣 *xiang1-qi4*_[SMELL/TARGET]
fragrant-air
‘the light and mild fragrance’

Synaesthetic uses of Mandarin adjectives of physical force for the visual situation, however, cannot be explained exclusively by the perceived similarity basis. As demonstrated in example (33a), some synaesthetic uses of the adjective 輕 *qing1* ‘light (in weight)’ for the visual situation can be considered to be motivated by the correspondence concerning the low perceptual intensity between the physical force and the visual perception of the geometrical line. Example (33b), however, illustrates that other synaesthetic usages of the adjective 輕 *qing1* ‘light (in weight)’ for the visual situation would be grounded in the sensory integration, as the buoyant visual situation of the gauze generally associated with a light weight.

(33) Tactile adjectives of physical force used for the visual situation (vision)

- a. 在 *zai4* 幾何學 *ji3-he2-xue2* 上 *shang4* [...]
in geometry up [...]
- 輕 *qing1*_[TOUCH/SOURCE] 細 *xi4* 之 *zhi1*

light (in weight)	thin	NOM
<u>線</u> <i>xian4</i> _[VISION/TARGET]	具有 <i>ju4-you3</i>	纖細 <i>xian1-xi4</i> 、
line	possess-have	thin-thin
柔弱 <i>rou2-ruo4</i> 、	輕巧 <i>qing1-qiao3</i> 、	
soft-weak	light (in weight)-delicate	
瀟灑 <i>xiao1-sa3</i>		的 <i>de</i>
(of water) deep and clear-spill		NOM
感覺 <i>gan3-jue3</i>		
feel-feel		

‘In geometry (...), the light and thin line gives the thin, weak, delicate, and natural feeling.’

- b. 校園 *xiao4-yuan2* 中 *zhong1* 不時 *bu4-shi2*
- school-campus center NEG-time
- 可 *ke3* 見 *jian4*_[VISION/TARGET] 一襲 *yi1-xi2*
- AUX see one-CL
- 輕 *qing1*_[TOUCH/SOURCE] 紗 *sha1*_[VISION/TARGET]
- light (in weight) gauze
- ‘The light gauze can often be seen in the campus.’

3.3.7 Pain

There are four Mandarin adjectives for pain attested with synaesthetic uses in the Sinica corpus, one of them exhibiting the distribution in taste, three in vision, one in hearing, while none in smell.

The gustatory usage of the adjective 麻 *ma2* ‘trembling’, as shown in example (34), is consistent with the physiological finding that the sensation induced on the tongue and lips by Szechuan pepper shares the same RA1 channel with the mechanical vibration (Hagura et al. 2013). Thus, the adjective 麻 *ma2* ‘trembling’ used for taste, suggests the neural association basis for linguistic synaesthesia, as assumed by the biological association account.

(34) Tactile adjectives of pain used for taste

乾煸 <i>gan1-bian3</i>		牛肉絲 <i>niu2-rou4-si1</i> _[TASTE/TARGET] ,	
dry-fry		cow-meat-slice	
麻 <i>ma2</i> _[TOUCH/SOURCE]	而 <i>er2</i>	不 <i>bu4</i>	辣 <i>la4</i>
trembling	but	NEG	hot (in taste)

‘The dry-fried slice of beef is pungent, but not hot.’

There is only one Mandarin pain adjective with synaesthetic usages for the visual dimension (i.e., 脹 *zhang4* ‘swelling [in pain]’), and two for the visual situation, while none for the color. As shown in example (35), the adjective 脹 *zhang4* ‘swelling (in pain)’ used for the visual dimension, denotes the enlargement of shapes, which is generally an associated experience when people perceiving the swelling pain. Thus, the synaesthetic use of the adjective 脹 *zhang4* ‘swelling (in pain)’ for the visual dimension would be more likely to suggest the sensory integration basis for synaesthetic transfers. Example (36), however, shows that the synaesthetic uses of

Mandarin pain adjectives for the visual situation are in line with the perceived similarity basis for linguistic synaesthesia, as the tactile stabbing sensation and the visual glaring sensation conceptualized by 刺刺 *ci4-ci4* ‘stabbing’ are both unpleasant.

(35) Tactile adjectives of pain used for the dimension (vision)

發 <i>fa1</i>	<u>脹 <i>zhang4</i></u> _[TOUCH/SOURCE]	的 <i>de</i>
produce	swelling (in pain)	NOM
<u>罐頭 <i>guan4-tou2</i></u> _[VISION/TARGET]		
tin-head		
‘the swelling tin’		

(36) Tactile adjectives of pain used for the visual situation (vision)

<u>刺刺 <i>ci4-ci4</i></u> _[TOUCH/SOURCE]	的 <i>de</i> 、	不 <i>bu4</i>
stabbing- stabbing	NOM	NEG
太 <i>tai4</i>	舒服 <i>shu1-fu1</i>	的 <i>de</i>
too	stretch-dress	NOM
<u>視覺 <i>shi4-jue2</i></u>	<u>效果 <i>xiao4-guo3</i></u> _[VISION/TARGET]	
vision-sense	effect-result	
‘the stabbing and uncomfortable visual effect’		

The only Mandarin pain adjective with auditory uses is 軟弱 *ruan3-ruo4* ‘feeble’ conceptualizing a low intensity of hearing, as shown in example (37). This interpretation would suggest the sensory integration basis for linguistic

synaesthesia, as humans experiencing feeble sensations generally produce weak voices.

(37) Tactile adjectives of pain used for hearing

以 <i>yi3</i>	<u>軟弱</u> <i>ruan3-ruo4</i> _[TOUCH/SOURCE]	的 <i>de</i>
use	soft-weak	NOM
	<u>聲音</u> <i>sheng1-yin1</i> _[HEARING/TARGET]	道 <i>dao4</i>
sound-voice		say
	‘saying in a weak voice’	

3.3.8 Summary

It has been demonstrated that Mandarin adjectives for specific tactile perceptions exhibit more complex patterns in linguistic synaesthesia than the adjectives for tactile intensities. Specifically, Mandarin adjectives for tactile hardness, sharpness, smoothness, and pain were identified with synaesthetic uses for the visual dimension, while adjectives for the tactile intensity were not found to show the distribution. In addition, Mandarin tactile quality adjectives have also been established to exhibit different tendencies from the tactile intensity adjectives, with respect to the interpretations of synaesthetic usages. That is, there are tactile quality adjectives attested to conceptualize the perceptual intensity rather than a specific perceptual property in their synaesthetic expressions, such as the temperature adjective 烈 *lie4* ‘scorching’ used for taste. There is, however, none Mandarin tactile intensity adjectives

found to denote perceptual properties in linguistic synaesthesia, which instead all preserved their intensity concepts.

It should also be noted that, although the general synaesthetic distributions of Mandarin tactile quality adjectives are consistent with the prediction of the embodiment account, analogous to those of Mandarin tactile intensity adjectives, Mandarin adjectives for specific tactile perceptions did show differences in their synaesthetic transfers. One intriguing pattern is that adjectives representing tactile perceptions that are typically experienced by grasping of hands, such as hardness and smoothness, demonstrated synaesthetic transfers to the visual dimension, whereas adjectives of other tactile perceptions (e.g., temperature and dampness adjectives) did not show the tendency. Furthermore, in terms of the underlying mechanisms of linguistic synaesthesia, the perceived similarity of intensity and affective evaluation proposed in the embodiment account of linguistic synaesthesia has been found to be insufficient to explain the synaesthetic usages of Mandarin tactile quality adjectives. Rather, the sensory integration and the neural association have also been attested to ground linguistic synaesthesia in Mandarin tactile quality adjectives.

3.4 Summary of synaesthetic tendencies of Mandarin tactile adjectives

This chapter has figured out the synaesthetic tendencies of Mandarin tactile adjectives, based on their distributions in the Sinica corpus. As predicted by

the embodiment account of linguistic synaesthesia, Mandarin tactile adjectives were found to be used for all other four senses (i.e., taste, vision, hearing, and smell). However, Mandarin adjectives for different tactile perceptions, showed different patterns in linguistic synaesthesia, which was not predicted by the embodiment account. Besides, the synaesthetic transfers of Mandarin tactile adjectives could be motivated not only by the perceived similarity, but also by the sensory integration and by the neural association, consistent with the assumption of Zhao et al. (2018b, in press) that linguistic synaesthesia would be the most likely to be grounded by multiple mechanisms.

The tendencies of linguistic synaesthesia of Mandarin tactile adjectives will be compared with those of Mandarin gustatory, visual, auditory, and olfactory adjectives in the following two chapters, to examine the directionality of Mandarin synaesthesia. Therefore, the directional tendency between touch and taste for linguistic synaesthesia in Mandarin will be one of the main goals of next chapter, which focuses on the synaesthetic patterns of Mandarin gustatory adjectives.

Chapter 4: Linguistic synaesthesia of Mandarin gustatory adjectives

This chapter is extension of Zhao et al. (2018b, in press) to explore the finer-grained tendencies and mechanisms of synaesthetic usages of Mandarin gustatory adjectives, different from Zhao et al.'s (2018b, in press) contrastive focus on the differences of synaesthetic patterns between Mandarin and English concerning gustatory adjectives. In addition, more synaesthetic data has been collected in this study, by adopting a looser criterion for identifying Mandarin adjectives originally used for taste. For instance, Mandarin adjective 膩 *ni4* 'greasy' has the etymological meaning of 'much fat', which is analogous to the adjective 濃 *nong2* 'dense dew' (see Section 2.1.1 in Chapter 2), where taste and vision are both possible original source domains. 濃 *nong2* 'dense dew' could be assigned to taste, based on its close relation with the attested gustatory adjective 淡 *dan4* 'not salty/of mild taste'. However, there is no attested taste item revealing the relation with 膩 *ni4* 'greasy'. This study, nevertheless, included 膩 *ni4* 'greasy' as an original gustatory item, on the basis of its more frequent use for taste (i.e., 18 counts) than for vision (i.e., three counts) in Mandarin based on the Sinica corpus.

Specifically, Sections 4.1 and 4.2 of this chapter will explore the synaesthetic tendencies for Mandarin gustatory intensity adjectives and Mandarin gustatory quality adjectives respectively. Following these, the general transfer patterns and underlying mechanisms of linguistic

synaesthesia of Mandarin gustatory adjectives will be figured out in Section 4.3. The last section will examine the directionality between touch and taste in Mandarin synaesthesia.

4.1 Gustatory adjectives of intensity

There are 21 Mandarin gustatory adjectives identified with synaesthetic usages in the Sinica corpus involving 2,291 token examples (see Appendix 2). Among these adjectives, two adjectives conceptualized the gustatory intensity, i.e., 淡 *dan4* ‘not salty/of mild taste’ and 濃 *nong2* ‘of intense taste’.²⁰

The gustatory intensity adjectives were found to be used for vision, hearing, and smell, but not for touch in the Sinica corpus, as shown in examples (1) through (4).

- (1) Gustatory adjectives of intensity used for the color (vision)

20 It should be noted that the adjective 淡 *dan4* ‘not salty/of mild taste’ can be used for both the gustatory quality, such as 菜不鹹不淡 *cai4 bu4 xian2 bu4 dan4* ‘the dish is not salty or tasteless (just right)’, and the gustatory intensity, such as 淡淡的甜味 *dan4-dan4 de tian2 wei4* ‘the slight sweetness’ in Mandarin. Moreover, the gustatory quality use is predominant for the adjective 淡 *dan4* in Mandarin, with about 85.6% (161/188) of its gustatory usages for quality found in the Sinica corpus. The adjective used in synaesthetic expressions, however, was attested to all denote the perceptual intensity for other sensory modalities, which was therefore assigned to the category of gustatory intensity adjectives for discussion.

- a. 淡 dan4_[TASTE/SOURCE] 藍色 lan2-se4_[VISION/TARGET]
of mild taste blue-color
‘light blue’
- b. 葉色 ye4-se4_[VISION/TARGET] 濃 nong2_[TASTE/SOURCE]
leave-color of intense taste
- 綠 lv4_[VISION/TARGET]
green
‘The color of leaves is deep-green.’

(2) Gustatory adjectives of intensity used for the visual situation (vision)

- a. 淡淡 dan4-dan4_[TASTE/SOURCE] 笑意 xiao4-yi4_[VISION/TARGET]
of mild taste-of mild taste smile-meaning
‘the faint smile’
- b. 濃濃 nong2-nong2_[TASTE/SOURCE] 的 de
of intense taste-of intense taste NOM
- 眉毛 mei2-mao2_[VISION/TARGET]
eyebrow-hair
‘the thick eyebrow’

(3) Gustatory adjectives of intensity used for hearing

- a. 淡 dan4_[TASTE/SOURCE] 了 le
of mild taste ASP
- 喧鬧聲 xuan1-nao4-sheng1_[HEARING/TARGET]
clamor-noisy-sound
‘The noise is weakened.’
- b. 濃濃 nong2-nong2_[TASTE/SOURCE]

of intense taste-of intense taste

廣東腔 *guang3dong1-qiang1*_[HEARING/TARGET]

Guangdong-accent

‘the strong accent of Cantonese’

(4) Gustatory adjectives of intensity used for smell

a. **淡淡 *dan4-dan4***_[TASTE/SOURCE] 的 *de*
of mild taste-of mild taste NOM

花香 *hua1-xiang1*_[SMELL/TARGET]

flower-fragrance

‘the light fragrance of flowers’

b. 女子 *nv3-zi3* 的 *de* **體味 *ti3-wei4***_[SMELL/TARGET]
female-PAR GEN body-odor

真 *zhen1* **濃 *nong2***_[TASTE/SOURCE]

really of intense taste

‘The odor of the woman is quite strong.’

The synaesthetic distributions of Mandarin adjectives of gustatory intensity are thus consistent with the prediction of embodiment account of linguistic synaesthesia, following the trend from the more embodied to the less embodied, namely, from the sense needing physical contact with perceived objects (i.e., taste) to the senses without such requirements (i.e., vision, hearing, and smell). The unobserved direction from taste to touch was also predicted by the theory, since touch is more embodied with sensory

receptors all over the body compared with taste, which has sensory receptors only in the mouth (Lehrer 1978; Shen 1997).

The interpretations of the synaesthetic expressions for these gustatory intensity adjectives also support the perceived similarity basis for linguistic synaesthesia proposed by the embodiment account. That is, the concept of intensity and the polarity of the intensity scale for the adjectives 淡 *dan4* ‘of mild taste’ and 濃 *nong2* ‘of intense taste’ were both preserved in synaesthetic transfers. Specifically speaking, 淡 *dan4* ‘of mild taste’, originally on the negative side of the intensity scale for gustation, was employed to characterize the faintness of perceptions in vision, hearing, and smell, as illustrated in (1a), (2a), (3a), and (4a), whereas 濃 *nong2* ‘of intense taste’ on the positive side of the gustatory intensity scale, retained the positive polarity in what was perceived by the eyes, ears, and the nose, such as (1b), (2b), (3b), and (4b).

It is interesting to note that Mandarin gustatory intensity adjectives were not attested to exhibit synaesthetic uses for the visual dimension.

4.2 Gustatory adjectives of quality

Mandarin gustatory quality adjectives were found with synaesthetic uses for vision, hearing, and smell in the Sinica corpus, just as Mandarin gustatory intensity adjectives discussed above.

There are ten Mandarin gustatory adjectives of quality found with synaesthetic distributions in vision, of which five were employed to

characterize the color, and nine were used to describe the visual situation, while none was demonstrated with synaesthetic uses for the visual dimension. Therefore, Mandarin gustatory quality adjectives, similar to Mandarin gustatory intensity adjectives, were also unattested to exhibit the synaesthetic transfer to the visual dimension.

The interpretations of synaesthetic expressions of Mandarin gustatory quality adjectives used for the color and the visual situation both support the perceived similarity basis for linguistic synaesthesia as suggested by the embodiment account. Specifically, the adjectives with color usages all originally conceptualized positive tastes, which were still employed to describe pleasant visual sensations of specific colors, such as 鮮美 *xian1-meī3* ‘tasty’ in example (5). With respect to Mandarin gustatory quality adjectives used for the visual situations, the affective evaluations were also retained. For instance, 甜 *tian2* ‘sweet’ always implied that the objects are pleasing to the visual sense, as in (6a), whereas 苦 *ku3* ‘bitter’ indicated unpleasant perceptions in vision, as illustrated in (6b).

(5) Gustatory adjectives of quality used for the color (vision)

<u>顏色</u> <i>yan2-se4</i> _[VISION/TARGET]	<u>鮮美</u> <i>xian1-meī3</i> _[TASTE/SOURCE]
face-color	tasty-tasty
‘The color is bright and beautiful.’	

(6) Gustatory adjectives of quality used for the visual situation (vision)

a.	<u>甜美</u> <i>tian2-meī3</i> _[TASTE/SOURCE]	的 <i>de</i>
	sweet-tasty	NOM

笑容 *xiao4-rong2*_[VISION/TARGET]

smile-appearance

‘the sweet smile’

b. 苦 *ku3*_[TASTE/SOURCE] 著 *zhe1* 臉 *lian3*_[VISION/TARGET]

bitter

ASP

face

‘with bitter facial expressions’

The correspondence concerning affective evaluations between taste and hearing was also attested for the nine Mandarin gustatory quality adjectives used for auditory perceptions. As illustrated in example (7), 甜 *tian2* ‘sweet’ was used to characterize a positive auditory sensation, while 苦 *ku3* ‘bitter’ was employed to describe an unpleasant perception in hearing. Thus, the synaesthetic transfers from taste to hearing for Mandarin gustatory quality adjectives are also consistent with the perceived similarity basis for linguistic synaesthesia.

(7) Gustatory adjectives of quality used for hearing

a. 甜 *tian2*_[TASTE/SOURCE] 而 *er2* 輕柔 *qing1-rou2*

sweet

and

light-soft

的 *de*

聲音 *sheng1-yin1*_[HEARING/TARGET]

NOM

voice-voice

‘the sweet and soft voice’

b. 苦 *ku3*_[TASTE/SOURCE] 調 *diao4*_[HEARING/TARGET]

bitter

tune

‘the bitter tune’

There are 14 Mandarin gustatory quality adjectives attested with synaesthetic usages for olfactory perceptions. Zhao et al. (2018b, in press) have suggested that the olfactory usages of Mandarin gustatory quality adjectives are grounded in the perceived similarity of affective evaluations between taste and smell. For instance, the adjective 甜 *tian2* ‘sweet’ as a positive taste was generally used for a pleasant perception of smell, as shown in (8a) for 香 *xiang1* ‘fragrance’. Besides, the study also assumed that the collocations of the adjectives 苦 *ku3* ‘bitter’ and 酸 *suan1* ‘sour’ both conceptualizing negative perceptions of taste with 香 *xiang1* ‘fragrance’ were triggered by specific contexts, i.e., tea or coffee and vinegar respectively, as illustrated in (8b) and (8c). This study, however, argues that the contextually-triggered olfactory uses of Mandarin gustatory quality adjectives in fact indicate the sensory integration basis for linguistic synaesthesia. That is, the bitter taste as an intrinsic property of coffee and tea tends to be perceptually associated with the odor of these objects, as tasting and smelling are generally mutually-dependent to determine the flavor of food (Winter 2016a; Winter 2016b), which would thus motivate the conceptualization of the olfactory perception of coffee and tea in terms of the concepts of the gustatory perceptions of these objects. Similarly, the recurring association between the sour taste (as an intrinsic property of vinegar) and the odor of vinegar is also likely to ground the description of olfactory properties of vinegar through its gustatory concepts.

(8) Gustatory adjectives of quality used for smell

- a. 撲鼻 *pu1-bi2*_[SMELL/TARGET] 的 *de*
 rush.to-nose NOM
甜 *tian2*_[TASTE/SOURCE] 香 *xiang1*_[SMELL/TARGET]
 sweet fragrant
 ‘the tangy sweet fragrance’
- b. 微 *wei1* 苦 *ku3*_[TASTE/SOURCE]
 slightly bitter
氣香 *qi1-xiang1*_[SMELL/TARGET]
 air-fragrant
 ‘the slightly bitter fragrance of air’ (in the coffee context)
- c. 酸 *suan1*_[TASTE/SOURCE] 香 *xiang1*_[SMELL/TARGET]
 sour fragrant
撲鼻 *pu1-bi2*_[SMELL/TARGET]
 rush.to-nose
 ‘The pleasant sour odor is strong.’ (in the vinegar context)

Mandarin gustatory quality adjectives have been found not only to exhibit the transfers from taste to less embodied modalities, including vision, hearing, and smell, as predicted by the embodiment account, but also to be employed for the more embodied modality, i.e., touch.

There are five Mandarin gustatory quality adjectives identified with synaesthetic transfers to touch involving 104 token examples, as shown in example (9). In terms of the interpretation, the adjectives 酸 *suan1* ‘sour’, 膩 *ni4* ‘greasy’, 油膩 *you2-ni4* ‘greasy’, and 苦 *ku3* ‘bitter’ conceptualizing unpleasant gustatory perceptions originally, were still used to characterize the

negative sensations in touch, as in (9a-d). These examples therefore support the perceived similarity basis for synaesthetic transfers.

The adjective 辣 *la4* ‘hot (in taste)’, however, showed a different pattern, which conceptualized a neutral gustatory perception generated when the tongue is in contact with a chilli pepper in Mandarin (Zhao et al. 2018b, in press). Studies such as Wu (1989) and Wang (1996) have demonstrated that the adjective 辣 *la4* ‘hot (in taste)’ is a later use of 辛 *xin1* ‘hot (in taste)’, originally related to taste. The adjective 辣 *la4* ‘hot (in taste)’ is, thus, different from English gustatory adjectives *pungent* and *hot* that describe gustation through the synaesthetic transfers from touch (Williams 1976). With respect to the tactile use of 辣 *la4* ‘hot (in taste)’, it conceptualized a combinative perception of high temperature and pain, as shown in (9e). Therefore, the interpretation of 辣 *la4* ‘hot (in taste)’ used for touch is in line with the biological association of the spicy taste with temperature (Hirasa and Takemasa 1998) and pain (Caterina et al. 1997), which supports the biological association basis for linguistic synaesthesia.

(9) Gustatory adjectives of quality used for touch

- | | | |
|----|--|---|
| a. | 覺得 <i>jue2-de</i> | 鼻子 <i>bi2-zi</i> _[TOUCH/TARGET] |
| | feel-receive | nose-PAR |
| | 一 <i>yi1</i> | 酸 <i>suan1</i> _[TASTE/SOURCE] |
| | ASP | sour |
| | ‘feeling sore in the nose’ | |
| b. | 一身 <i>yi1-shen1</i> _[TOUCH/TARGET] | 膩 <i>ni4</i> _[TASTE/SOURCE] |

one-body greasy'

汗 *han4*_[TOUCH/TARGET]

sweat

'the sticky sweat all over the body'

c. 不 *bu4* 油腻 *you3-ni4*_[TASTE/SOURCE] 的 *de*

NEG oil-greasy NOM

珍珠 *zhen1-zhu1* 香水 *xiang1-shui3*

pearl-pearl fragrant-water

洗面霜 *xi3-mian4-shuang1*_[TOUCH/TARGET]

wash-face-cream

'the non-greasy cleansing cream with pearl essence and perfume'

d. 苦 *ku3*_[TASTE/SOURCE] 寒 *han3*_[TOUCH/TARGET]

bitter cold

'bitter cold'

e. 感觉 *gan3-jue2* 眼 *yan3*_[TOUCH/TARGET]

feel-feel eye

辣 *la4*_[TASTE/SOURCE] 手 *shou3* 冷 *leng3*

hot (in taste) hand cold

'feeling burning pain in eyes and cold in hands'

4.3 Summary of synaesthetic tendencies of

Mandarin gustatory adjectives

Mandarin gustatory intensity and quality adjectives were found to show subtle differences in linguistic synaesthesia. Specifically, all synaesthetic

transfers of the gustatory intensity adjectives were predicted by the embodiment account, following the embodiment principle mapping from the more embodied modality (i.e., taste) to less embodied ones (i.e., vision, hearing, and smell). In addition, the interpretations of synaesthetic expressions of these intensity adjectives are all consistent with the perceived similarity basis for linguistic synaesthesia proposed by the embodiment account. Mandarin gustatory quality adjectives, however, exhibited more complex patterns, compared to the intensity adjectives. That is, though most synaesthetic distributions of gustatory quality adjectives were attested to follow the embodiment tendency mapping from the more embodied to the less embodied, there are a small but important number of exceptions to the embodiment account mapping from taste to touch, i.e., with 26.3% (5/19) by type and 6.0% (104/1,738) by token among all synaesthetic usages of Mandarin gustatory quality adjectives. Besides, with respect to the underlying mechanism of linguistic synaesthesia, apart from the perceived similarity basis, there are synaesthetic expressions of Mandarin gustatory quality adjectives suggesting the sensory integration basis (e.g., the olfactory usages of 苦 *ku3* ‘bitter’ and 酸 *suan1* ‘sour’) and the biological association basis (e.g., the adjective 辣 *la4* ‘hot [in taste]’ used for touch).

It is notable, however, that Mandarin gustatory intensity adjectives demonstrated a similar pattern to Mandarin gustatory quality adjectives. That is, both were not found to be used for the visual dimension. It can thus be concluded that Mandarin gustatory adjectives were unattested to show the synaesthetic transfer to the dimension of the visual modality. Besides, there are other general synaesthetic patterns of Mandarin gustatory adjectives,

which could be figured out when combining the tendencies of Mandarin gustatory intensity and quality adjectives in linguistic synaesthesia. Specifically, most synaesthetic distributions of Mandarin gustatory adjectives, i.e., with 76.2% (16/21) for lexical types and 95.5% (2,187/2,291) for lexical tokens, are consistent with the prediction of the embodiment account of linguistic synaesthesia mapping from the more embodied to the less embodied. However, there is a significant portion of Mandarin gustatory adjectives, i.e., with 23.8% (5/21) by type and 4.5% (104/2,291) by token, violating the embodiment principle with transfers from taste to touch. With respect to the underlying mechanism of linguistic synaesthesia, Mandarin gustatory adjectives not only showed the perceived similarity basis, but also demonstrated the sensory integration basis and the biological association basis for linguistic synaesthesia, which are analogous to Mandarin tactile adjectives (see Chapter 3).

4.4 Directionality between touch and taste in Mandarin synaesthesia

There are basically two methods proposed to figure out the synaesthetic directionality between sensory modalities in the literature. One is Strik Lievers' (2015) study utilizing the frequency of synaesthetic transfers in a specific corpus, and the other is Zhao and Huang's (2018) work focusing on the percentage of synaesthetic lexical types in one sense used for another sense. As pointed by Winter (2016a), both token and type should be

considered for the synaesthetic directionality. This study, thus, took into consideration both the frequency of synaesthetic tokens and the percentage of synaesthetic lexical types, to figure out the directional tendency between touch and taste for Mandarin synaesthesia.

Specifically, the synaesthetic transfers from touch to taste were found to show a similar frequency to the transfers from taste to touch in the Sinica corpus, i.e., with 125 token examples (see Appendix 1) and 104 token examples (see Appendix 2) respectively. In terms of the percentage of synaesthetic lexical types, 9.6% (7/73) of Mandarin tactile synaesthetic adjectives were used for taste, and 23.8% (5/21) of Mandarin gustatory synaesthetic adjectives were employed for touch. Although the taste-for-touch percentage is larger than the touch-for-taste, both percentages are much smaller than 50%, which would thus be less likely to suggest a predominant direction of linguistic synaesthesia between touch and taste. Therefore, this study has generalized the directional tendency between touch and taste for Mandarin synaesthesia as Figure 3.



Figure 3: Directional tendencies between touch and taste in Mandarin synaesthesia

It can thus be concluded that the predominant directionality from touch to taste observed in Indo-European languages, such as English, French, and Italian (see Ullmann 1957; Williams 1976; Strik Lievers 2015), was not attested for Mandarin synaesthesia, based on both lexical tokens and lexical types. It is intriguing to note that Zhao and Huang (2018) have also found the

bi-directionality between touch and taste for Mandarin synaesthesia, although the study utilized a different method (i.e., the dictionary-based approach) from this study.

One of the most important implications, with respect to the different directional tendency between touch and taste for Mandarin synaesthesia from that for linguistic synaesthesia in Indo-European languages, is that Mandarin synaesthesia would not support the cross-lingual universality of synaesthetic tendencies hypothesized by the biological association account of linguistic synaesthesia (Williams 1976). I will return to the issue in more details in Chapter 7, after figuring out the synaesthetic tendencies of Mandarin visual, auditory, and olfactory adjectives, as well as Mandarin compound adjectives combining different sensory modalities.

Chapter 5: Linguistic synaesthesia of Mandarin visual, auditory, and olfactory adjectives

The extracted synaesthetic data has shown that vision, hearing, and smell exhibit much lower degrees of synaesthetic participation than touch and taste in Mandarin, of which there are only four auditory adjectives and two olfactory adjectives identified with synaesthetic usages in the Sinica corpus (see Chapter 2). This chapter, therefore, focuses on the synaesthetic tendencies of Mandarin adjectives from all the three sensory modalities (i.e., vision, hearing, and smell).

Shen (1997) has suggested that vision, hearing, and smell do not necessarily involve the physical contact between sensory organs and perceived objects, which are thus less embodied than touch and taste. One more recent study, i.e., Zhao and Huang (2018), assumed that visual, auditory, and olfactory modalities could also be differentiated in terms of the degree of embodiment, where vision and hearing should be more embodied than smell given their greater dominance in the human perceptual system. Following the embodiment account of linguistic synaesthesia, it would be predicted that Mandarin visual and auditory adjectives could be used for smell, but not for touch and taste, and that Mandarin olfactory adjectives would be the least likely to transfer to other senses.

It should be noted that the embodiment account of linguistic synaesthesia did not figure out the embodiment between vision and hearing. Intriguingly, the biological association account of linguistic synaesthesia proposed that the synaesthetic transfers between vision and hearing are grounded in neural connections in the brain (Marks et al. 1987; Ward et al. 2006). Therefore, based on the biological association model, synaesthetic mappings from vision to hearing and from hearing to vision would be both expected in Mandarin adjectives.

In what follows, the first three sections will present the synaesthetic patterns of Mandarin visual, auditory, and olfactory adjectives respectively, based on which the general transfer hierarchy of Mandarin synaesthesia will be figured out. Section 5.4 will explore the embodiment of five sensory modalities, based on the tendencies of Mandarin synaesthesia.

5.1 Visual adjectives

There are 99 Mandarin visual adjectives identified with synaesthetic usages, which involve 3,034 synaesthetic instances in the Sinica corpus. As elaborated in Chapter 3, this study followed Williams (1976) to term adjectives originally for visual color/light as “color” and adjectives for dimension/shape as “dimension”. Besides, Mandarin visual adjectives excluding color adjectives and dimension adjectives were named as “visual situation” to facilitate the discussion. As illustrated in Table 6, synaesthetic usages were found to be involved not only in Mandarin adjectives

conceptualizing colors and dimensions, such as 暗 *an4* ‘dark’ and 大 *da4* ‘big’ respectively, but also in adjectives representing visual situations, such as 緊 *jin3* ‘tense (in vision)’ and 鬆 *song1* ‘shaggy’. Linguistic synaesthesia of adjectives for visual situations, however, was not taken into consideration by Williams (1976). In contrast, this study will explore the synaesthetic patterns of Mandarin adjectives in all the three visual sub-types separately (For a detailed summary of the distribution of synaesthetic uses of Mandarin visual adjectives, please see Appendix 3).

Table 6: Sub-types of vision for Mandarin visual synaesthetic adjectives

Visual sub-types	Numbers of adjectives	Examples
Color	30	暗 <i>an4</i> ‘dark’
		亮 <i>liang4</i> ‘bright’
Dimension	33	大 <i>da4</i> ‘big’
		小 <i>xiao3</i> ‘small’
Visual situation	36	緊 <i>jin3</i> ‘tense (in vision)’
		鬆 <i>song1</i> ‘shaggy’

5.1.1 Color

There are 30 Mandarin color adjectives originally describing visual brightness or clearness (but not the chromatic categories, such as 黑 *heil* ‘black’ and 紅 *hong2* ‘red’) found to be used for other senses in the Sinica corpus, as shown in Table 6 above. Among these adjectives, 27 adjectives

were demonstrated to exhibit synaesthetic transfers to hearing, and eight to smell. The olfactory usages of Mandarin color adjectives are consistent with the prediction of the embodiment account of linguistic synaesthesia. With respect to the auditory distributions of Mandarin color adjectives, although these synaesthetic expressions were predicted by the biological association account of linguistic synaesthesia, they are not contradictory with the embodiment account as well, as the degree of embodiment between vision and hearing has not been differentiated by the theory.

It is interesting to note that the interpretations of the auditory uses of Mandarin color adjectives also support both the perceived similarity basis proposed by the embodiment account and the neural association basis suggested by the biological association account for linguistic synaesthesia. As shown in (1a-b), the adjective for low clearness (i.e., 雜 *za2* ‘varicolored’) was employed to describe an unpleasant auditory sensation, while the adjective for high clearness (i.e., 純淨 *chun2-jing4* ‘pure’) was used for a pleasant perception of hearing, hence supporting the perceived similarity of subjective evaluations grounding synaesthetic transfers from vision to hearing. Besides, the perceptual “intrinsic” correspondence between brightness and pitch (Marks et al. 1987: v; Ward et al. 2006), has also been verified in Mandarin color adjectives. That is, adjectives for low brightness were employed to conceptualize the low pitch of hearing, such as 暗 *an4* ‘dark’ in (1c), whereas adjectives for high brightness were used to describe auditory perceptions with a high pitch, such as 亮 *liang4* ‘bright’ in (1d). These

synaesthetic expressions are thus consistent with the biological association basis for linguistic synaesthesia.

(1) Visual color adjectives used for hearing

- a. 雜 *za2*_[VISION/SOURCE] 音 *yin1*_[HEARING/TARGET]
 varicolored sound
 ‘the noise’
- b. 純淨 *chun2-jing4*_[VISION/SOURCE] 無瑕 *wu2-xia2*
 pure-clean no-flaw
 的 *de* 嗓音 *sang3-yin1*_[HEARING/TARGET]
 NOM throat-sound
 ‘the clean and flawless voice’
- c. 音色 *yin1-se4*_[HEARING/TARGET] [...] 悶 *men1*
 sound-color [...] stuffy
暗 *an4*_[VISION/SOURCE]
 dark
 ‘The sound is dull and dark.’
- d. 高 *gao1* 音 *yin1*_[HEARING/TARGET] 則 *ze2*
 high would
亮 *liang4*_[VISION/SOURCE]
 bright
 ‘The sound with a high pitch would be bright.’

The interpretation of Mandarin color adjectives used for olfactory perceptions showed interesting patterns. That is, adjectives for low brightness or clearness (i.e., low visibility) were used to conceptualize the low intensity

of olfactory perceptions, regardless of affective contents. As illustrated in (2a-b), both 暗 *an4* ‘dark’ and 隱隱 *yin3-yin3* ‘faint’ originally conceptualizing low visibility were employed to denote the low intensity of olfactory perceptions, where the former adjective was used for a pleasant smell, while the latter for an unpleasant odor. Mandarin visual adjectives for high brightness or clearness, however, always implied that the modified olfactory perceptions were pleasant, as shown in (2c-d) where both 清 *qing1* ‘limpid’ and 清爽 *qing1-shuang3* ‘clear’ were employed for fragrance. Despite the difference, the perceived similarity basis for linguistic synaesthesia could still be supported by the olfactory expressions of Mandarin color adjectives, of which the correspondence between vision and smell for the adjectives of low brightness or clearness lies in the perceived intensity, whereas for the adjectives of high brightness or clearness lies in the subjective evaluation.

(2) Visual color adjectives used for smell

a.	<p>暗 <i>an4</i>_[VISION/SOURCE]</p> <p>dark</p> <p>飄 <i>piao1</i></p> <p>flutter</p> <p>霉味 <i>mei2-wei</i></p> <p>mildew-flavor</p> <p>‘The faint fragrance is mixing with the smell of mildew.’</p>	<p>香 <i>xiang1</i>_[SMELL/TARGET]</p> <p>fragrant</p> <p>在 <i>zai4</i></p> <p>in</p> <p>中 <i>zhong1</i></p> <p>center</p>
b.	<p>一股 <i>yi1-gu3</i></p> <p>one-CL</p> <p>隱隱 <i>yin3-yin3</i>_[VISION/SOURCE]</p>	<p>霉味 <i>mei2-wei4</i>_[SMELL/TARGET]</p> <p>mildew-flavor</p> <p>浮盪 <i>fu2-dang4</i></p>

	faint-faint	float-sway
	‘There floats a faint smell of mildew.’	
c.	<u>聞</u> <i>wen2</i> _[SMELL/TARGET]	到 <i>dao4</i>
	smell	get
	荷花 <i>he2-hua1</i>	的 <i>de</i>
	lotus-flower	GEN
	<u>清</u> <i>qing1</i> _[VISION/SOURCE]	<u>香</u> <i>xiang1</i> _[SMELL/TARGET]
	limpid	fragrant
	‘The delicate fragrance of lotus was perceived.’	
d.	<u>清爽</u> <i>qing1-shuang3</i> _[VISION/SOURCE]	的 <i>de</i>
	limpid-bright	NOM
	<u>芳香</u> <i>fang1-xiang1</i> _[SMELL/TARGET]	
	fragrant-fragrant	
	‘the delicate fragrance’	

It is remarkable that Mandarin color adjectives did exhibit synaesthetic transfers to touch and taste, hence at odds with the embodiment account of linguistic synaesthesia. Specifically, there are four color adjectives identified with distributions in touch including 清 *qing1* ‘limpid’, 清爽 *qing1-shuang3* ‘clear’, 隱隱 *yin3-yin3* ‘faint’, and 爽朗 *shuang3-lang3* ‘clear’, and four in taste, i.e., 清 *qing1* ‘limpid’, 清爽 *qing1-shuang3* ‘clear’, 雜 *za2* ‘varicolored’, and 清白 *qing1-bai2* ‘clear white’.

The interpretations of the color adjectives used for touch and taste all support the perceived similarity basis for synaesthetic transfers. As shown in example (3), the adjective 隱隱 *yin3-yin3* ‘faint’ originally for low brightness

preserved the low intensity for tactile perceptions, and the adjective 清爽 *qing1-shuang3* ‘clear’ originally for high brightness retained the positive evaluation for touch, which are similar to their synaesthetic usages for smell. In terms of the gustatory uses of Mandarin color adjectives, their interpretations are analogous to the color adjectives used for auditory sensations, which are grounded in the perceived similarity of affective evaluations. That is, adjectives for low brightness or clearness were utilized to describe unpleasant tastes, such as 雜 *za2* ‘varicolored’ in (4a), while adjectives for high brightness or clearness were employed to characterize pleasant gustatory sensations, such as 清爽 *qing1-shuang3* ‘clear’ in (4b). Thus, although the tactile and gustatory distributions of Mandarin color adjectives are counter-examples of the embodiment account of linguistic synaesthesia mapping from the less embodied to the more embodied, the interpretations of the synaesthetic expressions of these adjectives do support the perceived similarity basis for linguistic synaesthesia suggested by the theory.

(3) Visual color adjectives used for touch

- a. 隱隱 *yin3-yin3*_[VISION/SOURCE] 鈍痛 *dun4-tong4*_[TOUCH/TARGET]
 faint-faint blunt-pain
 ‘the weak dull pain’
- b. 清爽 *qing1-shuang3*_[VISION/SOURCE] 的 *de*
 limpid-bright NOM
徐風 *xu2-feng1*_[TOUCH/TARGET]
 slow-wind

‘the refreshing zephyr’

(4) Visual color adjectives used for taste

a. 那種 *na4-zhong3* [...] 食物 *shi2-wu4*, 著實 *zhuo2-shi2*

that-CL [...] food-object indeed-indeed

令人 *ling4-ren2* 作嘔 *zuo4-ou3*,

cause-people make-vomit

酸甜苦辣 *suan1-tian2-ku3-la4*_[TASTE/TARGET]

sour-sweet-bitter-hot (in taste)

雜 *za2*_[VISION/SOURCE] 揉 *rou3*

varicolored mix

‘The food really makes people throw up, in which sourness, sweetness, bitterness, and spicy taste are mixed.’

b. 清爽 *qing1-shuang3*_[VISION/SOURCE] 的 *de*

limpid-bright NOM

甜 *tian2* 味 *wei4*_[TASTE/TARGET]

sweet flavor

‘the refreshing sweetness’

5.1.2 Dimension

The synaesthetic distributions of Mandarin dimension adjectives are analogous to those of Mandarin color adjectives.²¹ Among the 33 dimension adjectives, 31 adjectives were attested with transfers to hearing, three to smell, which are in line with the prediction of the embodiment account. Besides, the tactile and gustatory usages of Mandarin dimension adjectives have also been found, contrary to the embodiment model, of which three dimension adjectives exhibited the transfer from vision to touch, and six from vision to taste.

The interpretations of auditory and olfactory expressions of Mandarin dimension adjectives both support the perceived similarity basis for linguistic synaesthesia. In terms of the auditory usages of Mandarin dimension adjectives, the adjectives were mapped to different aspects of hearing, such as 高 *gao1* ‘high’ and 低 *di1* ‘low’ to the pitch, and 大 *da4* ‘big’ and 小 *xiao3* ‘small’ to loudness, as shown in example (5). The polarities of the adjectives on the dimension scales, however, were all preserved. In other words, the adjectives on the positive side of the dimension scales were still used for the strong side of specific auditory sub-scales, such as 高 *gao1* ‘high’ for the high

²¹ Williams (1976) also figured out the transfer direction between color and dimension for English sensory adjectives, where dimension adjectives could transfer to color, but not vice versa. This study confirmed the pattern for Mandarin sensory adjectives, in which Mandarin color adjectives were not found with transfers to dimensions, while dimension adjectives were attested to be used for colors, such as 大紅 *da4 hong2* ‘bright red’ and 淺綠 *qian3 lv4* ‘light green’. The intra-sensory mapping, however, is not the focus of this study, which will thus not be discussed in depth.

pitch and 大 *da4* ‘big’ for the big volume, while the adjectives on the negative side of the dimension scales were employed for the weak side of the auditory sub-scales, such as 低 *di1* ‘low’ for the low pitch and 小 *xiao3* ‘small’ for the small volume, as illustrated in (5).

(5) Visual dimension adjectives used for hearing

<u>聲音</u> <i>sheng1-yin1</i> _[HEARING/TARGET]	有 <i>you3</i>
sound-voice	have
<u>高</u> <i>gao1</i> _[VISION/SOURCE]	<u>低</u> <i>di1</i> _[VISION/SOURCE]
high	low
<u>大</u> <i>da4</i> _[VISION/SOURCE]	<u>小</u> <i>xiao3</i> _[VISION/SOURCE]
big	small

‘Sounds exhibit the differences of high pitches, low pitches, big volumes, and small volumes.’

Mandarin dimension adjectives used for olfactory perceptions also showed the perceived similarity of intensity between vision and smell. As shown in example (6), the adjective for the small size (i.e., 薄 *bao2* ‘thin’) was used to conceptualize the low olfactory intensity, while the adjective for the large size (i.e., 大 *da4* ‘big’) was employed to denote the high intensity of smell.

(6) Visual dimension adjectives used for smell

a. <u>狐臭</u> <i>hu2-chou4</i> _[SMELL/TARGET]	[...]
fox-stink	[...]

<u>味道</u> <i>wei4-dao</i> _[SMELL/TARGET]	[...]	<u>薄</u> <i>bao2</i> _[VISION/SOURCE]
flavor-path	[...]	thin
‘The bromhidrosis is weak.’		
b. <u>體臭</u> <i>ti3-chou4</i> _[SMELL/TARGET]	[...]	
body-stink	[...]	
<u>味道</u> <i>wei4-dao</i> _[SMELL/TARGET]	[...]	<u>大</u> <i>da4</i> _[VISION/SOURCE]
flavor-path	[...]	big
‘The body odor is strong.’		

Mandarin dimension adjectives with distributions in touch are 細 *xi4* ‘thin’, 沈 *chen2* ‘deep’, and 薄 *bao2* ‘thin’, which were used to conceptualize the tactile perceptions that can be experienced by grasping, such as 細 *xi4* ‘thin’ employed to characterize the tender texture of meat in example (7). Thus, the neural association between grasping-based tactile sensations and visual dimension sensations has been realized not only in Mandarin tactile adjectives (see Chapter 3), but also in Mandarin visual adjectives. Specifically, Mandarin tactile adjectives exhibited the direction from touch to vision, while visual dimension adjectives demonstrated the direction from vision to touch, both of which would, however, suggest the biological association basis for linguistic synaesthesia.

(7) Visual dimension adjectives used for touch

<u>肉質</u> <i>rou4-zhi4</i> _[TOUCH/TARGET]	<u>細</u> <i>xi4</i> _[VISION/SOURCE]
meat-quality	thin
‘The meat is tender.’	

The gustatory expressions of Mandarin dimension adjectives are analogous to the auditory expressions of these adjectives, with respect to the interpretations. As shown in example (8), the adjective for the big dimension (i.e., 厚 *hou4* ‘thick’) was used to conceptualize the strong gustatory intensity, while the adjective for the small dimension (i.e., 薄 *bao2* ‘thin’) was employed to denote the weak perceptual intensity in taste. Thus, the polarity of the dimension adjectives on the dimension scale was retained when used for taste, hence supporting the perceived similarity basis for linguistic synaesthesia.

(8) Visual dimension adjectives used for taste

<u>酒</u> <i>jiu3</i> _[TASTE/TARGET]	的 <i>de</i>	<u>厚</u> <i>hou4</i> _[VISION/SOURCE]
wine	NOM	thick
<u>薄</u> <i>bao2</i> _[VISION/SOURCE]		
thin		
‘the strong and weak tastes of wine’		

5.1.3 Visual situation

Mandarin adjectives for visual situations were found to be used for hearing, smell, and touch, but not for taste in the Sinica corpus. The former two distributions (i.e., the auditory and olfactory distributions) of visual situation adjectives support the embodiment account of linguistic synaesthesia, while the latter one (i.e., the tactile distribution) is contrary to the theory.

puerile (in vision)

NOM

童聲 *tong2-sheng1*_[HEARING/TARGET]

child-sound

‘the puerile voice of children’

Two Mandarin visual situation adjectives attested with olfactory usages are 清幽 *qing1-you1* ‘graceful’ and 細緻 *xi4-zhi4* ‘exquisite’, both of which preserved their positive evaluations when used to describe olfactory sensations. As shown in example (10), 清幽 *qing1-you1* ‘graceful’ for a pleasant sensation of visual situations was employed to characterize the fragrance of the body. The interpretation thus supports the perceived similarity basis for synaesthetic transfers.

(10) Visual situation adjectives used for smell

清幽 *qing1-you1*_[VISION/SOURCE]

的 *de*

graceful

NOM

體香 *ti3-xiang1*_[SMELL/TARGET]

body-fragrance

‘the graceful fragrance of the body’

There are 11 Mandarin visual situation adjectives used for touch, whose interpretations are consistent with the sensory integration basis for linguistic synaesthesia. Based on behavioral and neural studies, touch and vision have been found to exhibit predominant associations, such as touching generally involving seeing behaviorally, and tactile tasks recruiting overlapping

cortical regions with visual tasks (see Winter 2016a). Thus, it is not surprising that conceptualization of tactile perceptions in terms of visual concepts has been realized in language. Example (11) illustrates the sensory integration between vision and touch grounding the synaesthetic transfers, where the adjective 嫩 *nen4* ‘delicate’ originally describing the visual state of newborn objects, which are easily broken and damaged, was utilized to conceptualize the easily cut or chewed texture of physical objects.

(11) Visual situation adjectives used for touch

<u>肉</u> <i>rou4</i> _[TOUCH/TARGET]	<u>嫩</u> <i>nen4</i> _[VISION/SOURCE]
meat	delicate
味 <i>wei4</i>	美 <i>mei3</i>
flavor	tasty
‘The meat is tender, and the flavor is delicious.’	

5.1.4 Summary of synaesthetic tendencies of Mandarin visual adjectives

The general synaesthetic tendencies of Mandarin visual adjectives could be figured out, when the synaesthetic patterns of the color, dimension, and visual situation adjectives combined. In terms of synaesthetic distributions, 74.7% (74/99) of adjective types and 75.7% (2,297/3,034) of token examples for Mandarin visual adjectives were predicted by the embodiment account of linguistic synaesthesia, mapping from the more embodied (i.e., vision) to the

less embodied (i.e., hearing and smell). Nevertheless, there are a small number of synaesthetic distributions of the adjectives, i.e., 25.3% (25/99) by type and 24.3% (737/3034) by token, contrary to the prediction of the embodiment model for linguistic synaesthesia, used for more embodied sensory modalities (i.e., touch and taste). Besides, the auditory usages of the visual adjectives are also consistent with the prediction of the biological association account of linguistic synaesthesia, suggesting the biological association basis for linguistic synaesthesia.

The interpretations of synaesthetic expressions of Mandarin visual adjectives have also suggested ternary underlying mechanisms of linguistic synaesthesia, including the perceived similarity, the biological association, and the sensory integration, hence analogous to those of Mandarin tactile adjectives (see Chapter 3) and Mandarin gustatory adjectives (see Chapter 4).

5.1.5 Directionality among touch, taste, and vision in Mandarin synaesthesia

The directionality of Mandarin synaesthesia between vision and touch and between vision and taste could also be generalized, based on both the frequency of synaesthetic transfers and the percentage of synaesthetic lexical types. With respect to the directional tendency between vision and touch for Mandarin synaesthesia, the frequency of the transfers from touch to vision (i.e., 1,722 token instances) is much higher than that from vision to touch (i.e., 673 token instances) in the Sinica corpus. In addition, the percentage of

touch-for-vision adjectives, i.e., 84.9% (62/73), is also much higher than that of vision-for-touch adjectives with 18.2% (18/99) in Mandarin. Thus, a tendencies-based (but not absolute) directionality from touch to vision could be figured out for Mandarin synaesthesia.

The directional tendency between taste and vision is similar to the one between touch and vision. That is, the synaesthetic transfers from taste to vision are much more frequent than the transfers from vision to taste in the Sinica corpus, i.e., with 1,931 and 64 token examples respectively. Besides, the percentage of the taste-for-vision adjectives, i.e., 57.1% (12/21), is also much higher than the percentage of the vision-for taste adjectives, i.e., 10.1% (10/99).

The directional hierarchy of Mandarin synaesthesia containing touch, taste, and vision has thus been summarized as Figure 4, by extending Figure 3 for the directionality between touch and taste (see Chapter 4).

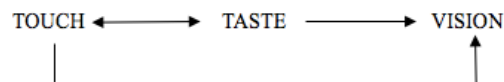


Figure 4: Directional tendencies among touch, taste, and vision in Mandarin synaesthesia

5.2 Auditory adjectives

5.2.1 Synaesthetic tendencies of Mandarin auditory adjectives

There are only four Mandarin auditory adjectives identified with synaesthetic usages in the Sinica corpus, i.e., 和諧 *he2-xie2* ‘harmonious’, 喧鬧 *xuan1-nao4* ‘noisy’, 吵 *chao3* ‘loud’, and 喧嘩 *xuan1-hua2* ‘noisy’. All the adjectives were found to only have visual distributions in linguistic synaesthesia. In addition, except for 和諧 *he2-xie2* ‘harmonious’ utilized for both visual colors and visual situations, the other three adjectives were employed only to characterize colors (cf. Appendix 4). As mentioned at the beginning of the chapter, Mandarin auditory adjectives used for vision were expected by both the embodiment account and the biological association account of linguistic synaesthesia.

The interpretations of color expressions of Mandarin auditory adjectives support both the perceived similarity basis and the biological association basis for linguistic synaesthesia. As shown in example (12), the adjective 和諧 *he2-xie2* ‘harmonious’ describing a positive auditory sensation preserved the affective evaluation to characterize the pleasant property of colors, and the adjective 喧鬧 *xuan1-nao4* ‘noisy’ conceptualizing high loudness retained the perceptual intensity to describe the color with high brightness. However, it should be noted that the color usage of the adjective 喧鬧 *xuan1-nao4* ‘noisy’ is also consistent with the perceptual connection between visual brightness and auditory loudness (Marks et al. 1987; Ward et al. 2006), indicating the neural association underlying synaesthetic transfers.

(12) Auditory adjectives used for the color (vision)

- a. 色彩 se4-cai3_[VISION/TARGET] 和諧 he2-xie2_[HEARING/SOURCE]
color-color harmonious
‘The colors are in harmony.’
- b. 喧鬧 xuan1-nao4_[HEARING/SOURCE] 的 *de*
noisy NOM
色彩 se4-cai3_[VISION/TARGET]
color-color
‘the loud color’

The only adjective 和諧 *he2-xie2* ‘harmonious’ utilized for visual situations, suggests the perceived similarity basis for linguistic synaesthesia, in which the positive evaluation was preserved from hearing to vision, as shown in example (13).

- (13) Auditory adjectives used for the visual situation (vision)

畫面 hua4-mian4_[VISION/TARGET] 的 *de*
painting-face NOM
和諧 he2-xie2_[HEARING/SOURCE]
harmonious
‘the harmony of the painting’

5.2.2 Directionality among touch, taste, vision, and hearing in Mandarin synaesthesia

It has been demonstrated that Mandarin tactile and gustatory adjectives were found to be used for hearing (see Chapters 3 and 4), while Mandarin auditory adjectives were not attested with synaesthetic distributions in touch and taste. Thus, the directions from touch to hearing and from taste to hearing could be figured out.

Zhao and Huang (2018) generalized a bi-directional tendency between vision and hearing for Mandarin synaesthesia, based on the close percentages of synaesthetic lexical types. This study has confirmed that the percentage of the vision-for-hearing adjectives is close to that of the hearing-for-vision adjectives, i.e., with 87.9% (87/99) and 100% (4/4) respectively. Nonetheless, the tendencies-based directionality from vision to hearing could still be observed for Mandarin synaesthesia, if the frequency of synaesthetic transfers taken into consideration. That is, the synaesthetic transfers from vision to hearing were attested to exhibit a much higher frequency (i.e., with 2,234 tokens) than the transfers from hearing to vision (i.e., with 30 tokens) in the Sinica corpus, which could suggest a predominant mapping direction from vision to hearing for linguistic synaesthesia in Mandarin.

Thus, the synaesthetic directionality containing touch, taste, vision, and hearing has been generalized as Figure 5 by extending Figure 4.

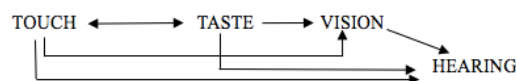


Figure 5: Directional tendencies among touch, taste, vision, and hearing in Mandarin synaesthesia

5.3 Olfactory adjectives

5.3.1 Synaesthetic tendencies of Mandarin olfactory adjectives

Mandarin olfactory adjectives have also been found with synaesthetic usages in the Sinica corpus (see Appendix 5), which do contradict the embodiment account of linguistic synaesthesia, as smell was suggested to be the least embodied sense hardly mapping to other senses by the theory (Zhao and Huang 2018). Nevertheless, the synaesthetic distributions of Mandarin olfactory adjectives are very limited in the Sinica corpus. More specifically, there are only two adjectives involving linguistic synaesthesia: one is 香 *xiang1* ‘fragrant’ only with synaesthetic uses for taste in 22 token examples, and the other is 臭 *chou4* ‘smelly’ only used for visual situations in ten instances.

The interpretations of synaesthetic expressions of the two olfactory adjectives are in line with the perceived similarity basis for synaesthetic transfers proposed by the embodiment model. As shown in examples (14) and (15), 香 *xiang1* ‘fragrant’ preserved its positive evaluation in the transfer from smell to taste, and 臭 *chou4* ‘smelly’ originally describing a negative olfactory perception was still used to conceptualize an unpleasant sensation in vision.

(14) Olfactory adjectives used for taste

<u>香</u> <i>xiang1</i> _[SMELL/SOURCE]		中 <i>zhong1</i>	帶 <i>dai4</i>
fragrant		center	have
<u>澀</u> <i>se4</i>	的 <i>de</i>	<u>滋味</u> <i>zi1-wei4</i> _[TASTE/TARGET]	
rough	NOM	taste-flavor	
‘the fragrant taste with the astringent flavor’			

(15) Olfactory adjectives used for the visual situation (vision)

<u>擺</u> <i>bai3</i>	出 <i>chu1</i>	一張 <i>yi1-zhang3</i>
display	out	one-CL
<u>臭</u> <i>chou4</i> _[SMELL/SOURCE]		<u>臉</u> <i>lian3</i> _[VISION/TARGET]
smelly		face
‘making an unpleasant facial expression’		

5.3.2 Directionality among touch, taste, vision, hearing, and smell in Mandarin synaesthesia

Before figuring out the mapping directionality of five sensory modalities for Mandarin synaesthesia, it would be better to summarize the synaesthetic transfers between them (see Appendices 1-5). As shown in Table 7, linguistic synaesthesia exhibits a large number of transfer types in Mandarin synaesthesia. Nevertheless, the transfers are not random, but instead generally conform to certain patterns. Based on Figure 5 for the directional tendencies among touch, taste, vision, and hearing for Mandarin synaesthesia (see Section 5.2.2), a general transfer hierarchy of Mandarin synaesthesia could be generalized, if the synaesthetic tendencies of smell taken into account.

Table 7: A summary of synaesthetic transfers between five senses in Mandarin synaesthesia

Source domains	Transfer types
Intensity	Tactile intensity → Gustatory intensity; Visual color; Visual situation; Hearing; Smell
Temperature	Tactile temperature → Gustatory intensity; Visual color; Visual situation; Hearing; Smell
Hardness	Tactile hardness → Visual color; Visual dimension; Visual situation; Hearing; Smell
Sharpness	Tactile sharpness → Visual color; Visual dimension; Visual situation; Hearing
Dampness	Tactile dampness → Visual color; Visual situation; Hearing; Smell
Smoothness	Tactile smoothness → Gustatory quality; Visual dimension; Visual situation; Hearing; Smell
Physical force	Tactile physical force → Gustatory intensity; Visual color; Visual situation; Hearing; Smell
Pain	Tactile pain → Gustatory quality; Visual dimension; Visual situation; Hearing
Intensity	Gustatory intensity → Visual color; Visual situation; Hearing; Smell

TOUCH

TASTE	Quality	Gustatory quality → Tactile temperature; Tactile smoothness; Tactile pain; Visual color; Visual situation; Hearing; Smell
	Color	Visual color → Tactile intensity; Tactile pain; Gustatory intensity; Gustatory quality; Hearing; Smell
VISION	Dimension	Visual dimension → Tactile hardness; Tactile physical force; Gustatory intensity; Gustatory quality; Hearing; Smell
	Visual situation	Visual situation → Tactile hardness; Tactile physical force; Hearing; Smell
HEARING	Hearing	Hearing → Visual color; Visual situation
SMELL	Smell	Smell → Gustatory quality; Visual situation

Firstly, the directional tendency from touch to smell could be established for Mandarin synaesthesia, since there are 15 Mandarin tactile adjectives used for smell with 30 synaesthetic examples, while there is none Mandarin olfactory adjective showing transfers to touch. In terms of the directionality between taste and smell, both the frequency of transfer tokens and the percentage of synaesthetic lexical types could suggest a predominant direction from taste to smell for Mandarin synaesthesia. That is, the synaesthetic transfers from taste to smell (i.e., with 114 tokens) are more frequent than the transfers from smell to taste (i.e., with 22 tokens) in the Sinica corpus. In addition, the percentage of the taste-for-smell adjectives is

also larger than that of the smell-for-taste adjectives in Mandarin, i.e., with 76.2% (16/21) and 50% (1/2) respectively.

The directional tendency between vision and smell is more complex than those between touch and smell and between taste and smell in Mandarin synaesthesia. Specifically, the frequency of synaesthetic transfers from vision to smell (i.e., with 63 instances) is much higher than the one from smell to vision (i.e., with ten instances) in the Sinica corpus. The percentage of the vision-for-smell adjectives, i.e., 13.1% (13/99), however, is lower than that of the smell-for-vision adjectives, i.e., 50% (1/2). Nevertheless, this study has assumed a predominant direction from vision to smell for Mandarin synaesthesia, given that synaesthetic uses of Mandarin olfactory adjectives are quite infrequent. Besides, the synaesthetic distribution of Mandarin olfactory adjectives in vision is also very limited, where the olfactory adjectives can only be used for visual situations, but not for colors or dimensions. With respect to the directionality between hearing and smell in Mandarin synaesthesia, there is none synaesthetic transfer between these two sensory modalities attested in the Sinica corpus. Therefore, the general synaesthetic hierarchy of five senses in Mandarin Chinese has been worked out as Figure 6, through extending the hierarchy in Figure 5 (see Section 5.2.2).

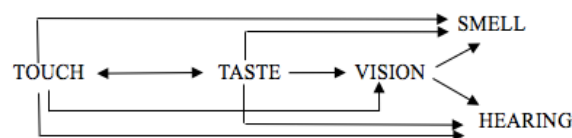


Figure 6: The general hierarchy of five senses in Mandarin synaesthesia

It should be mentioned that Viberg (1983) found that sensory verbs showed a reverse directional tendency to sensory adjectives in languages, i.e., with the pattern of sensory verbs as: vision → hearing → touch → taste/smell. Caballero and Paradis (2015) suggested that the discrepancy of hierarchies between sensory adjectives and sensory verbs resulted from the contrast between speaker-oriented and addressee-oriented perspectives. More specifically, the study proposed that the synaesthetic pattern of sensory adjectives reflected the speaker-oriented perspective, thus motivating conceptualization of less concrete and immediate sensory experiences in terms of concepts of more concrete and immediate ones, whereas the hierarchy of sensory verbs exhibited the addressee-oriented perspective, grounding the usage of the concepts for more verifiable experiences to describe less verifiable ones. It is more important, however, to note that linguistic synaesthesia cannot be found frequently in Mandarin verbs. The Mandarin verb 聞 *wen2* ‘to smell’ would be the only possible case involving synaesthetic transfers. Nevertheless, in terms of the verb 聞 *wen2* ‘to smell’, it is still controversial as to whether it underwent a synaesthetic transfer from hearing to smell or just illustrated a semantic specialization from denoting both sensory activities (i.e., both hearing and smell) to conceptualizing smelling particularly in Chinese (see Hong 1989; Wang 1997; Wang and Akitani 2014; among others). Furthermore, the case, strictly speaking, does not violate the pattern in Figure 6, where the directionality between hearing and smell was not attested in Mandarin adjectives. Thus, it can be concluded that the synaesthetic hierarchy generalized based on Mandarin sensory

adjectives would be the most likely to be general tendencies of Mandarin synaesthesia as well.

5.4 Embodiment of five senses in Mandarin synaesthesia

It has been established that Mandarin synaesthesia does exhibit directionality in general, as predicted by the embodiment account of linguistic synaesthesia. Following the embodiment model, it is thus reasonable to assume that the directional tendencies between sensory modalities of Mandarin synaesthesia reflect the degrees of embodiment of human senses.

Shen (1997) suggested that touch and taste are more embodied than vision, hearing, and smell, as the former two sensory modalities necessarily involve the physical contact between sensory organs and perceived objects. This assumption can be supported by the directional tendencies of Mandarin synaesthesia, as shown by Figure 6 where synaesthetic directions were attested from touch and taste to vision, hearing, and smell. Moreover, this study found that there is other linguistic evidence, suggesting that touch and taste are more embodied than vision, hearing, and smell. The evidence comes from the different degrees of the synaesthetic participation of Mandarin sensory adjectives from five senses. As presented in Table 2 in Chapter 2, more than 61% of Mandarin tactile and gustatory adjectives were attested with synaesthetic usages, while less than 31% of Mandarin visual, auditory, and olfactory adjectives were identified to involve linguistic synaesthesia.

Therefore, touch and taste are more frequent source domains than vision, hearing, and smell in Mandarin synaesthesia. As suggested by Cognitive Linguistics that conceptual mappings are generally from the more embodied to the less embodied (see Lakoff and Johnson 1980; Gibbs 2005), touch and taste involved more frequently as source domains in linguistic synaesthesia can be considered to indicate the higher degree of embodiment of these two senses than the other three senses in Mandarin.

The hierarchy of Mandarin synaesthesia in Figure 6 suggests that touch and taste are both the most embodied among five sensory modalities, as bi-directional tendencies between touch and taste were found in Mandarin synaesthesia. Thus, the embodiment rank of touch and taste in Mandarin synaesthesia is inconsistent with Shen's (1997) assumption that touch with sensory receptors all over the body is more embodied than taste with sensory receptors only in the mouth. It should be noted, however, that it is not uncontroversial whether taste is an essentially different sense from touch or just a sub-type of touch. For instance, Popova (2005) considered taste to be a specific type of touch. In addition, the synaesthetic participation rate of Mandarin gustatory adjectives (i.e., with 84%) is higher than that of Mandarin tactile adjectives (i.e., with 61.3%) (see Table 2 in Section 2.2.2), which does not support touch with a higher degree of embodiment than taste in Mandarin as well. I will go into more details about the cultural dominance of taste in Chinese in Chapter 7, which might motivate taste to exhibit a similar degree of embodiment to touch in Mandarin synaesthesia.

The embodiment among vision, hearing, and smell could also be suggested based on the directional tendencies of Mandarin synaesthesia. That

is, vision should be more embodied than hearing and smell, as directionality from vision to hearing and from vision to smell were both attested (see Figure 6). There is also other evidence to support vision with a higher degree of embodiment than hearing and smell. For instance, Drury et al. (1996) found that vision takes up the largest region in the brain, and Stokes and Biggs (2015) suggested that vision can influence perceptual contents of other sensory modalities, both of which demonstrated the dominance of vision in human perceptual systems. In addition, the perceptual dominance of vision could also be indicated by linguistic patterns. For example, Winter (2016a) found that vision has the most differential lexicalized items in English. Similarly, the visual modality has also been shown to involve the most sensory adjectives in Mandarin (i.e., with 664 adjectives, see Table 2 in Section 2.2.2) by this study. Thus, it can be expected that vision is the most embodied among the sensory modalities without physical contact between sensory organs and perceived objects.

Zhao and Huang (2018) and Zhao et al. (2018a) have both assumed that the lexical gap on the sensory adjective for the perceptual intensity in smell in Mandarin could be considered to suggest the lowest degree of embodiment of the olfactory sense. That is, there are lexicalized adjectives originally conceptualizing tactile, gustatory, visual, and auditory intensities in Mandarin, such as 強 *qiang2* ‘strong’, 淡 *dan4* ‘of mild taste’, 亮 *liang4* ‘bright’, and 響 *xiang3* ‘loud’ respectively. On the contrary, lexicalized adjectives originally for the olfactory intensity have not been found in Mandarin. Among the ten olfactory adjectives collected for Mandarin (see Table 2 in Section 2.2.2), this study verified the assumption of Zhao and Huang (2018) and Zhao et al.

(2018a). The perceptual intensity is measured exactly by the body proper. Therefore, the absence of lexicalization for the olfactory intensity in Mandarin would be the most likely to suggest the lowest body involvement (i.e., the lowest embodiment) in the olfactory sensation among five senses.

The directional tendencies of Mandarin synaesthesia would thus suggest that five senses do exhibit different degrees of embodiment, among which touch and taste are the most embodied, vision follows, and hearing is less embodied, while smell is the least embodied in Mandarin. As elaborated above, such an embodiment rank of five sensory modalities has also been found to be consistent with various physiological and linguistic facts. Therefore, since physiologically-based experiences can also be differentiated in terms of different degrees of embodiment, it is necessary to enrich the embodiment theory that mainly focuses on the dichotomy between embodied and non-embodied experiences in linguistic research, as noted by Caballero and Paradis (2015) and Zhao et al. (2018a). Furthermore, CMT would also call for a closer-examination, which generally employs the embodiment theory to explore prototypical metaphors (i.e., the conceptualization of non-bodily experiences in terms of concepts representing human bodily perceptions and interactions with surrounding environments, see Section 1.1.3), if linguistic synaesthesia could be analyzed as a kind of metaphor. I will return to these two theoretical issues in Chapter 7.

Next chapter will provide another piece of evidence to support the embodiment rank of the five senses in Mandarin Chinese, by focusing on the synaesthetic tendencies of Mandarin compound adjectives combining different sensory modalities.

Chapter 6: Linguistic synaesthesia of Mandarin compound adjectives combining different sensory modalities

Zhao and Huang (2018) demonstrated that Mandarin sensory adjectives compounded by concepts originally for different senses also followed directionality in linguistic synaesthesia, whose transfer directions are consistent with those of the constituent concept representing a higher sensory modality on the transfer hierarchy of linguistic synaesthesia. For instance, adjectives involving the combination between taste and vision, such as 醇厚 *chun2-hou4* ‘mellow’ (i.e., taste + vision) and 清淡 *qing1-dan4* ‘light’ (i.e., vision + taste), were attested to have distributions in hearing and smell, but not in touch, such as 醇厚歌聲 *chun2-hou4 ge1-sheng1* ‘the mellow singing’ and 清淡的荷花香氣 *qing1-dan4 de he2-hua1 xiang1-qi4* ‘the light fragrance of the lotus’ (Zhao and Huang 2018). The study has thus assumed that the adjectives combining taste and vision share the same synaesthetic distributions with the constituent morpheme conceptualizing vision that shows tendencies-based mapping directions to hearing and smell, but not to touch, of which vision is on a higher position than taste in the hierarchy for Mandarin synaesthesia.

This chapter will employ a much larger data sample to test Zhao and Huang’s (2018) assumption, i.e., with 61 adjectives and 538 synaesthetic

instances extracted from the Sinica corpus. Besides, this chapter will also examine the applicability of the embodiment rank of five sensory modalities figured out in the last chapter (see Section 5.4) for Mandarin compound adjectives combining different senses in linguistic synaesthesia. Specifically, Section 6.1 will focus on the general synaesthetic tendencies of Mandarin compound adjectives containing morphemes originally for different senses. Section 6.2 will discuss the compound adjectives with three combination patterns, which have been found to involve synaesthetic usages frequently in the Sinica corpus. The last section will compare the synaesthetic patterns of Mandarin compound adjectives combining different sensory modalities with those of Mandarin adjectives involving one sensory modality, i.e., Mandarin tactile, gustatory, visual, auditory, and olfactory adjectives discussed in the last three chapters.

6.1 Synaesthetic patterns of Mandarin compound adjectives combining different senses

The transfer hierarchy of Mandarin synaesthesia depicted in Figure 6 (see Section 5.3.2) has shown that hearing and smell are both with the highest position on the hierarchy, which seldom map to other senses. Thus, following Zhao and Huang's (2018) claim that compound adjectives combining different senses shared the same synaesthetic distributions with the

constituent morphemes conceptualizing a higher sense on the synaesthetic hierarchy, it would be predicted that Mandarin compound adjectives combining either hearing or smell are not very likely to have synaesthetic distributions.

Table 8: Data distributions of synaesthetic uses of Mandarin compound adjectives combining different sensory modalities

Compound	Type	Token	Examples
patterns	percentages	percentages	
TOUCH + VISION	55.8%	39.9%	粗壯 <i>cu1-</i>
VISION + TOUCH	(34/61)	(215/538)	<i>zhuang4</i> ‘burly’
TOUCH + TASTE	21.3%	27.9%	苦澀 <i>ku3-se4</i>
TASTE + TOUCH	(13/61)	(150/538)	‘bitter’
TASTE + VISION	14.8%	9.5%	清淡 <i>qing1-dan4</i>
VISION + TASTE	(9/61)	(51/538)	‘light’
TOUCH + HEARING	4.9%	15.2%	柔和 <i>rou2-he2</i>
HEARING + TOUCH	(3/61)	(82/538)	‘soft’
TOUCH + SMELL	1.6%	7.1%	溫馨 <i>wen1-xin1</i>
	(1/61)	(38/538)	‘cozy’
HEARING + TASTE	1.6%	0.4%	平淡 <i>ping2-dan4</i>
	(1/61)	(2/538)	‘dull’
Total	100%	100%	-
	(61/61)	(538/538)	

Table 8 shows that the prediction of Zhao and Huang (2018) can be supported by the extracted synaesthetic data for Mandarin compound

adjectives combining different sensory modalities from the Sinica corpus. Specifically, if disregarding the combination order of senses, there are six combination patterns for the compound adjectives. Among these synaesthetic adjectives, the adjectives combining touch and hearing (e.g., 柔和 *rou2-he2* ‘soft’), combining touch and smell (e.g., 溫馨 *wen1-xin1* ‘cozy’), and combining hearing and taste (e.g., 平淡 *ping2-dan4* ‘dull’) all occupy very small percentages. That is, the percentages of lexical types are all smaller than 5% and the percentages of token examples are all less than 16%. In terms of the cumulative percentages of the compound adjectives with these three combination patterns, the lexical types occupy 8.2% (5/61), and the token examples take up 22.7% (122/538). Thus, as predicted by Zhao and Huang (2018), linguistic synaesthesia was not found frequently in Mandarin compound adjectives with different combining senses related to hearing or smell.

Linguistic synaesthesia has, however, been attested frequently in Mandarin compound adjectives combining touch and vision (e.g., 粗壯 *cu1-zhuang4* ‘burly’), combining touch and taste (e.g., 苦澀 *ku3-se4* ‘bitter’), and combining taste and vision (e.g., 清淡 *qing1-dan4* ‘light’), whose cumulative percentages are 91.8% (56/61) by lexical type and 77.3% (416/538) by lexical token among all the synaesthetic compound adjectives, as shown in Table 8. As none of touch, taste, and vision are on the highest position in the hierarchy of Mandarin synaesthesia (see Figure 6), the frequent synaesthetic usages of Mandarin compound adjectives combining any two of these three modalities could be explainable by Zhao and Huang’s (2018) theory. That is, among

touch, taste, and vision, vision is the sensory modality on a higher position in the hierarchy of Mandarin synaesthesia, which has synaesthetic directions to hearing and smell (see Section 5.1). Thus, Zhao and Huang (2018) predicted that Mandarin compound adjectives combining any two of touch, taste, and vision would at least have synaesthetic distributions in hearing and smell, in line with the distributions of vision. This prediction will be tested in more details in the next section. Before that, it is necessary to have a look at the interpretations of the synaesthetic uses of Mandarin compound adjectives combining different sensory modalities.

Examples (1) through (6) below illustrate the specific synaesthetic usages of Mandarin compound adjectives combining different sensory modalities, all of which support the perceived similarity basis for linguistic synaesthesia.

Specifically, as shown in example (1) for compound adjectives combining touch and vision, the adjective 輕微 *qing1-wei1* ‘slight’ combined morphemes originally for a tactile perception with the weak perceptual intensity and a visual perception with the weak perceptual intensity, which was still employed to characterize an auditory sensation with the weak intensity, as in (1a). Similarly, the adjective 細滑 *xi4-hua2* ‘fine and smooth’ containing the concept for a positive tactile sensation (i.e., smoothness) was used to describe fragrance which is a pleasant odor, as in (1b). Thus, the synaesthetic uses of the compound adjectives combining touch and vision support the perceived similarity basis for linguistic synaesthesia.

- (1) a. 輕微 *qing1-wei1*_[(TOUCH + VISION)/SOURCE] 的 *de*
 light (in weight)-small NOM
聲音 *sheng1-yin1*_[HEARING/TARGET]
 sound-voice
 ‘the slight sound’
- b. 香氣 *xiang1-qi4*_[SMELL/TARGET] [...] [...]
 fragrant-air
細滑 *xi4-hua2*_[(VISION + TOUCH)/SOURCE]
 thin-smooth
 ‘The fragrance is light and smooth.’

The synaesthetic usages of Mandarin compound adjectives combining touch and taste are also consistent with the perceived similarity basis for linguistic synaesthesia, where the correspondences between source sensory modalities and target sensory modalities concerning the perceptual intensity or the affective evaluation can be figured out. As shown in (2a), the adjective 濃烈 *nong2-lie4* ‘strong’ with constituent morphemes both related to a strong perceptual intensity (i.e., for taste and touch respectively) was used for the strong olfactory intensity. The adjective 柔美 *rou2-mei3* ‘graceful’ in (2b) was employed to characterize a pleasant sensation of hearing, whose constituent morphemes conceptualized a positive tactile sensation and a positive taste originally.

- (2) a. 濃烈 *nong2-lie4*_[(TASTE + TOUCH)/SOURCE] [...] [...]
 of intense taste-scorching

油漆味 *you2-qi1-wei4*_[SMELL/TARGET]

oil-paint-flavor

‘the strong smell of the oil paint’

b. 柔美 *rou2-mei3*_[(TOUCH + TASTE)/SOURCE] 的 *de*

soft-tasty

NOM

聲音 *sheng1-yin1*_[HEARING/TARGET]

sound-voice

‘the soft and pleasant sound’

The adjective 濃郁 *nong2-yu4* ‘strong’ combining a strong taste and a strong visual sensation in (3a), also showed the perceived similarity of perceptual intensity grounding synaesthetic transfers, as the adjective preserved its positive polar on the perceptual intensity scale when used for smelling. Example (3b) illustrates the perceived similarity of the affective evaluation for linguistic synaesthesia, where 清甜 *qing1-tian2* ‘slightly sweet’ combining a positive visual perception and a positive gustatory perception was employed to characterize the pleasant odor of rice.

(3) a. 濃郁 *nong2-yu4*_[(TASTE + VISION)/SOURCE] 的 *de*

of intense taste-dense

NOM

血腥味 *xue3-xing1-wei4*_[SMELL/TARGET]

blood-of fishy smell-flavor

‘the strong smell of blood’

b. 清甜 *qing1-tian2*_[(VISION + TASTE)/SOURCE] 的 *de*

limpid-sweet

NOM

米香 *mi3-xiang1*_[SMELL/TARGET]

rice-fragrance

‘the slightly sweet fragrance of rice’

Mandarin compound adjectives combining touch and hearing, and combining touch and smell both support the perceived similarity of subjective evaluations for linguistic synaesthesia. As shown in example (4), the adjective 柔和 *rou2-he2* ‘soft’ combining a positive tactile sensation and a positive auditory sensation was utilized for a pleasant sensation of vision. Similarly, the adjective 溫馨 *wen1-xin1* ‘cozy’ combining a pleasant temperature and a pleasant smell was employed to describe the positive visual sensation in example (5). The adjective 平淡 *ping2-dan4* ‘dull’ combining hearing and taste both with a weak perceptual intensity was used to conceptualize the weak visual intensity of colors in example (6), thus demonstrating the perceived similarity of perceptual intensity underlying linguistic synaesthesia.

(4) 柔和 *rou2-he2*_[(TOUCH + HEARING)/SOURCE] 的 *de*

soft-harmonious

NOM

燈光 *deng1-guang1*_[VISION/TARGET]

lamp-light

‘the soft lamplight’

(5) 畫面 *hua4-mian4*_[VISION/TARGET]

painting-face

温馨 *wen1-xin1*_[(TOUCH + SMELL)/SOURCE]

lukewarm-fragrant

‘The painting looks cozy.’

(6) 色彩 *se4-cai3*_[VISION/TARGET] 平淡 *ping2-dan4*_[(VISION + TASTE)/SOURCE]

color-color

of level tone-of mild taste

‘The color is dull.’

To summarize, linguistic synaesthesia has not been found frequently in Mandarin compound adjectives with combining senses related to hearing or smell, while frequent synaesthetic usages of Mandarin compound adjectives combining any two of touch, taste, and vision have been attested, both of which are consistent with the predictions of Zhao and Huang (2018). Besides, the synaesthetic usages of Mandarin compound adjectives combining different senses support the perceived similarity basis for linguistic synaesthesia.

6.2 Mandarin compound adjectives combining touch, taste, and vision

It has been shown that Mandarin compound adjectives combining any two of touch, taste, and vision are involved in linguistic synaesthesia frequently, of which vision is on a higher position than touch and taste in the transfer hierarchy of Mandarin synaesthesia. Zhao and Huang (2018) claimed that

Mandarin compound adjectives combining different senses shared the same synaesthetic distributions with the constituent morphemes representing the senses on a higher position in the synaesthetic hierarchy of Mandarin. This section will test the assumption based on the empirical data from the Sinica corpus, instead of the data from dictionaries utilized by Zhao and Huang (2018).

Mandarin compound adjectives combining touch and vision have been found with synaesthetic distributions in hearing, smell, and taste, as shown in Table 9. The auditory and olfactory usages of Mandarin compound adjectives combining touch and vision are consistent with the prediction of Zhao and Huang (2018), where vision is on a higher position than touch in the synaesthetic hierarchy with transfer directions to hearing and smell. Nevertheless, the gustatory usages of Mandarin compound adjectives combining touch and vision were not predicted by Zhao and Huang (2018), since the higher constituent modality (i.e., vision) was not expected to map to taste in Mandarin synaesthesia. It is important, however, to note that the gustatory distributions of the compound adjectives are quite infrequent, with only 5.9% (2/34) by lexical type and 2.3% (5/215) by lexical token. Moreover, it should also be recalled that vision has been attested with infrequent transfers to taste as well, as elaborated in Chapter 5. Thus, the general distributions of Mandarin compound adjectives combining touch and vision have verified the assumption of Zhao and Huang (2018) showing tendencies-based (but not absolute) synaesthetic directionality to hearing and smell, analogous to those of the adjectives consisting of only the visual modality in Mandarin synaesthesia.

Table 9: Synaesthetic distributions of Mandarin compound adjectives combining touch, taste, and vision

Source domains	Target domains		
TOUCH + VISION	HEARING	SMELL	TASTE
VISION + TOUCH			
Transferability	91.2%	17.6%	5.9%
of adjectives	(31/34)	(6/34)	(2/34)
Percentage	94.9%	2.8%	2.3%
of synaesthetic tokens	(204/215)	(6/215)	(5/215)
TOUCH + TASTE	VISION	HEARING	SMELL
TASTE + TOUCH			
Transferability	84.6%	61.5%	38.5%
of adjectives	(11/13)	(8/13)	(5/13)
Percentage	60%	28%	12%
of synaesthetic tokens	(90/150)	(42/150)	(18/150)
TASTE + VISION	HEARING	SMELL	TOUCH
VISION + TASTE			
Transferability	44.4%	66.7%	11.1%
of adjectives	(4/9)	(6/9)	(1/9)
Percentage	27.5%	68.6%	3.9%
of synaesthetic tokens	(14/51)	(35/51)	(2/51)

Mandarin compound adjectives combining touch and taste would be predicted to have distributions in vision, hearing, and smell, following Zhao and Huang (2018), as touch and taste are both on the lowest position in the transfer hierarchy of Mandarin synaesthesia. As demonstrated in Table 9, the visual, auditory, and olfactory usages of Mandarin compound adjectives

combining touch and taste have all been found in the Sinica corpus, hence confirming Zhao and Huang's (2018) hypothesis.

The synaesthetic pattern of Mandarin compound adjectives combining taste and vision is analogous to that of Mandarin compound adjectives combining touch and vision discussed above. That is, counter-examples to the prediction of Zhao and Huang (2018), i.e., tactile usages of the compound adjectives combining taste and vision, have been found. The exceptions, however, occupy quite small proportions, i.e., with 11.1% (1/9) in terms of lexical types and 3.9% (2/51) in terms of token examples. Therefore, Mandarin compound adjectives combining taste and vision also exhibited tendencies-based synaesthetic directionality with transfers to hearing and smell, as predicted by Zhao and Huang (2018).

It can thus be concluded that the distribution of synaesthetic uses of Mandarin compound adjectives combining touch and vision, combining touch and taste, and combining taste and vision in the Sinica corpus has confirmed Zhao and Huang's (2018) assumption, sharing the same tendencies-based mapping directionality with the constituent sensory modality with a higher position on the transfer hierarchy of Mandarin synaesthesia.

6.3 Adjectives combining different senses and adjectives involving one sense in Mandarin synaesthesia

Based on the synaesthetic patterns of Mandarin compound adjectives combining different senses elaborated above, it can be found that the compound adjectives share both similarities and differences with the adjectives involving only one sensory modality in Mandarin synaesthesia (see Chapters 3 through 5).

Specifically, both the compound adjectives combining different senses and the adjectives involving one sense have been attested to follow directionality in Mandarin synaesthesia, of which the directionality is both tendencies-based rather than absolute. Besides, the interpretations of the synaesthetic usages of both kinds of adjectives support the perceived similarity basis for linguistic synaesthesia.

The differences between the compound adjectives combining different senses and the adjectives involving one sense in Mandarin synaesthesia lie in: (1) the compound adjectives followed the directional tendency of the constituent modality on a higher position in the synaesthetic hierarchy, while the adjectives involving one sense did not exhibit the pattern, whose constituent modalities are the same with the same position in the synaesthetic hierarchy; and (2) synaesthetic uses of the compound adjectives have only suggested the perceived similarity basis for linguistic synaesthesia, whereas synaesthetic usages of the adjectives involving one sense have demonstrated multiple mechanisms underlying linguistic synaesthesia, including the perceived similarity, the sensory integration, and the biological association.

It is intriguing that both the similarities and differences between the compound adjectives combining different senses and the adjectives involving one sense in Mandarin synaesthesia can be explained by the embodiment of

senses. With respect to the similarities, the directional tendencies of both kinds of adjectives are consistent with the different degrees of embodiment of human senses, which motivate synaesthetic mappings from the more embodied to the less embodied. In addition, the perceived similarity basis for linguistic synaesthesia suggested by both the compound adjectives combining different senses and the adjectives involving one sense in Mandarin synaesthesia also highlights the role of the body's experience (i.e., embodiment) in structuring language, as proposed by the embodiment account of linguistic synaesthesia (Shen 1997; Popova 2005).

The differences between the compound adjectives combining different senses and the adjectives involving one sense in Mandarin synaesthesia can be predicted by the generalized embodiment rank of five senses in Mandarin, i.e., touch/taste > vision > hearing > smell. That is, the compound adjectives combining different senses did not show the same synaesthetic distributions with the adjectives involving one sense, but instead followed the directional tendencies of the constituent sense with less embodiment on a higher position in the synaesthetic hierarchy, which would in fact indicate the different degrees of embodiment of combining senses in the compound adjectives. Moreover, Mandarin compound adjectives containing either hearing or smell were not found with frequent synaesthetic distributions, and compound adjectives combining vision with touch or combining vision with taste showed frequent synaesthetic transfers to hearing and smell, while compound adjectives combining touch and taste were attested with frequent synaesthetic distributions in vision, hearing, and smell. This pattern does suggest that touch and taste are the most embodied, and vision follows, while hearing and

smell are less embodied in Mandarin synaesthesia. With respect to the difference on the underlying mechanism for linguistic synaesthesia, it can be expected that the compound adjectives combining different senses have not shown all mechanisms underlying linguistic synaesthesia, but demonstrated the most frequent one, i.e., the perceived similarity basis for Mandarin synaesthesia. That is, the compound adjectives combining different senses are more constrained than the adjectives involving one sensory modality in synaesthetic usages.

Next chapter will explore the theoretical implications of linguistic synaesthesia, based on the synaesthetic patterns of both the compound adjectives combining different senses and the adjectives involving one sense, which have been figured out for Mandarin synaesthesia.

Chapter 7: From linguistic synaesthesia to conceptual metaphor theory and embodiment

This chapter aims to establish the correlations between the synaesthetic tendencies having been figured out in Mandarin and the different theoretical accounts of linguistic synaesthesia. Besides, a finer-grained account of embodiment will be suggested to refine CMT and the embodiment theory, to ensure that linguistic synaesthesia can be accounted for by the theories.

Specifically, Section 7.1 will demonstrate that neither the embodiment account nor the biological association account for linguistic synaesthesia proposed in the literature can fully predict the distribution of synaesthetic uses of Mandarin sensory adjectives in the Sinica corpus, which would instead suggest an incorporated theoretical model containing both embodiment mechanisms and biological association mechanisms underlying linguistic synaesthesia. Section 7.2 will establish that linguistic synaesthesia is also a kind of metaphor as a linguistic realization of conceptual metaphors, similar to typical metaphors mapping from bodily experiences to non-bodily experiences. Following this, Section 7.3 will propose a finer-grained account of embodiment covering the notions of the degree of embodiment and the type of embodied events, which I argue to need be included by both CMT and the embodiment theory. The last section will summarize the theoretical

implications of linguistic synaesthesia from both linguistic and interdisciplinary perspectives.

7.1 Mandarin synaesthetic tendencies and competitive theoretical models

It has been demonstrated that different theoretical models of linguistic synaesthesia differ in their assumptions of how linguistic synaesthesia is realized in the language, of which the embodiment account predicted the directionality of synaesthetic transfers from the more embodied modalities to less embodied ones, while the biological association account suggested the cross-lingual universality of synaesthetic tendencies. In addition, the embodiment account proposed the perceived similarity of intensity and subjective evaluations grounding linguistic synaesthesia, whereas the biological association account assumed the neural connections underlying linguistic synaesthesia (see Section 1.1.2). Based on the generalized tendencies of linguistic synaesthesia in Mandarin Chinese, the section will examine to what extent the proposals of the different theoretical models can be supported or disproved.

7.1.1 Directionality and perceived similarity

Chapters 3 through 5 have shown that linguistic synaesthesia of Mandarin tactile, gustatory, visual, auditory, and olfactory adjectives do exhibit directionality, as predicted by the embodiment account. More specifically, the directional tendencies have been attested from touch to vision, from touch to hearing, from touch to smell, from taste to vision, from taste to hearing, from taste to smell, from vision to hearing, and from vision to smell in Mandarin synaesthesia (see Figure 6 in Chapter 5). Besides, Mandarin compound adjectives combining different sensory modalities have also been found to follow directionality, namely, to obey the directional patterns of the constituent sense on a higher position in the hierarchy of Mandarin synaesthesia (see Chapter 6).

There are, however, two important issues that should be noted, with respect to the directionality of Mandarin synaesthesia. First, except for the synaesthetic transfers from touch to hearing, from touch to smell, and from taste to hearing, all other directional patterns are tendencies-based rather than absolute, as assumed by Strik Lievers (2015). For instance, the overall agreement of Mandarin gustatory adjectives with the prediction mapping from the more embodied to the less embodied is 76.2% (16/21) for lexical types and 95.5% (2,187/2,291) for lexical tokens (See Section 4.3). Similarly, 74.7% (74/99) by type and 75.7% (2,297/3,034) by token of Mandarin visual adjectives have been attested to be used for less embodied sensory modalities, i.e., hearing and smell (See Section 5.1.4). Moreover, the unidirectional tendency was not observed for Mandarin synaesthesia between touch and taste. Rather, linguistic synaesthesia in Mandarin Chinese exhibited similar possibilities of mapping directions from touch to taste and from taste to touch,

different from that in Indo-European, Hebrew, and Indonesian languages (e.g., Williams 1976; Shen 1997; Shen and Gil 2008; Strik Lievers 2015). Therefore, the embodiment model of linguistic synaesthesia predicted most but not all synaesthetic transfers of Mandarin sensory adjectives, as the synaesthetic usages violating the directionality principle were also found.

The other issue concerning the directionality proposal of the embodiment account for linguistic synaesthesia, is related to the synaesthetic patterns of touch and vision, both of which are multi-dimensional (Miller and Johnson-Laird 1976; Purves et al. 2001 [2000]), such as touch including temperature, hardness, and so on, and vision including colors, dimensions, and so forth. That is, the directionality proposal of the embodiment account for linguistic synaesthesia only considered the mappings among five sensory modalities, which did not predict the distinct patterns of different sub-domains of tactile and visual modalities in linguistic synaesthesia. One of the most intriguing patterns is concerned with the visual sensations of the dimension. Specifically, only Mandarin tactile adjectives conceptualizing tactile perceptions that are experienced typically by hands' grasping, such as 粗 *cū* 'rough' and 尖 *jiān* 'sharp', have been found with synaesthetic uses for visual dimensions, while Mandarin adjectives in other sensory domains have not been identified to show the usages (see Table 7 in Section 5.3.2)

The perceived similarity of intensity and subjective evaluations underlying synaesthetic transfers between senses suggested by the embodiment account, has also been confirmed in most Mandarin synaesthetic expressions. For instance, Mandarin adjectives for the perceptual intensity always retained the polarity of the intensity scale in their synaesthetic uses,

such as gustatory adjectives 濃 *nong2* ‘of intense taste’ used to represent the strong intensity of other sensory perceptions and 淡 *dan4* ‘of mild taste’ employed for the weak perceptual intensity in other modalities. Similarly, Mandarin adjectives for specific perceptual properties generally preserved the affective evaluations in linguistic synaesthesia, such as the adjective 軟 *ruan3* ‘soft’ originally for a positive tactile perception conceptualizing pleasant sensations for other senses, and the adjective 硬 *ying4* ‘hard’ originally for a negative tactile sensation denoting unpleasant perceptions in other sensory domains. Nevertheless, there are other synaesthetic examples that cannot be explained by the perceived similarity between source sensory domains and target sensory domains. Take the afore-mentioned synaesthetic pattern concerning the visual dimension for example. In addition to Mandarin tactile adjectives conceptualizing grasping-based perceptions found to have synaesthetic distributions in the visual dimension, Mandarin visual adjectives originally characterizing visual dimensions were also attested to be used for tactile perceptions that can be experienced by grasping, such as 細 *xi4* ‘thin’ and 薄 *bao2* ‘thin’. Among the synaesthetic transfers between tactile grasping-based sensations and visual dimensions, the correspondences on either the perceptual intensity or the subjective evaluation between touch and vision, however, could not be figured out. Nonetheless, the bi-directional synaesthetic transfers are consistent with the neural association between touch and vision for shape perceptions discovered by Amedi et al. (2002), which indicates the biological association basis for linguistic synaesthesia. Besides, the synaesthetic expressions, such as Mandarin temperature

adjectives used for colors, gustatory adjectives originally conceptualizing unpleasant tastes (i.e., 苦 *ku3* ‘bitter’ and 酸 *suan1* ‘sour’) employed for the pleasant smell, have been found to suggest the sensory integration basis for linguistic synaesthesia.

In sum, the assumptions of directionality and perceived similarity of the embodiment account of linguistic synaesthesia can be supported by most synaesthetic uses of Mandarin sensory adjectives. However, it is more important to note that neither assumptions can be verified in all Mandarin synaesthetic expressions. That is, Mandarin synaesthesia only exhibited tendencies-based but not absolute directional patterns. In addition, synaesthetic transfers of Mandarin sensory adjectives cannot only be grounded in the perceived similarity of intensity and subjective evaluations, but also motivated by the biological association and the sensory integration.

7.1.2 Cross-lingual universality and biological connections

Zhao et al. (2018b, in press) employed a corpus-based approach to investigate the synaesthetic uses of gustatory adjectives in Mandarin and English. The study found that Mandarin and English did not share the same synaesthetic patterns, where the main difference is concerned with the relative positions of vision and hearing on the synaesthetic hierarchies: vision precedes hearing for Mandarin gustatory adjectives, while vision follows hearing for English gustatory adjectives. Besides, Zhao and Huang’s (2018) dictionary-based

study also demonstrated that the general transfer hierarchy of Mandarin synaesthesia is different from that of English synaesthesia generalized by Williams (1976), where, for instance, the transfer between touch and taste is bi-directional in Mandarin synaesthesia, while the one is unidirectional in English synaesthesia.

This comprehensive corpus-based research has confirmed the findings of Zhao et al. (2018b, in press) and Zhao and Huang (2018), where Mandarin synaesthesia showed both commonality and specificity when compared to the attested synaesthetic patterns for English. Since Williams' (1976) hierarchy (cf. Figure 2 in Chapter 1) of English synaesthesia is compatible with but stronger than the one of Ullmann's (1957) (cf. Figure 1 in Chapter 1), i.e., with "more falsifiable" predictions and constraints (Winter 2016a: 144), the general synaesthetic hierarchy of Mandarin Chinese (cf. Figure 6 in Chapter 5) has been compared with the Williams' model.

Specifically, similar patterns of linguistic synaesthesia in Mandarin and English are that: (1) the synaesthetic transfers from touch to hearing, from taste to smell, and from taste to hearing show the same directionality in both Mandarin synaesthesia and English synaesthesia; and (2) the olfactory sense manifests itself only as a target domain in both Mandarin synaesthesia and English synaesthesia.

The differences of synaesthetic tendencies between Mandarin and English, however, are more intriguing, including: (1) the synaesthetic directions from touch to taste and from taste to touch are both possible in Mandarin, while only the direction from touch to taste has been attested in English; (2) touch can transfer to both color and dimension in the visual

modality in Mandarin, whereas touch can only map to color in English; (3) touch has been attested with synaesthetic transfers to smell in Mandarin, but not in English; and (4) taste has been identified with synaesthetic uses for vision including colors in Mandarin, while taste has not been reported with the transfer direction to color in English. Thus, Mandarin synaesthesia does not show the same tendencies with English synaesthesia, which hence does not support the cross-lingual universality of synaesthetic patterns assumed by the biological association account of linguistic synaesthesia.

With respect to the underlying mechanism of linguistic synaesthesia, the biological connections have been established in Mandarin synaesthetic expressions, precisely speaking, including: (1) the sharing neural channel between the sharp taste induced by the Szechuan pepper and the mechanical vibration (e.g., 麻 *ma2* ‘trembling’); (2) the neural associations of the spicy taste with temperature as well as with pain (e.g., 辣 *la4* ‘hot [in taste]’); (3) the neural co-activation of touch and vision in perceiving shapes (e.g., 爛 *lan4* ‘tender’); and (4) the neural connections between the visual brightness and the auditory pitch as well as between the visual brightness and loudness (e.g., 亮 *liang4* ‘bright’ and 喧鬧 *xuan1-nao4* ‘noisy’ respectively). Nevertheless, it has also been found that the biological association basis is not the exclusive mechanism underlying linguistic synaesthesia of Mandarin sensory adjectives. Rather, the biological association, the perceived similarity, and the sensory integration have been established to work collectively for Mandarin synaesthesia (see Chapters 3 through 5).

To summarize, the patterns of Mandarin synaesthesia showing language-specific characteristics when compared to those of English synaesthesia, do not support the cross-lingual universality of synaesthetic tendencies proposed by the biological association account of linguistic synaesthesia. Besides, the biological association has also been demonstrated only to be one of the underlying mechanisms of linguistic synaesthesia.

7.1.3 An incorporated theoretical model for linguistic synaesthesia

Zhao et al. (2018b, in press) have proposed that the distribution of synaesthetic uses of Mandarin gustatory adjectives cannot be predicted by a single theory (i.e., either the embodiment account or the biological association account for linguistic synaesthesia), but can be explained by an incorporated approach containing both embodiment and biological mechanisms. As elaborated above, this proposal has been confirmed by the synaesthetic usages of Mandarin sensory adjectives, which suggest three kinds of mechanisms underlying linguistic synaesthesia. Specifically, the perceived similarity and the sensory integration are both embodiment mechanisms that are related to humans' bodily experiences or interactions with external environments (Johnson 1987), while the neural connection is exactly the biological mechanism shaped by the structure of human brains.

The general directional tendencies of Mandarin synaesthesia can thus be explainable by the incorporated model for linguistic synaesthesia.

Specifically, the embodiment mechanisms underlying linguistic synaesthesia, which follow the general cognitive principle mapping from the more embodied to the less embodied (Lakoff and Johnson 1980), would motivate synaesthetic transfers from more embodied modalities to less embodied ones. The biological mechanisms would, however, be more likely to result in synaesthetic mappings with both directions between two senses (Rakova 2003), such as the synaesthetic transfers between the grasping-based tactile perceptions and the visual dimensions mentioned above, hence making synaesthetic transfers from the less embodied to the more embodied possible. Therefore, the tendencies-based rather than absolute directionality of Mandarin synaesthesia would be the most likely to result from the interactions between the embodiment mechanisms and the biological mechanisms.

The language-specific characteristics of linguistic synaesthesia in Mandarin Chinese can also be predicted by the incorporated model of linguistic synaesthesia. That is, although the biological mechanisms based on similar structures of human brains tend to result in analogous patterns of linguistic synaesthesia across different languages, the embodiment mechanisms based on bodily experiences are subject to differences of surrounding environments. Thus, the bi-directional tendency of linguistic synaesthesia between touch and taste attested in Mandarin rather than in English would be probably caused by the great dominance of taste in Chinese culture. For instance, Wang (1996) has found that food culture plays an important role in creation and representation of Chinese characters, and Xiong and Huang (2016) has demonstrated the synaesthetic versatility of the Chinese concept 味 *wei4* 'taste' in Buddhist texts (i.e., used for all other four

senses, including touch, vision, hearing, and smell). Both studies have thus indicated the great cultural impact of gustation in linguistic behaviors of Chinese. While more systematic evidence should be discovered to establish that gustatory experiences exhibit a greater cultural dominance among Chinese speakers than among English speakers, the hypothesis would provide a possible way to explain the Mandarin-specific characteristic of synaesthetic transfers between touch and taste. That is, although touch with sensory receptors all over the body is more embodied than taste with sensory receptors only in the mouth (Lehrer 1978; Shen 1997), the cultural dominance of gustation in Mandarin tends to reduce the difference of embodiment between touch and taste, lowering the preference of synaesthetic transfers from touch to taste in Mandarin.²²

To summarize, the incorporated theoretical model of linguistic synaesthesia containing both embodiment mechanisms and biological mechanisms not only can account for the general tendencies of Mandarin synaesthesia (i.e., the tendencies-based rather than absolute directionality), but also can predict the language-specific characteristic of linguistic synaesthesia in Mandarin Chinese (i.e., the bi-directional transfer pattern between touch and taste). As the tendencies-based directionality of linguistic

²² With respect to the language-specific characteristics of Mandarin synaesthesia, it is notable that Mandarin compound adjectives have also been found with synaesthetic usages (see Chapter 6), while there has been none English compound adjective reported to be involved in linguistic synaesthesia (see appendices in Williams 1976: 475-476; Strik Lievers 2015: 92-93). Therefore, word formation would also be likely to result in the differences on synaesthetic patterns between Mandarin and English, which will be left for future studies.

synaesthesia has also been attested in Indo-European and Hebrew languages (e.g., Shen 1997; Strik Lievers 2015), it is reasonable to assume that linguistic synaesthesia in these languages is also not likely to be grounded in only one single mechanism, but instead be motivated by both the embodiment mechanisms and the biological mechanisms. Thus, the incorporated theoretical model proposed for Mandarin synaesthesia would be applicable to accounting for linguistic synaesthesia in other languages.

7.2 Linguistic synaesthesia as a sub-type of metaphor

It has been established that linguistic synaesthesia does not share the same patterns with typical metaphors (see Section 1.1.3). For instance, linguistic synaesthesia manifests itself as mapping from one bodily domain to another bodily domain, while prototypical metaphors generally map from bodily experiences to non-bodily experiences. In addition, linguistic synaesthesia has been attested to show the tendencies-based directionality, while typical metaphors have not been found to exhibit the pattern. Furthermore, linguistic synaesthesia has been found to be grounded not only in the embodiment mechanisms but also in the biological mechanisms, whereas typical metaphors have been widely recognized to be motivated by the embodiment mechanisms. Thus, it can be understood that linguistic synaesthesia has received little attention from the perspective of the theories of metaphors in linguistic research, particularly from the perspective of CMT, which is

primarily related to the metaphorical expressions mapping from the concrete to the abstract with “implicit target domains”, such as “*see the main point of that paper*” (Gibbs 2011: 530-531). One recent study, i.e., Strik Lievers (2017: 86), however, suggested that linguistic synaesthesia is indeed a metaphor, which displays a “conceptual conflict” between separate sensory concepts involved. As the notion of the conceptual conflict was not defined clearly in the research, it is still questionable whether linguistic synaesthesia is a metaphor by its nature. This study thus employed other evidence to examine the relationship between linguistic synaesthesia and metaphor.

Firstly, following CMT, typical metaphors conceptualizing more abstract experiences in terms of concrete experiences are typical linguistic realizations of conceptual metaphors, such as ARGUMENT IS WAR and LOVE IS A JOURNEY, which are employed systematically in both poetic and ordinary languages (Lakoff and Johnson 1980; Lakoff 1993; Gibbs 2011). Similarly, the widespread and systematic usages of linguistic synaesthesia in poetic and ordinary languages have also been demonstrated by various studies. For instance, Ullmann (1966 [1963]) has found that linguistic synaesthesia is employed across different human languages. Research, such as Ullmann (1957), Shen (1997), and Yu (2003), has attested the poetic usages of linguistic synaesthesia in different languages (e.g., English, French, Hungary, Hebrew, and Mandarin), and studies, including Williams (1976), Strik Lievers (2015), Zhao et al. (2018b, in press), and so forth, have established the pervasive usages of linguistic synaesthesia in different ordinary languages. In addition, the large sample of the extracted data of Mandarin synaesthesia

in this study (see Chapter 2), can also suggest the frequent use of linguistic synaesthesia.

Secondly, classic studies on conceptual metaphors, such as Lakoff and Johnson (1980) and Lakoff (1993), have proposed that typical metaphors tend to preserve the cognitive topology of source domains, namely, to follow the invariance principle. This study has confirmed the invariance hypothesis for linguistic synaesthesia of Mandarin sensory adjectives as well. For instance, Mandarin sensory adjectives have been demonstrated to generally preserve their polarities of the perceptual intensity or the affective evaluation when used in linguistic synaesthesia.

Thirdly, studies, such as Ahrens (2002) and Gibbs (2011), have shown the cognitive reality of typical metaphors in language comprehension. For example, metaphors following the general mapping principle from the more accessible to the less accessible have been found with higher acceptability and interpretability than metaphors violating the principle (Ahrens 2002). With respect to the cognitive reality of linguistic synaesthesia, experimental studies conducted by Shen and his colleagues (Shen 1997; Shen and Cohen 1998; Shen and Eisenman 2008; Shen and Gadir 2009), and Werning (2006) have also demonstrated that comprehension of synaesthetic expressions is also influenced by the mapping directions from the more embodied to the less embodied, analogous to prototypical metaphors. For example, Shen and his colleagues found that synaesthetic expressions following the mapping principle are easier to interpret, to recall, and are judged as more natural than the expressions violating the principle.

Lastly, as suggested by El Refaie (2015: 74) for image metaphors that should be interpreted as conceptual metaphors, linguistic synaesthesia can also fulfill a wide range of communicative and conceptual functions, similar to prototypical metaphors, including “attracting our attention, providing imaginative pleasure, and helping us to understand and evaluate particular conceptual domains”. Take Mandarin synaesthetic expression 尖銳的笛音 *jian1-rui4 de di2-yin1* ‘the sharp sound of the flute’ for example. The expression would be easier to evoke people’s attention, compared to non-synaesthetic descriptions for the sound of the flute, such as 好聽的笛音 *hao3-ting1 de di2-yin1* ‘the melodious sound of the flute’ or 難聽的笛音 *nan2-ting1 de di2-yin1* ‘the unpleasant sound of the flute’. Besides, the expression 尖銳的笛音 *jian1-rui4 de di2-yin1* ‘the sharp sound of the flute’ could also help people to understand the property of the sound of the flute through the sharp property of knives, thus obtaining a much vivid grasping of the knowledge of the auditory domain. As the modifier 尖銳 *jian1-rui4* ‘sharp’ connotes a negative evaluation for touch in its source domain, which still implies an unpleasant feeling for the sound of the flute in the synaesthetic expression 尖銳的笛音 *jian1-rui4 de di2-yin1* ‘the sharp sound of the flute’, the evaluative function of linguistic synaesthesia could be detected.

Thus, linguistic synaesthesia mapping from the concrete to the concrete shares the same essential characteristics with typical metaphors mapping from the concrete to the abstract as linguistic realizations of conceptual metaphors, which include showing pervasive and systematic usages in both poetic and ordinary languages, following the invariance principle, exhibiting

cognitive reality of mapping directionality in language comprehension, and fulfilling communicative and conceptual functions. Therefore, linguistic synaesthesia should be taken into consideration by CMT.

7.3 A finer-grained account of embodiment

As elaborated above, linguistic synaesthesia is also a kind of metaphor, which should be accounted for by CMT. Therefore, the theory should be refined to explain the unique characteristics of linguistic synaesthesia.

The first characteristic of linguistic synaesthesia is the mapping from one bodily experience to another bodily experience. CMT has proposed that bodily experiences of humans provide the cognitive basis for metaphors, where the experiences involving more bodily contact and bodily interactions with surrounding environments are more embodied, and concepts representing these experiences are more accessible, which are employed to structure less embodied experiences and express less accessible concepts (Lakoff and Johnson 1980; Johnson 1987). Although the theory has not assumed to be confined to the dichotomy of bodily versus non-bodily experiences, linguistic studies following the theory mainly focus on the conceptualization of non-bodily experiences in terms of bodily experiences (e.g., Sweetser 1990; Lien 2005; among many others). However, linguistic synaesthesia could suggest that the dichotomy is insufficient for metaphors, as conceptual mappings from the bodily to the bodily also have realizations in the language. Furthermore, though both the source domains and target

domains of linguistic synaesthesia are bodily, they have been found to exhibit different degrees of embodiment. For instance, this study attested that touch and taste are the most embodied, vision follows, and hearing is less embodied, while smell is the least embodied in Mandarin Chinese (see Section 5.4). Therefore, the degree of embodiment is a crucial concept for CMT to account for linguistic synaesthesia. In other words, experiences should be characterized in terms of a continuum from strongly embodied to strongly dis-embodied events, rather than according to a dichotomy between bodily and non-bodily events in CMT. It is interesting to note that Ahrens (2002) has proposed that mapping principles or underlying reasons in metaphorical mappings between source domains and target domains are crucial for CMT to constrain and predict metaphorical mappings. The concept of the degree of embodiment proposed by this study would, however, suggest that the specification of source domains in metaphorical mappings is also important for CMT to strengthen the theoretical power.

The type of embodied events is another important notion to enrich CMT for linguistic synaesthesia. It has been shown that linguistic synaesthesia exhibits tendencies-based directionality, which is grounded in both embodiment mechanisms and biological mechanisms, different from prototypical metaphors. Furthermore, this study has also demonstrated that the tendencies-based directionality of linguistic synaesthesia would result from the interactions between the embodiment mechanisms and the biological mechanisms. Therefore, it is important for CMT to also include the biological mechanisms as the embodied basis for metaphors. As pointed out by Rakova (2003), there has not been a consensus on what kinds of events can be

regarded as embodied activities for cognitive representations. For instance, linguists generally recognize the bodily interaction and coupling with the external environment as embodied activities (e.g., Lakoff and Johnson 1980; Johnson 1987). Cognitive scientists, however, consider neural activations in the brain to be embodied activities (e.g., Winter 2016a; Meteryard et al. 2012). Linguistic synaesthesia grounded in both the embodiment mechanisms and the biological mechanisms would be the most likely to suggest that both bodily interactions with external environments and neural activities in the brain are embodied events underlying linguistic representations including metaphors. It is intriguing to note that increasing studies, such as Teng (2006: 83), Cacciari (2008), and Lakoff (2008), have suggested that the neural activities “embedded in and appropriately coupled to” the bodily interactions with surrounding environments underlie and constrain metaphorical conceptualizations in languages.

Thus, CMT should include the notions of the degree of embodiment and the type of embodied events to explain the characteristics of linguistic synaesthesia, where the two notions in fact constitute a finer-grained account of embodiment. The refined version of CMT would also be useful to examine other physiologically-based metaphorical representations. Take the image metaphor “*the folding bed is a crocodile*” collected by El Refaie (2015: 71) for example. Though both the folding bed and the crocodile are concrete objects that can be experienced by human bodies in the expression, the crocodile as an animate object would be more accessible than the folding bed as an inanimate object, as the former can move, make a sound, and so forth, which could provide people with multiple embodied experiences. If we adopt

the refined version of CMT that is based on a finer-grained account of embodiment, the source domain and the target domain of the image metaphorical expression could be differentiated in terms of the different degrees of embodiment, which would explain the metaphorical mapping for the expression “*the folding bed is a crocodile*”.

Furthermore, with respect to the finer-grained account of embodiment per se, it would facilitate the understanding of other cognitive behaviors, apart from the linguistic conceptualizations, since cognitive activities, such as memory, reasoning, imagination, and so forth, have also been widely recognized to be grounded in the embodiment (e.g., Gibbs 2005; Grady 2005; Meteryard et al. 2012; Pexman 2017). One implication of the finer-grained theory of embodiment for cognitive research, for instance, is that more attention should be given to touch and taste rather than overwhelmingly to vision, as suggested by Popova (2005), as touch and taste do exhibit a higher degree of embodiment than vision evidenced by linguistic conceptualizations.

7.4 Summary of theoretical implications of linguistic synaesthesia

This chapter has examined the theoretical implications of linguistic synaesthesia. Both the embodiment account and the biological association account for linguistic synaesthesia have been demonstrated to be insufficient to explain and predict the tendencies of Mandarin synaesthesia. Thus, an incorporated theoretical model containing both embodiment mechanisms and

biological mechanisms has been suggested. In addition, it has been found that linguistic synaesthesia is also a kind of metaphor as a linguistic realization of conceptual metaphors, analogous to prototypical metaphors mapping from the concrete to the abstract. This study has thus proposed a finer-grained account of embodiment including the notions of the degree of embodiment and the type of embodied events, to refine CMT and the embodiment theory for linguistic synaesthesia.

There is another interesting implication of linguistic synaesthesia from a non-linguistic perspective that should be mentioned. That is, studies on neurological synaesthesia, such as Ramachandran and Hubbard (2001), Ward (2006), Marks and Mulvenna (2013a), and so forth, have hypothesized that neurological synaesthesia and linguistic synaesthesia share analogous mechanisms. Similarly, based on the parallels between the patterns of linguistic synaesthesia in Italian and the psychophysical interactions between different sensory modalities, Ronga et al. (2012) also assumed that linguistic synaesthesia and neurological synaesthesia shared the same origins and mechanisms. Following the hypothesis, the fact that linguistic synaesthesia is grounded in multiple mechanisms would imply that neurological synaesthesia is the least likely to be motivated by the neural mechanism exclusively. It is intriguing to note that linguistic concepts can also induce neurological synaesthesia, such as the lexical-gustatory synaesthesia (Banissy et al. 2014), which might indicate that the conceptual system also plays a role in underlying neurological synaesthesia. Given the focus on linguistic synaesthesia in the thesis, I need to stop here. Nevertheless, the interweaving between neurological synaesthesia and linguistic synaesthesia is a fascinating

but challenging issue in the scientific field, which would make a great breakthrough to our understanding of brain and cognition, if resolved.

Chapter 8: Conclusion

This thesis has examined the tendencies of Mandarin synaesthesia and the theoretical implications of linguistic synaesthesia from a corpus-based approach. With respect to the data collection for Mandarin synaesthesia, this study proposed a linguistic synaesthesia identification procedure (LSIP), which has been demonstrated to be applicable to identification of linguistic synaesthesia of other languages in other corpora. In addition, based on the distribution of synaesthetic uses of Mandarin sensory adjectives in the Sinica corpus, this study has found that: (1) Mandarin synaesthesia exhibits directionality mapping from more embodied modalities to less embodied ones, as predicted by the embodiment account of linguistic synaesthesia; (2) the directional patterns of Mandarin synaesthesia are tendencies-based rather than absolute, as the synaesthetic transfers violating the directionality have also been attested in Mandarin; (3) the tendencies of Mandarin synaesthesia show both commonality and specificity when compared to the attested patterns of English synaesthesia, which hence does not support the cross-lingual universality of synaesthetic tendencies suggested by the biological association account of linguistic synaesthesia; and (4) in terms of the mechanisms underlying linguistic synaesthesia, synaesthetic usages of Mandarin sensory adjectives not only suggest the perceived similarity basis of intensity and subjective evaluations, but also indicate the sensory integration basis and the neural connection basis for linguistic synaesthesia.

This study has also proposed an incorporated theoretical model containing both embodiment mechanisms and biological mechanisms to account for linguistic synaesthesia, as neither the embodiment account nor the biological association account of linguistic synaesthesia could fully predict the synaesthetic patterns of Mandarin sensory adjectives. Instead, the incorporated model not only could explain the tendencies of Mandarin synaesthesia, but also would predict the language-specific characteristics of linguistic synaesthesia in Mandarin Chinese. Furthermore, it has also been demonstrated that the incorporated theoretical model could explain synaesthetic patterns of other languages.

The important theoretical implications of linguistic synaesthesia for Conceptual Metaphor Theory and the embodiment theory have also been figured out. The study has established that linguistic synaesthesia is also a kind of metaphor as a linguistic realization of conceptual metaphors, based on its pervasive usages in both poetic and ordinary languages, conformity to the invariance principle, cognitive reality in language comprehension, and communicative and conceptual functions. Therefore, Conceptual Metaphor Theory and the embodiment theory have been suggested to be refined, to explain the characteristics of linguistic synaesthesia. The thesis thus argued that the theories should include a finer-grained account of embodiment covering the notions of the degree of embodiment and the type of embodied events.

A corpus-based approach such as the one employed in the current study would be ill-suited to study how neuro-cognitive mechanisms function exactly to underlie linguistic synaesthesia. However, if linguistic synaesthesia

(and metaphors) does involve linguistic conceptualizations based on neuro-cognitive motivations, then corpus-based distributions would offer direct evidence for how the bridge between neuro-cognitive activities and linguistic conventions of conceptualization could be built, and how such conventions would be formed differently for different languages. One of the future studies for the current research is to compare the attested patterns of Mandarin synaesthesia from the corpus-based approach with those found by experimental methods, such as Chen et al.'s (2017) work on the exclusivity and competition of sensory modalities in Mandarin sensory words, for deeper and further understanding of linguistic synaesthesia (and metaphors) and eventually the nature of conceptualization and representation of meanings in human brains.

Appendix 1. Distributions of synaesthetic uses of Mandarin tactile adjectives in the Sinica corpus

Source domain	Target domain					Total	
TOUCH	TAS- TE	SME- LL	Col- or	Dimen- sion	VISION Visual situation	HEAR- ING	
Intensity							
強 <i>qiang2</i>	0	0	55	0	8	13	76
‘strong’							
強烈 <i>qiang2-lie4</i>	3	6	33	0	21	3	66
<i>lie4</i> ‘strong’							
弱 <i>ruo4</i>	0	0	12	0	8	16	36
‘weak’							
Temperature							
冷 <i>leng3</i>	0	1	14	0	35	117	167
‘cold’							
熱烈 <i>re4-lie4</i>	0	0	0	0	30	64	94
‘scorching’							

烈 <i>lie4</i>	78	0	0	0	13	0	91
‘scorching’							
熱 <i>re4</i>	0	1	1	0	46	0	48
‘hot’							
寒 <i>han2</i>	0	0	22	0	9	2	33
‘chilling’							
溫暖 <i>wen1-</i>	0	2	9	0	11	3	25
<i>nuan3</i>							
‘warm’							
冰冷 <i>bing1-</i>	0	0	1	0	11	11	23
<i>leng3</i> ‘ice- cold’							
暖 <i>nuan3</i>	0	0	22	0	0	0	22
‘warm’							
灼灼 <i>zhuo2-</i>	0	0	4	0	4	0	8
<i>zhuo2</i>							
‘scorching’							
冷冰冰	0	0	0	0	3	3	6
<i>leng3-bing1-</i> <i>bing1</i> ‘icy’							
溫 <i>wen1</i>	0	0	0	0	2	3	5
‘lukewarm’							
熾烈 <i>chi4-</i>	0	0	3	0	2	0	5
<i>lie4</i>							
‘scorching’							

熾熱 <i>chi4-re4</i>	0	1	0	0	3	0	4
'scorching'							
凜凜 <i>lin3-</i>	0	0	0	0	3	0	3
<i>lin3</i> 'cold'							
寒冷 <i>han2-</i>	0	0	0	0	1	1	2
<i>leng3</i> 'cold'							
冷冽 <i>leng3-</i>	0	0	0	0	2	0	2
<i>lie4</i>							
'piercingly cold'							
火熱 <i>huo3-</i>	0	0	0	0	2	0	2
<i>re4</i> 'hot'							
冰涼 <i>bing1-</i>	0	0	0	0	0	1	1
<i>liang2</i> 'ice- cold'							
涼 <i>liang2</i>	0	0	1	0	0	0	1
'cool'							
刺冽 <i>ci4-lie4</i>	0	0	1	0	0	0	1
'chilling'							
乾冷 <i>gan1-</i>	0	0	0	0	1	0	1
<i>leng3</i> 'dry- cold'							

Hardness

爛 <i>lan4</i>	0	0	0	109	8	0	117
‘tender’							
溫柔 <i>wen1-</i>	0	0	0	0	42	41	83
<i>rou2</i> ‘soft’							
柔 <i>rou2</i>	0	0	11	0	8	31	50
‘soft’							
輕柔 <i>qing1-</i>	0	1	1	0	9	23	34
<i>rou2</i> ‘soft’							
軟 <i>ruan3</i>	0	2	0	0	21	4	27
‘soft’							
柔軟 <i>rou2-</i>	0	1	2	0	13	6	22
<i>ruan3</i> ‘soft’							
硬 <i>ying4</i>	0	0	0	0	17	0	17
‘hard’							
僵硬 <i>jiang1-</i>	0	0	0	0	14	2	16
<i>ying4</i> ‘stiff’							
酥 <i>su1</i>	0	0	0	0	8	0	8
‘crisp’							
脆 <i>cui4</i>	0	0	0	0	0	7	7
‘crisp’							
輕脆 <i>qing1-</i>	0	0	0	0	0	6	6
<i>cui4</i> ‘crisp’							
僵 <i>jiang1</i>	0	0	0	0	6	0	6
‘stiff’							

硬梆梆	0	0	0	0	2	0	2
<i>ying4-bang1-</i>							
<i>bang1</i> ‘hard’							
柔韌 <i>rou2-</i>	0	0	0	0	0	1	1
<i>ren4</i> ‘pliable’							
堅硬 <i>jian1-</i>	0	0	0	0	0	1	1
<i>ying</i> ‘hard’							
脆弱 <i>cui4-</i>	0	0	0	0	1	0	1
<i>ruo4</i> ‘fragile’							

Sharpness

尖 <i>jian1</i>	0	0	0	122	0	117	239
‘sharp’							
尖銳 <i>jian1-</i>	0	0	0	10	2	21	33
<i>ruì4</i> ‘sharp’							
銳利 <i>ruì4-li4</i>	0	0	0	2	17	0	19
‘sharp’							
凌厲 <i>ling2-</i>	0	0	0	0	12	0	12
<i>li4</i> ‘sharp’							
鈍 <i>dun4</i>	0	0	1	4	1	3	9
‘blunt’							
犀利 <i>xi1-li4</i>	0	0	1	0	2	1	4
‘sharp’							
銳 <i>ruì4</i>	0	0	0	0	0	2	2
‘sharp’							

尖利 <i>jian1-</i>	0	0	0	0	0	1	1
<i>li4</i> ‘sharp’							
鋒利 <i>feng1-</i>	0	0	0	0	1	0	1
<i>li4</i> ‘sharp’							

Dampness

乾 <i>gan1</i>	0	0	3	0	456	9	468
‘dry’							
濕 <i>shi1</i>	0	1	3	0	66	0	70
‘damp’							
溫潤 <i>wen1-</i>	0	1	6	0	3	1	11
<i>run4</i> ‘moist’							
濕潤 <i>shi1-</i>	0	0	0	0	8	0	8
<i>run4</i> ‘moist’							
乾燥 <i>gan1-</i>	0	1	0	0	2	0	3
<i>zao4</i> ‘dry’							
柔潤 <i>rou2-</i>	0	0	0	0	0	1	1
<i>run4</i> ‘soft- moist’							
濡濕 <i>ru4-shi1</i>	0	0	0	0	1	0	1
‘damp’							

Smoothness

粗 <i>cu1</i>	0	0	0	133	0	7	140
‘rough’							

澀 <i>se4</i>	22	2	0	0	0	1	25
‘rough’							
粗糙 <i>cul-</i>	0	0	0	0	17	2	19
<i>caol</i> ‘rough’							
黏 <i>nian2</i>	0	0	0	0	8	3	11
‘sticky’							
滑 <i>hua2</i>	0	1	0	0	2	0	3
‘smooth’							
乾澀 <i>gan1-</i>	0	0	0	0	0	2	2
<i>se4</i> ‘dry- rough’							
滑溜溜 <i>hua2-</i>	0	0	0	0	2	0	2
<i>liu1-liu1</i> ‘smooth’							

Physical

force

輕 <i>qing1</i>	2	2	2	0	103	244	353
‘light (in weight)’							
重 <i>zhong4</i>	17	7	3	0	18	40	85
‘heavy’							
笨重 <i>ben4-</i>	0	0	0	0	10	1	11
<i>zhong4</i> ‘heavy’							

強勁 <i>qiang2-</i>	1	0	0	0	7	0	8
<i>jing4</i> ‘of strong force’							
笨 <i>ben4</i>	0	0	0	0	3	0	3
‘heavy’							
粗重 <i>cu1-</i>	0	0	0	0	1	1	2
<i>zhong4</i> ‘heavy’							
Pain							
脹 <i>zhang4</i>	0	0	0	22	0	0	22
‘swelling (in pain)’							
軟弱 <i>ruan3-</i>	0	0	0	0	2	2	4
<i>ruo4</i> ‘feeble’							
麻 <i>ma2</i>	2	0	0	0	0	0	2
‘trembling’							
刺 <i>ci4</i>	0	0	0	0	1	0	1
‘stabbing’							
Total	125	30	211	402	1,109	818	2,695

Appendix 2. Distributions of synaesthetic uses of Mandarin gustatory adjectives in the Sinica corpus

Source domain	Target domain						Total
TASTE	TOU-	SME-	VISION			HEAR-	
	CH	LL	Col- or	Dimen- sion	Visual situation	ING	
Intensity							
淡 <i>dan4</i> ‘of mild taste’	0	27	212	0	38	71	348
濃 <i>nong2</i> ‘of intense taste’	0	33	34	0	133	5	205
Quality							
美 <i>mei3</i> ‘tasty’	0	1	0	0	1222	23	1246
酸 <i>suan1</i> ‘sour’	90	10	0	0	0	1	101

鮮 <i>xian1</i>	0	0	83	0	0	0	83
‘tasty’							
辣 <i>la4</i> ‘hot (in taste)’	2	0	0	0	78	0	80
苦 <i>ku3</i>	1	1	0	0	66	1	69
‘bitter’							
甜美 <i>tian2-</i> <i>mei3</i> ‘tasty’	0	1	1	0	29	26	57
甜 <i>tian2</i>	0	13	2	0	13	8	36
‘sweet’							
甜蜜 <i>tian2-</i> <i>mi4</i> ‘sweet’	0	3	0	0	10	3	16
油膩 <i>you2-</i> <i>ni4</i> ‘greasy’	5	2	0	0	5	0	12
膩 <i>ni4</i>	6	0	0	0	3	1	10
‘greasy’							
辛辣 <i>xin1-la4</i>	0	7	0	0	0	0	7
‘hot (in taste)’							
甜膩 <i>tian2-</i> <i>ni4</i> ‘overly sweet’	0	4	0	0	0	2	6
鹹 <i>xian2</i>	0	5	0	0	0	0	5
‘salty’							

辛 <i>xin1</i> ‘hot (in taste)’	0	3	0	0	0	0	3
鮮美 <i>xian1-</i> <i>mei3</i> ‘tasty’	0	0	1	0	1	0	2
甘 <i>gan1</i> ‘sweet’	0	2	0	0	0	0	2
甘甜 <i>gan1-</i> <i>tian2</i> ‘sweet’	0	1	0	0	0	0	1
甘美 <i>gan1-</i> <i>mei3</i> ‘tasty’	0	0	0	0	0	1	1
甘醇 <i>gan1-</i> <i>chu2</i> ‘luscious’	0	1	0	0	0	0	1
Total	104	114	333	0	1,598	142	2,291

Appendix 3. Distributions of synaesthetic uses of Mandarin visual adjectives in the Sinica corpus

Source domain	Target domain					Total
VISION	TOUCH	TASTE	SMELL	HEARING		
Color						
清 <i>qing1</i>	21	26	38	31		116
'limpid'						
清楚 <i>qing1-</i>	0	0	1	62		63
<i>chu3</i> 'clear'						
雜 <i>za2</i>	0	1	6	53		60
'varicolored'						
清晰 <i>qing1-</i>	0	0	0	34		34
<i>xil</i> 'clear'						
清爽 <i>qing1-</i>	13	12	3	0		28
<i>shuang3</i>						
'clear'						
幽幽 <i>you1-</i>	0	0	1	18		19
<i>you1</i> 'faint'						

爽朗	1	0	0	12	13
<i>shuang3-</i>					
<i>lang3</i> 'clear'					
隱隱 <i>yin3-</i>	2	0	2	7	11
<i>yin3</i> 'faint'					
明亮 <i>ming2-</i>	0	0	0	7	7
<i>liang4</i>					
'bright'					
清亮 <i>qing1-</i>	0	0	0	6	6
<i>liang4</i>					
'bright'					
暗 <i>an4</i>	0	0	3	3	6
'dark'					
透明 <i>tou4-</i>	0	0	0	4	4
<i>ming2</i>					
'transparent'					
朗朗 <i>lang3-</i>	0	0	0	3	3
<i>lang3</i> 'bright'					
明朗 <i>ming2-</i>	0	0	0	3	3
<i>lang3</i> 'bright'					
清純 <i>qing1-</i>	0	0	0	3	3
<i>chun2</i> 'clear'					
混濁 <i>hun2-</i>	0	0	0	3	3
<i>zhuo2</i>					
'turbid'					

清澈 <i>qing1-</i>	0	0	0	3	3
<i>che4</i> ‘limpid’					
亮 <i>liang4</i>	0	0	0	2	2
‘bright’					
純淨 <i>chun2-</i>	0	0	0	2	2
<i>jing4</i> ‘pure’					
清白 <i>qing1-</i>	0	1	0	0	1
<i>bai2</i> ‘clear white’					
黯然 <i>an4-</i>	0	0	0	1	1
<i>ran2</i> ‘dark’					
開朗 <i>kai1-</i>	0	0	0	1	1
<i>lang3</i> ‘clear’					
明晰 <i>ming2-</i>	0	0	0	1	1
<i>xi1</i> ‘clear’					
清朗 <i>qing1-</i>	0	0	0	1	1
<i>lang3</i> ‘clear and bright’					
澄澈 <i>cheng2-</i>	0	0	0	1	1
<i>che4</i> ‘clear’					
澄淨 <i>cheng2-</i>	0	0	0	1	1
<i>jing4</i> ‘clean and clear’					
渾 <i>hun2</i>	0	0	0	1	1
‘turbid’					

渾沌 <i>hun2-</i>	0	0	0	1	1
<i>dun4</i> ‘turbid’					
清澄 <i>qing1-</i>	0	0	0	1	1
<i>cheng2</i>					
‘limpid’					
氤氳 <i>yun1-</i>	0	0	1	0	1
<i>yun4</i>					
‘enshrouding’					

Dimension

大 <i>da4</i>	0	0	1	1083	1084
‘big’					
高 <i>gaol</i>	0	0	0	197	197
‘high’					
低 <i>di1</i>	0	0	0	182	182
‘low’					
小 <i>xiao3</i>	0	0	0	84	84
‘small’					
長 <i>chang2</i>	0	0	0	77	77
‘long’					
沈 <i>chen2</i>	6	0	1	67	74
‘deep’					
低沈 <i>di1-</i>	0	0	0	45	45
<i>chen2</i> ‘low’					

細 <i>xi4</i>	8	0	0	27	35
‘thin’					
高亢 <i>gao1-</i>	0	0	0	26	26
<i>kang4</i> ‘high’					
巨大 <i>ju4-da4</i>	0	0	0	16	16
‘huge’					
深 <i>shen1</i>	0	0	0	16	16
‘deep’					
肥 <i>fei2</i>	0	14	0	0	14
‘fat’					
薄 <i>bao2</i>	1	3	1	1	6
‘thin’					
淺 <i>qian3</i>	0	1	0	5	6
‘shallow’					
渾厚 <i>hun2-</i>	0	1	0	5	6
<i>hou4</i> ‘very thick’					
深沈 <i>shen1-</i>	0	0	0	6	6
<i>chen2</i> ‘deep’					
厚 <i>hou4</i>	0	4	0	1	5
‘thick’					
短 <i>duan3</i>	0	0	0	3	3
‘short’					
細微 <i>xi4-</i>	0	0	0	3	3
<i>wei1</i> ‘thin’					

纖細 <i>xian1-</i>	0	0	0	3	3
<i>xi4</i> ‘very thin’					
扁 <i>bian3</i>	0	0	0	2	2
‘flat’					
短促 <i>duan3-</i>	0	0	0	2	2
<i>cu4</i> ‘very short’					
綿長 <i>mian2-</i>	0	0	0	2	2
<i>chang2</i> ‘very long’					
細碎 <i>xi4-sui4</i>	0	0	0	2	2
‘fragmented’					
豐厚 <i>feng1-</i>	0	0	0	1	1
<i>hou4</i> ‘thick’					
浩大 <i>hao4-</i>	0	0	0	1	1
<i>da4</i> ‘huge’					
宏大 <i>hong2-</i>	0	0	0	1	1
<i>da4</i> ‘huge’					
寬廣 <i>kuang1-</i>	0	0	0	1	1
<i>guang3</i> ‘broad’					
寬厚 <i>kuan1-</i>	0	0	0	1	1
<i>hou4</i> ‘broad and thick’					

深厚 <i>shen1-</i>	0	1	0	0	1
<i>hou4</i> ‘deep and thick’					
微小 <i>wei1-</i>	0	0	0	1	1
<i>xiao3</i> ‘very small’					
細小 <i>xi4-</i>	0	0	0	1	1
<i>xiao3</i> ‘thin and small’					
陰沈 <i>yin1-</i>	0	0	0	1	1
<i>chen2</i> ‘of low sky’					

Visual

situation

緊 <i>jin3</i> ‘tense (in vision)’	409	0	0	2	411
鬆 <i>song1</i> ‘shaggy’	116	0	0	0	116
嫩 <i>nen4</i> ‘delicate’	45	0	0	1	46
幽靜 <i>you1-</i> <i>jing1</i> ‘graceful’	0	0	0	25	25

鬆弛 <i>song-</i>	14	0	0	0	14
<i>chi2</i> ‘slack’					
沈靜 <i>chen2-</i>	0	0	0	12	12
<i>jing4</i> ‘still’					
緊繃 <i>jin3-</i>	11	0	0	0	11
<i>beng1</i> ‘taut (in vision)’					
細緻 <i>xi4-zhi4</i>	4	0	1	5	10
‘exquisite’					
細嫩 <i>xi4-</i>	7	0	0	2	9
<i>nen4</i> ‘delicate’					
清靜 <i>qing1-</i>	0	0	0	8	8
<i>jing4</i> ‘secluded’					
激昂 <i>ji1-</i>	0	0	0	7	7
<i>ang2</i> ‘aroused’					
綿綿 <i>mian2-</i>	6	0	0	1	7
<i>mian2</i> ‘continuous’					
嬌滴滴	0	0	0	5	5
<i>jiao1-di1-di1</i> ‘delicately pretty’					

緊密 <i>jin3-</i>	5	0	0	0	5
<i>mi4</i> ‘close’					
稚嫩 <i>zhi4-</i>	0	0	0	5	5
<i>nen4</i> ‘puerile (in vision)’					
昂揚 <i>ang2-</i>	0	0	0	4	4
<i>yang2</i> ‘soared’					
緊迫 <i>jin3-</i>	0	0	0	4	4
<i>po4</i> ‘close’					
清幽 <i>qing1-</i>	0	0	4	0	4
<i>you1</i> ‘graceful’					
空白 <i>kong1-</i>	0	0	0	3	3
<i>bai2</i> ‘blank’					
蒼老 <i>cang1-</i>	0	0	0	3	3
<i>lao3</i> ‘aged’					
毛茸茸	3	0	0	0	3
<i>mao2-rong2-</i> <i>rong2</i> ‘hairy’					
密集 <i>mi4-ji2</i>	0	0	0	3	3
‘dense’					
稀落 <i>xi1-luo4</i>	0	0	0	3	3
‘sparse’					

亮麗 <i>liang4-</i>	0	0	0	2	2
<i>li4</i> ‘beautiful’					
纏綿 <i>chan2-</i>	0	0	0	1	1
<i>mian2</i>					
‘continuous’					
稠 <i>chou2</i>	0	0	0	1	1
‘dense’					
大方 <i>da4-</i>	0	0	0	1	1
<i>fang1</i>					
‘graceful’					
滾滾 <i>gun3-</i>	0	0	0	1	1
<i>gun3</i>					
‘billowing’					
嬌媚 <i>jiao4-</i>	0	0	0	1	1
<i>mei4</i>					
‘charming’					
緊湊 <i>jin3-</i>	0	0	0	1	1
<i>cou4</i>					
‘compact’					
連綿 <i>lian2-</i>	0	0	0	1	1
<i>mian2</i>					
‘continuous’					
綿密 <i>mian2-</i>	0	0	0	1	1
<i>mi4</i> ‘dense’					

清麗 <i>qing1-</i>	0	0	0	1	1
<i>li4</i> ‘elegantly beautiful’					
清逸 <i>qing1-</i>	0	0	0	1	1
<i>yi4</i> ‘elegant’					
鬆垮 <i>song1-</i>	1	0	0	0	1
<i>kua3</i> ‘baggy’					
緻密 <i>zhi4-</i>	0	0	0	1	1
<i>mi4</i> ‘dense’					
Total	673	64	63	2,234	3,034

Appendix 4. Distributions of synaesthetic uses of Mandarin auditory adjectives in the Sinica corpus

Source	Target domain						Total
domain							
HEARING	TOU-	TAS-	SME-	VISION			
	CH	TE	LL	Color	Dimen-	Visual	
					sion	situation	
和諧 <i>he2-</i>	0	0	0	3	0	23	26
<i>xie2</i>							
‘harmonious’							
喧鬧 <i>xuan1-</i>	0	0	0	2	0	0	2
<i>nao4</i> ‘noisy’							
吵 <i>chao3</i>	0	0	0	1	0	0	1
‘loud’							
喧嘩 <i>xuan1-</i>	0	0	0	1	0	0	1
<i>hua2</i> ‘noisy’							
Total	0	0	0	7	0	23	30

Appendix 5. Distributions of synaesthetic uses of Mandarin olfactory adjectives in the Sinica corpus

Source domain	Target domain						Total
SMELL	TOU- CH	TAS- TE	Col- or	Dimen- sion	Visual situation	HEAR- ING	
香 <i>xiang1</i> 'fragrant'	0	22	0	0	0	0	22
臭 <i>chou4</i> 'smelly'	0	0	0	0	10	0	10
Total	0	22	0	0	10	0	32

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