THE EFFECT OF THE MECHANISM OF WORK BEHAVIORAL AUTOMATICITY ON WORK-RELATED MUSCULOSKELETAL SYMPTOMS IN THE WORKPLACE

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The Effect of the Mechanism of Work Behavioral Automaticity on Work-related Musculoskeletal Symptoms in the Workplace

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CERTIFICATE OF ORIGINALITY

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________________________________ (Signed)

Yanwen Xu (Name of student)

Dedication

I would like to dedicate this work to my family, friends, colleagues, and classmates who have supported me throughout my studies in every way.

Abstract of thesis entitled *The Effect of the Mechanism of Work Behavioral Automaticity on Work-related Musculoskeletal Symptoms in the Workplace* submitted by Yanwen Xu for the degree of Doctor of Philosophy at The Hong Kong Polytechnic University (June 2014)

Abstract

Work behavioral automaticity (WBA) can be characterized as a learned and goal-directed behavioral response to the environment through frequency and reinforcement of movement. However, little research has been conducted into the mechanism underlying how WBA leads to the development of work-related musculoskeletal symptoms (WMS). This thesis reports on four studies, each of which examine different aspects of how WBA in the workplace relate to the development of WMS.

Study 1 was a cross-sectional survey of the prevalence of, and risk factors for, WMS in the catering industry. The results showed that the most prevalent form of WMS was shoulder pain amongst Chinese chefs (71.7%). The frequency of movement (such as wrist bending and exertion) was the main risk factor contributing to the development of WMS.

Based on the results of Study 1, Study 2 was an onsite ergonomic assessment of the risk factors contributing to WMS for Chinese chefs in a medium-sized restaurant. The results showed that standing for prolonged periods, poor manual handling postures, lifting heavy objects, and frequent and repetitive upper limb movements were the four main risk factors contributing to WMS. Moreover, such work behaviors were characterized by a high degree of automaticity; conducted without conscious awareness or intention, they had become habits.

Drawing on the findings of Study 2, study 3 therefore used grounded theory to explore the formation of WBA and its underlying mechanisms. The results show that workplace behavior is heavily goal oriented. Initially, novel behaviors involved in work tasks are experienced as requiring cognitive effort, but as such effort increases and behavioral training is applied , automaticity increases and the behavior becomes easier. The more undesirable work habits one has, the higher the probability one will suffer from some form of WMS.

Study 4 drew on the foregoing to develop a validated and reliable questionnaire to measure WBA in a group of Chinese chefs, followed by a case-control study to identify the characteristics of workers with or without WMS. A 51-item self-report WBA Scale (WBAS) emerged from this analysis. The WBAS demonstrated high test-retest reliability (0.630-0.929) and internal consistency (0.653-0.755). A four-factor structure for the instrument was identified through principal component analysis with varimax rotation. Criterion validity was established using C-WSF and WBAS ($r=-0.57$, $p<0.01$). The results of hierarchical logistic regression showed that environmental factors (OR=0.884), safety awareness (OR=1.417), and risk-taking beliefs (OR=1.261) predicted the development of WMS. All three predictors were subjected to further statistical testing and the results demonstrated that they play an important role in the formation of WBA in the workplace and hence contribute to the development of WMS.

Publications arising from the thesis

Cheng, A. S., Szeto, G. P., Xu, Y. W., & Feuerstein, M. (2014). Chinese translation and cross cultural adaptation of the workstyle short form. *J Occup Rehabil, 24*(4), 605-16.

Xu, Y.W. & Cheng, A. S. K. (2014). An onsite ergonomics assessment for risk of work-related musculoskeletal disorders among cooks in a Chinese restaurant. *Work, 48*(4), 539-45.

Xu, Y. W., Cheng, A. S. K., & Li-Tsang, W. P. (2013). Prevalence and risk factors of work-related musculoskeletal disorders in the catering industry: A systematic review. *Work, 44*(2), 107-16.

Xu, Y.W. & Cheng, A. S. K. (2012). *Workplace behavior and its relationship with work-related musculoskeletal disorders in catering industry: a qualitative study*. The 10th European Academy of Occupational Health Psychology (EAOHP) Conference- Zurich 2012, 11-13 April.

Xu, Y.W. & Cheng, A. S. K. (2010). *Preliminary study on prevalence and risk factors of work-related musculoskeletal disorders in catering industry in Hong Kong*. In proceeding of the 7th Pan-Pacific Conference on Rehabilitation and 2010 Graduate Student Conference on rehabilitation sciences. Hong Kong 2010, 23-24 October.

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香港職業安全健康局. (2011). *香港飲食業職業性筋骨勞損研究計劃報告 2011*. http://www.oshc.org.hk/download/research/69/0/Musculoskeletal%20Disorders_Catering_Chi.pdf. Accessed on 19 June 2014.

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ABBREVIATIONS

Attitude toward Knowledge and Environment	AKE
Analysis of Variance	ANOVA
Area Under Curve	AUC
Chinese Workstyle Short Form	C-WSF
95% Confidence Intervals	95% CI
Content Validity Index	CVI
Cumulative Symptoms Severity Score	CSSS
Decision Making	DM
Effectiveness of OSH Knowledge	EOK
Environmental Factors	EF
Exploratory Factor Analysis	EFA
Health Belief Model	HBM
Importance of Working for a Living	IWL
Intra-class Correlation Coefficient	ICC
Learning from Experience of WMS	LEM
National Institute for Occupational Safety and Health	NIOSH
Nordic Musculoskeletal Questionnaire	NMQ
Occupational Safety and Health	OSH
Occupational Safety and Health Council	OSHC
Odd Ratio	OR
Ovako Working Posture Assessment System	OWAS

Protection Motivation Theory	PMT
Rapid Upper Limb Assessment	RULA
Receiver Operating Characteristic Curve	ROC
Repetitive Strain Injury	RSI
Risk-taking Belief	RTB
Safety Awareness	SA
Social Cognitive Theory	SCT
Theory of Reasoned Action	TRA
Work Behavioral Automaticity	WBA
Work Behavioral Automaticity Scale	WBAS
Work-related Musculoskeletal Disorders	WMSD
Work-related Musculoskeletal Symptoms	WMS

Chapter I - Introduction

Work-related musculoskeletal symptoms (WMS) are defined as musculoskeletal complaints, including any aches, pains, or discomfort in the musculoskeletal system, which have a proven or hypothetical work-related causal component. This description includes conditions like musculoskeletal pain, repetitive strain injury (RSI), and so on (Kuorinka et al., 1987; Kuorinka & Forcie, 1995; Douphrate et al., 2014; Oude, Hengel, Visser, & Sluiter, 2011). WMS are not only common complaints in the workplace, but also constitute a public health problem and a major source of work-related disability (Williams & Westmorland, 2002; Stewart et al., 2003). The consequences of WMS include long-term sick leave, hospitalization, and workers' compensation claims and the associated costs (Fjell et al., 2007; Hannerz et al., 2002; Bonauto et al., 2006). Accordingly, they have a significant impact on individuals and society as a whole. In fact, WMS are now the most common type of reported occupational disease (rates over 45%) in Europe and other parts of the industrialized world (Colombini et al., 2006; Eurostat and Luxembourg, 2004).

According to the report of the European Survey on Working Conditions (ESWC), 24.7% of European workers complain of backache and 22.8% of muscular pain; 45.5% report working in painful or tiring positions, and 35% are required to handle heavy loads at work (Eurofound, 2012). In France, WMS led to the loss of seven million workdays in 2006, accounting for about EUR 710 million of enterprises' contributions (Schneider & Irastorza, 2010). The catering industry is one of the most important service sectors in Hong Kong, employing more than 200,000 staff. However, it is also a costly service in terms of WMS. A survey carried out in Norway from 1992 to 2003 found that caterers had the second highest rate of WMS (Morken, Mehlum, & Moen, 2007). In 2013, a total of 38,027 work-related injury cases were reported in Hong Kong. When different industries were compared, around 20% of injuries (the highest proportion of all sectors) occurred in the catering industry. Cuts, burns, scalds, slips, and falls were the most common problems, followed by injuries from lifting heavy objects, which accounted for 21.1% (Hong Kong Labor Department, 2013). Evidence collected by the US Department of Labor shows that WMS are largely caused by overexertion and pain suffered at work (Bureau of Labor Statistics, 1995), which in turn is usually caused by the physical loading required by the job.

Repetitive manual work, lifting, forceful movements, and awkward postures are well-known risk factors contributing to WMS (Latko et al., 1999; de Zwart, Frings-Dresen, & Kilbom, 2001; Hannerz, Tuchsen, & Kristensen, 2002; European Agency for Safety and Health at Work, 2009). Jobs in the catering industry have just the sort of characteristics that induce WMS, such as long hours, the need to cover long distances, heavy lifting in awkward postures, and so on (Fjell et al., 2007). WMS may occur if any of these risk factors, alone or in combination, overload the musculoskeletal system. Kitchen personnel face four main risk factors (Kuorinka & Forcier, 1995; Fjell et al., 2007; Devereux, Vlachonikolis, & Buckle, 2002):

- Posture, such as holding the head down when cooking, overreaching while preparing food, reaching for supplies, poorly designed kitchens, and small work spaces;
- Force, such as carrying bulk food packages, moving pots and pans, and placing dishes and glasses in racks;
- Repetition, such as chopping and dicing; and
- Duration, such as long working hours, sometimes without breaks.

These physical factors can determine whether a worker is at risk for developing WMS. However, other factors can increase the risk, such as the working environment and organization; the individual characteristics and capacities of the worker; and psychosocial factors such as job satisfaction, perceived workload, and job autonomy (Kuorinka & Forcier, 1995; Dempsey & Filiaggi, 2006; Tsai, 2009). Studies also show that physical and mental demands can combine to increase the risk of WMS (Tsai, 2009; Qiang & Chow, 2007).

Given the high prevalence of work-related injuries in the catering industry, increasing importance has been placed on controlling these risk factors. In particular, developing injury prevention strategies which can successfully lead to behavioral changes in the workplace has become a key topic of interest to researchers in this area (Nilsen et al., 2008; Christoffel & Gallagher, 1999). Currently, the three top-down principles of workplace injury prevention strategies are enforcement, environment, and education. Enforcement, through means such as safety legislation or regulation, aims to mandate certain behaviors to improve safety and then enforce them to boost compliance (Pearn, Nixon, & Scott, 2004). Environment, also known as engineering control or ergonomics intervention, focuses on the interaction between humans and their surroundings (Hanson, Vardon, & Lloyd, 2004). This aspect seeks to apply environmental modifications to the workplace to improve product design and safety. Education is a long-standing, person-oriented approach to modifying behaviors (Nilsen et al., 2008). It is assumed that educated workers will act in their own interests to avoid injury if they are fully informed of the risks and benefits (Fincham, 1992).

During the implementation of prevention strategies, behavioral change is crucial if an improvement in safety is to be achieved. Several models have been developed to understand various health-related behaviors and to design tailormade intervention strategies, such as the Health Belief Model (HBM: Rosenstock, 1966) and the Theory of Planned Behavior (TPB: Bandura, 1977). All these models stress that individual cognitions, such as attitudes and intentions, trigger behavior and are therefore important predictors of the actions people take. Moreover, behavior is also considered to be a result of information processing and deliberate planning, or a rational weighing of the potential costs and benefits of an act (Edwards, 1954; Lucas & Lloyd, 2005). However, in the average workplace, workers rarely weigh up the benefits and costs in such a precise and methodological way before performing a task, because the activity is carried out frequently and hence is already becoming automatic. Applying behavioral change models to the workplace to improve safety may therefore not assist in tackling deliberative, unconscious, or habitual behaviors (Bennett et al., 1995).

The main purpose of this study is therefore to identify the underlying mechanism of formation of work behavioral automaticity (WBA) and develop a scale, the WBAS, to measure it in the workplace. The results will enable a better understanding of WBA, which may in turn be helpful in addressing the needs of catering workers with WMS and effecting behavioral change in the workplace. The study may also shed light on the development of relevant interventions for injury prevention among this group of workers.

Statement of Purpose

The impact of WMS on workers, in terms of maintaining working role and productivity, is a major concern of contemporary societies. Much effort has been made to develop prevention strategies which will improve the safety of the environment and facilitate safety behaviors in the workplace.

Generally, workers tend to use their own ways or methods of completing tasks. These can be considered as a learning process or a form of learned behavior. During the evolution of cognitive processes, workers may experience a series of steps (learning, modifying, and adapting) in their cognitive and behavioral processing over time. This process can also be considered as dynamic decision making. Over time, the behavior is frequently repeated with a high degree of automaticity in a stable context. Such repeated behavior is triggered by situational cues and thus can be enacted with little conscious awareness. Accordingly, when asked to learn a new work method or injury prevention strategy, workers may comply but face resistance stemming from the previously learned behavior. This may be the reason why workers may understand or know about many occupational safety and health (OSH) practices, but not apply them to actual tasks.

The study of WBA is less often systematically demonstrated. However, it is important because it relates to the underlying mechanism of behavior and, potentially, to prevention and intervention strategies. Many behavioral change models focus on deliberation and the motivational processes driving behavior in health-related and other forms of study (Orbell & Verplanken, 2010). In contrast, this work acknowledges the role of WBA in contributing to WMS in the catering industry.

The overall aim of this study is to explore the underlying mechanism of WBA and develop a measurement tool to identify workers with or without WMS. It consists of four studies, each of which aims to examine WBA in the workplace in regard to different aspects of its relationship with WMS. Study 1 set out to explore the prevalence and risk factors of WMS in the catering industry. The goal of Study 2 was to examine the risk factors contributing to WMS for chefs in a medium-sized Chinese restaurant using onsite ergonomic assessment, so as to identify risky behaviors. Study 3 attempted to explore the formation of WBA and its underlying mechanisms through a qualitative study using the grounded theory method. Finally, the aim of Study 4 was to develop a validated and reliable questionnaire to measure WBA among Chinese chefs, followed by a case-control study using the instrument to discriminate between those with or without WMS.

Research Questions

This study set out to tackle four research questions:-

1. What is the prevalence rate of WMS in the catering industry in Hong Kong?

2. Which catering role has the highest rate of WMS, and why?

3. What is the process of forming WBA?

4. Can measuring WBA help us to distinguish between workers with or without WMS?

Organization of Thesis

This dissertation consists of eight chapters. Chapter I provides a general introduction to the study, including a statement of purpose, research questions, and overview of the structure. Chapter II presents a review of the literature and a systematic analysis of the prevalence and risk factors for MSS in the catering industry. It also outlines the common conceptual models of behavioral change and the Workstyle Model describing the relationships between the causes and consequences of WMS. The promotion of safety behaviors identified by research as influencing the occurrence of WMS is also discussed. Chapter III presents a cross-sectional study of the prevalence of, and risk factors for, WMS in the catering industry in Hong Kong. A detailed description of the method, including the research design, data collection procedures, instrumentation, and analysis, is presented, and the results explained and discussed. The plan for designing the second onsite ergonomic study is also presented.

Chapter IV reports on a field study of the risk factors for WMS among chefs in a medium-sized Chinese restaurant using onsite ergonomic assessment. Again, it presents a detailed description of the method, including the research design, data collection procedures, instrumentation, analysis, before discussing the results. The factors identified as important in contributing to the WMS outcomes for chefs are tested using the National Institute for Occupational Safety and Health (NIOSH) lifting equation, Ovako Working Posture Assessment System (OWAS), and Rapid Upper Limb Assessment (RULA) posture analysis system, based on observations and video recordings. The findings provide important evidence which was then used to plan for Study 3.

Chapter V describes a qualitative study applying the grounded theory method to explore the formation of WBA in the workplace and its underlying mechanism. The main themes and interrelationships generated by this study are presented and discussed.

Chapter VI presents the findings of another cross-sectional study to develop a validated and reliable questionnaire for measuring WBA in a group of chefs, followed by a case-control study to discriminate between those with or without WMS. The process of developing the measurement instrument, including test-retest reliability; internal consistency; content, criterion, and construct validity; and testing accuracy is presented. The chapter closes with an analysis of the hierarchical logistic regression methods used to test the validity of the scale.

Chapter VII presents a general discussion of the findings of each individual study and the work overall. The WBA results obtained from using the instrument are compared with other measures from studies conducted overseas. The importance of WBA in preventing WMS is discussed, as are strategies for preventing and breaking down undesirable WBA patterns.

Chapter VIII sets out the overall conclusions of this study and suggestions for future work. The benefits of using WBA in the workplace to assist in the development of healthy behaviors, and to develop intervention strategies, are also discussed.

Chapter II - Literature Review

WMS have become a major concern in the workplace. In 2012, 388,060 incidences of WMS were reported in the US, accounting for 34% of all injury and illness cases (Bureau of Labor Statistics, 2012). There were no statistically meaningful changes to the figures, including the incidence rate and case count, from 2011. However, the median number of days away from work had increased by 1, to 12. WMS account for nearly 70 million physician office visits in the US annually, and an estimated 130 million total healthcare encounters including outpatient, hospital, and emergency room visits. The annual costs, in terms of compensation, lost wages, and lost productivity, have been estimated at USD 45-54 billion (National Research Council and the Institute of Medicine, 2001). Additionally, in 2001 the US Bureau of Labor Statistics reported 26,794 carpal tunnel syndrome and 372,683 back injury cases involving days off work (Bureau of Labor Statistics, 2004). In the European countries, according to EUROSTAT figures on recognized occupational diseases (EODS), musculoskeletal disorders are the most commonly reported condition, accounting for about 39% of the total in 2005. Moreover, according to the latest figures from the ESWC, 24.7% of European workers complain of backache and 22.8% of muscular pain; 45.5% report working in painful or tiring positions, and 35% are required to handle heavy loads at work (Eurofound, 2012). More recent figures, for example from Austria, Germany, and France, demonstrate the increasing costs of WMS. In France, for example, seven million workdays were lost to them in 2006, accounting for about EUR 710 million of enterprises' contributions (Schneider & Irastorza, 2010).

Over the past decade, in Hong Kong, around 40,000 cases of occupational injuries involving sick leave more than 3 days have been reported, leading to the loss of more than a million working days and a direct cost in compensation of HK$215 million (see Table 1). This has placed substantial financial pressure on the insurance industry (Hong Kong Federation of Insurers, 2002, 2003). Perhaps more importantly, however, a look at the employment history of these workers reveals that the majority work in the social and personal services, wholesale, retail, restaurant, and hotel industries (Hong Kong Labor Department, 2012). Workers in these industries often do strenuous manual jobs. As a result, there is a high chance that they will develop WMS. In Hong Kong, work-related injuries tend to be caused by slipping, tripping, or falling on the same level; striking against or being struck by a moving object; and lifting or carrying (Hong Kong Labor Department, 2012)

The catering industry is one of the most important service sectors in Hong Kong, employing more than 200,000 people. However, it is also a costly service in terms of WMS. A survey carried out in Norway from 1992 to 2003 found that caterers had the second highest rate of WMS (Morken, Mehlum, & Moen, 2007). In 2013, a total of 38,027 work-related injury cases were reported in Hong Kong. The top-ranked industry was catering, accounting for around 20% of reported injuries. Cuts, burns, scalds, slips, and falls were the most common injuries, followed by those sustained from lifting heavy objects which accounted for 21.1% (Hong Kong Labor Department, 2013). Evidence gathered by the US Department of Labor shows that WMS are largely caused by overexertion and pain at work (Bureau of Labor Statistics, 1995), usually as a result of the physical loading required by the job.

Table 1

Work-related Injuries Reported in Hong Kong: 2003-2012

Year *	Number of Injuries	Sick Leave ≤7 days#^	Sick Leave >7 days ≤60 days	Sick Leave >60 days	Total Lost Days	Compensation (HKD millions)@
2003	49,649	16,579	19,172	5,639	1,281,501	276.57
2004	44,346	15,005	16,857	5,049	1,116,741	261.72
2005	46,587	16,062	17,379	5,136	1,171,516	235.88
2006	46,937	16,120	17,141	5,058	1,152,037	240.60
2007	43,979	17,051	18,267	5,344	1,211,650	229.30
2008	41,900	15,891	17,050	5,150	1,145,017	215.00
2009	39,579	15,332	16,213	5,191	1,146,832	188.00
2010	41,907	13,982	14,610	4,810	1,076,813	198.00
2011	40,578	14,931	15,214	5,478	1,210,188	209.00
2012	39,907	13,966	14,633	5,300	1,173,163	214.00

* Hong Kong Labor Department Annual Reports 2003-2012
# Number of injured workers
^Excludes cases involving sick leave of three days or less
@ Compensation for settled cases at year end

Prevalence of, and Risk Factors for, WMS in the Catering Industry

There has been increasing interest in WMS in the catering industry, particularly in risk factors and prevalence. One qualitative study (Tsai, 2009), using ethnographic content analysis and interviews with Chinese immigrant restaurant employees, shows that WMS (including aches and pains, soreness, and numbness) were their most troubling occupational illnesses. Cooks were at higher risk of WMS (Shiue et al., 2008), while their elbows were the body part most susceptible to injury (Armstrong & Chaffin, 1979). A retrospective case-control study was conducted on a cohort of 52,261 Chinese restaurant cooks to investigate the prevalence of confirmed and diagnosed musculoskeletal disorders. It shows that the annual incidence was around 25% for cooks, with suspect cases excluded (Shiue et al., 2008). Another study of a cohort of 100 casual dining Western restaurant servers finds that 42% reported experiencing WMS in the past year, most frequently in the lower back (18%) and shoulder (11%) (Dempsey & Filiaggi, 2006).

Literature Search Strategy

A systematic review was carried out to locate previous research on the prevalence and risk factors of WMS in the catering industry. Such an approach can help to ensure a full picture of relevant studies is presented, with the goal of guiding and providing a foundation for the original work of this study.

Searches were conducted in nine English-language medical databases, two Chinese full-text databases and seven websites devoted to OSH. Chinese databases were included out of concern that some studies conducted in Chinese may not have been published in English-language journals.

The Chinese databases were the China National Knowledge Infrastructure (CNKI), which is the biggest Chinese full-text database in the world, and the Chinese Electronic Periodical Services (CEPS), which is the first legally authorized online database in Taiwan to offer full-text periodicals published in Mainland China and Taiwan. Additionally, a manual search was performed on official OSH or related associations' websites for any articles related to work-related musculoskeletal disorders (WMSD) in the catering industry (Table 2).

Table 2

Search Strategies and Results by Database and Type

Type	Database Name	Search Strategies*	Citations
Medical	1. PubMed	#1 AND #2 AND #3	167
	2. Pre-Medline	#1 AND #2 AND #3	1
	3. Medline (1966+)	#1 AND #2 AND #3	103
	4. Cinahl	#1 AND #2 AND #3	19
	5. ISI Web of Science	#1 AND #2 AND #3	72
	6. PsychInfo	#1 AND #2 AND #3	87
	7. AMED (Allied and Complementary Database)	#1 AND #4	95
	8. SCOPUS	#1 AND #5	11
	9. Science Direct	#1 AND #4	79
			Total: 634
Mixed	10. China National Knowledge Infrastructure (CNKI)	#6	300
	11. Chinese Electronic Periodical Services (CEPS)	#7	101
			Total: 401
Websites	12. HSE (Health and Safety Executive, UK)	Manual search	8
	13. EU (European Agency for Safety and Health at Work)	Manual search	13
	14. SWEA (The Swedish Work Environment Authority)	Manual search	0
	15. OSHA (Occupational Safety and	Manual search	3

	Health Administration, US)		
	16. OSHC (Occupational Safety and Health Council, Hong Kong)	Manual search	6
	17. Hong Kong Labor Department	Manual search	1
	18. The National Restaurant Association, US	Manual search	0
			Total: 31
Total: 1066			

*Refers to the search term strings used (see main text).

Search terms. Search term strings were adopted from a previous study on musculoskeletal disorders in pianists, with minor modifications. The terms were entered as follows:-

- #1: Catering OR Restaurant* OR Fast food*
- #2: Cumulative Trauma Disorder* OR Disability OR Disabilities OR Musculoskeletal Disease* OR Musculoskeletal Disorder* OR Occupational Disease* OR Occupational Disorder* OR Overuse OR Overuse Syndrome* OR Pain OR Repetitive Motion Disorder* OR RSI OR Repetition Strain Injury OR Repetition Strain Injuries OR Repetitive Strain Injury OR Repetitive Strain Injuries OR manual materials handling OR Manual Handling Operation OR (Sprains and strains)
- #3: Causality OR Cohort Studies OR Cross-Sectional Studies OR Epidemiology OR Epidemiologic Factor* OR Follow-up Studies OR

Incidence Studies OR Prevalence OR Prevalence Studies OR Prospective Studies OR Risk* OR Risk Factor* OR Survey*

- #4: Pain OR disorder* OR injury* OR musculoskeletal
- #5: Pain OR musculoskeletal disorder*
- #6: 肌肉骨骼 or 职业伤害
- #7: 肌肉骨骼 or 職業傷害

Strings #4 and #5 using short search keywords were used when the database in question limited the number of search terms that could be used. Items #6 and #7 are the Chinese characters for musculoskeletal and occupational injury. Item #6 is written in simplified, and #7 in traditional, Chinese characters. The search operator asterisk (*) refers to a portion of a word.

Selection criteria. All citations retrieved were screened by title and abstract. Studies passed into the second round of screening if they dealt with the prevalence and or risk factors associated with WMS, including diagnosed disorders, in the catering industry. In the second round, papers were removed if they did not use an appropriate epidemiological methodology (that is, they were not cross-sectional, case-control, or cohort studies). All the references derived from the final group of papers were also screened in terms of the selection criteria, to maximize the pool of eligible papers.

Results from English-language medical databases. The searches resulted in 643 articles drawn from 9 medical databases, although the first round removed 626 of these which had nonspecific or irrelevant titles. Of the remaining 17 articles, 11 were eliminated in the second round as they did not match the selection criteria and study design. In the end, six articles were included from English-language medical databases.

Results from Chinese databases. The searches identified 401 articles from the 2 Chinese databases, 381 of which were eliminated by examining titles and abstracts. A further 14 papers were discarded because they did not address prevalence and/or risk factors. Finally, two more were eliminated based on study design. Four papers cited in Chinese databases were included in the final review.

Results from websites. A total of 31 reports and related information were identified, with 25 being screened out as not relevant to the topic. However, none of the remaining six citations met the second set of inclusion criteria, so no papers from this source were included in the final review.

Of the 10 articles selected, 3 drew on the same dataset, used similar methodologies, and reported identical results (one in English and two in Chinese). The earliest version of the publication was used and the two redundant papers discarded. Meanwhile, a review of the references of these papers revealed four more potentially eligible citations, namely two journal articles and two abstracts from proceedings. These articles brought the final total to 12, with 9 in English and 3 in Chinese (see Appendix 1).

Prevalence of WMS in the Catering Industry

The selected papers were all published between 1988 and 2009 (see Table 2). Six were from Taiwan (50%), 2 from Japan (17%), 1 from the US, and 1 each from Ireland, Finland, and Hong Kong. Of the population studied, 33% (n=4) were Chinese restaurant workers, with a reported prevalence of WMS from 25% to 86%; only 8% (n=1) studied Western restaurant workers, with a prevalence of 42%. The remaining 7 articles (58%) studied workers in schools, fast-food restaurants, medical centers, and so on, with reported prevalence ranging from 10% to 75%. The most frequently affected body parts were the lower back, neck, shoulder, elbow epicondyle, upper leg, and ankle/foot. The studies were mainly cross-sectional (75%, n=9), though there were two case-control (17%) and one prospective cohort study (8%).

Risk factors and locations. According to the findings from the 12 articles, risk factors can be classified into three groups; personal, physical, and other.

- Personal factors; age, gender, height, and weight;
- Physical factors;
  - lifting (heavy objects over long distances frequently);
  - carrying (heavy objects, for more than one minute);
  - standing (long working hours);
  - bending (frequently, while moving or lifting heavy objects);
  - twisting (continual twisting of the wrist);
  - moving (moving objects using the forearms);
  - posture (washing materials using the lower back and waist; putting the hand over the shoulder during lifting; twisting the trunk);
- Other factors;
  - duration (such as long hours);
  - force loading (such as carrying heavy objects with incorrect posture).

Female cooks aged 60 and above were approximately 3 times more likely than younger women to seek medical assistance for WMS. Moreover, starting with the 20-24 age group, female cooks had the highest incidence in almost every age category. Incidence increased with age. In addition, discomfort of the right knee had strong associations with height (odds ratio [OR]=2.76) and weight (OR=4.65), such that taller and heavier people were more likely to get injured. In general, repetitive movements, duration, posture, and force loading were the four main risk factors for WMS.

The lower back, shoulder, wrist, elbow, and ankle/foot were the most frequently affected body parts among cooks, servers, and sanitation workers. However, one paper reports that the neck was the most commonly injured body part. In one Chinese restaurant studied, cooks reported 4.91 times more lower back pain than the general population; 40% complained of WMS in the right shoulder, and 32% of servers complained of lower back pain. In the one Western restaurant studied, servers claimed a higher prevalence of WMS in the lower back (18%) and shoulder (11%). In addition, commissary food-service workers were more likely to report upper back (OR=16.1) and leg (OR=14.4) WMS. Chinese restaurant workers consistently suffered more WMS than those in the Western restaurant and in other kinds of catering establishment.

Implications for this Study

To the author's knowledge, this is the first systematic epidemiological review of WMS in the catering industry to combine both English and Chinese databases. It helps to provide a broader picture of WMS in the catering industry, and in Chinese restaurants in particular. Despite the effort to provide a comprehensive survey, there will be research on WMS that has not been included in this review. However, given the large number of databases searched, it is likely that a large percentage of the relevant papers has been included (Bragge, Bialocerkowski, & McMeeken, 2006).

Prevalence of WMS. The review identified a wide range of prevalence figures (3-86%) for WMS in catering employees, in terms of several different body parts. Such a wide range might be due to the diversity of the restaurants surveyed in the 12 papers. Four looked at Chinese restaurants (Shiue et al., 2008; Chyuan et al., 2002; Chyuan, Li, & Sung, 2005; Yeung et al., 1997), one at a Western-style restaurant (Dempsey & Filiaggi, 2006), while the remaining sites were school and medical centers, catering schools, commissary food-service companies, and so on (Chyuan, Ho, & Sung, 2005; Gleeson, 2001; Guo et al., 2005; Haukka et al., 2006; Huang et al., 1988; Tsou, Luo, & Hwang, 2009; Yuichiro et al., 1998). The diversity in organization, work methods, workplace layout, and tool and equipment design among these various sites could all contribute to the different prevalence figures obtained. This could also be attributed to the breadth of job titles of the workers studied (with, presumably, different physical demands in each role). The sample sizes varied widely, from 44 to 52,261, which could also give rise to an extremely wide range of prevalence estimates. In addition, 90% of the studies reviewed here were conducted on currently employed workers, and hence may have excluded those who could not cope with the pain of their WMS and had already left their jobs. As a result, all these studies may underestimate the true severity and prevalence rates of WMS.

One of the four Chinese restaurants studied shows an annual reported incidence of WMS associated with insurance claims of 25% for cooks. However, the other three report that more than 60% of staff, mainly cooks, sanitation workers, and servers, had complained of WMS, particularly musculoskeletal pain. Yeung et al. (1997) show that barbecue (BBQ) cooks reported the highest prevalence of musculoskeletal discomfort (86%), significantly higher than that of cooks in Japanese nursery schools (11.5%). Servers in Chinese restaurants were more likely to suffer WMS (64.3%) than their counterparts in a Western-style restaurant (42%). As mentioned in Chapter I, the demanding job characteristics of Chinese restaurants could be the major cause of this difference.

Location of WMS. The lower back, shoulder, wrist, elbow, and ankle/foot were the most frequently reported locations of WMS among cooks, servers, and sanitation workers, while participants in another study cited the neck as the most common site (Haukka et al., 2006). Across 52,261 Chinese restaurant cooks, the most frequently affected body part was the lower back, although the epicondyle was at a higher risk (OR>2) than other body parts for this group (Shiue et al., 2008). Chyuan, Li and Sung (2005) show that for their sample of 328 banquet workers serving Chinese cuisine, the prevalence of WMS in the left foot reached 59.8%. Another study shows that among 905 food-service employees from 24 hotel restaurants in Taiwan, lower back pain was most prevalent (52.6%) among kitchen staff, whereas both sanitation workers and dining room staff suffered mostly from shoulder pain with prevalence rates of 63.4% and 64.3%, respectively (Chyuan et al., 2002). Workers in Chinese restaurants may need to use more physical and mental energy due to the fact that Chinese cuisine relies on heavy utensils such as woks, dishes, and pots. This is particularly true in banqueting restaurants, where more than a thousand customers at a time may require dinner at occasions such as weddings. To summarize, cooks are most likely to suffer from WMS in the neck, lower back, shoulder, elbow, and wrist, whereas wait staff are most likely to suffer WMS in the elbow, lower back, and foot.

Risk factors for WMS. It is known that using different statistical methods can lead to different conclusions about WMS risk factors. Due to the cross-sectional nature of 75% of the studies reviewed here, no causal conclusions can be made. Cross-sectional studies simply cannot illuminate the temporal relationship between risk factors and WMS. However, they do provide valuable information which can be used as a basis for a longitudinal study. Risk factors can be classified into the personal and physical. Personal factors include age, gender, height, and weight. Physical factors include repetitive lifting, carrying, prolonged standing, bending, twisting, moving, and washing. Repetition, poor posture, exertion, frequency, and duration associated with these physical factors are the main risk factors contributing to WMS. Although many of the material-handling tasks are not excessive, the heavier tray lifts and carrying tasks are a cause for concern (Dempsey & Filiaggi, 2006). For Chinese restaurants, Chyuan, Li and Sung (2005) demonstrate that age, height, and weight are the main personal risk factors. They also report that long hours of working, standing, and serving Chinese food during banquets causes most servers some degree of musculoskeletal discomfort and fatigue. In a similar study of hotel restaurants, frequent and prolonged moving of heavy objects and bending while moving and lifting such objects was associated with shoulder pain and, in the latter example, lower back pain, and continual twisting and frequent vigorous wrist actions with finger/wrist pain (Chyuan et al., 2002; Chyuan, Ho, & Sung, 2005). Huang et al. (1988) show that the repetitive use of arms and hands, poor working posture, high frequencies, and long travel distances when lifting are the main risk factors for WMS . However, one study identifies self-reported job stress or workload as the main risk factor (Yuichiro et al., 1998). A full explanation of the interaction between WMS risk factors, and a demonstration of the biopsychosocial influence on risk factors and WMS, has yet to be proposed in this strand of research.

Table 3

Prevalence of, and Risk Factors for, WMS as Reported in 12 Selected Papers

	Reference (country/area)	Study Design	Population	Sample Characteristics	Prevalence	Significant Risk Factors
1	Dempsey & Filiaggi, 2006 (US)	Cross sectional	100 wait staff in 10 casual dining restaurants	Males: n=35, mean age=24.8, mean height=176.7cm; Females: n=64, mean age=25.7, mean height=164.6cm	42% in the past year	Although many of the materials handling tasks were not excessive, the lifting and carrying of heavier trays was a cause for concern.
2	Shiue et al., 2008 (Taiwan)	Retrospective case control	52,261 Chinese restaurant cooks, 209,044 references	Cooks: 22,445 male and 29,816 female; Other job titles: 119,264 male (57.1%) and 89,780 female (42.9%); Age (yrs): male: 32.3±9.3; female:	25% annual incidence rate	1. Age: Female cooks aged 60 and older were approximately 3

				35.3±10.1		times more likely than younger women to seek medical assistance for WMS. 2. Gender: female>male
3	Chyuan et al., 2002 (Taiwan)	Cross sectional	905 hotel restaurant workers	Male: n=497, 55%; Female: n=408, 45%; Kitchen staff: n=407; Sanitation: n=41; Dining room staff: n=457.	52.6 - 64.3%	1. Frequent bending while moving/lifting heavy objects; 2. Frequent long-lasting moving/lifting of objects; 3. Continuing twisting of wrist;

						4. Frequently vigorous wrist action; 5. Frequent bending while moving/lifting heavy objects.
4	Chyuan, Ho & Sung, 2005 (Taiwan)	Cross sectional	309 commissary employees	Male: n=122, 39.5%; Female: n=185, 59.9%; 38.8% of subjects aged 40-49 years	Unreported	Awkward posture including lifting the hand over the shoulder, twisting the body trunk, and carrying heavy objects for more than one minute.
5	Chyuan, Li & Sung, 2005	Cross sectional	328 banquet servers serving Chinese	39% waiters, 61% waitresses; 91.8% of the sample aged 15-24 years	56.7-59.8%	1. Younger workers

	(Taiwan)		cuisine			were more likely than older ones to complain of discomfort; 2. Discomfort of the right knee had strong associations with height (OR=2.76) and weight (OR=4.65).
6	Gleeson, 2001 (Ireland)	Prospective cohort study	315 catering students	Mean age: 22 years; 56% male, 44% female	10% over 10-month followup	1. Moving articles; 2. Manual handling.
7	Guo et al., 2005 (Taiwan)	Cross sectional	152 female catering workers in a school and 153 staff with other job titles	Female workers	33.5-46.7%	1. Raising arm over shoulders; 2. Twisting at the waist more than 20

						times/day; 3. Number of grasping movements and contact with ice or frozen materials.
8	Haukka et al., 2006 (Finland)	Cross-sectional	495 employees in municipal kitchens of schools, kindergartens, and nursing homes	Female, mean age 45 years	19-75%	Unreported
9	Huang et al., 1988 (Japan)	Case control	44 female school lunch center workers	Center A: n=24; age: 48.2±6.1; Center B: n=20; age: 46.8±7.4	Reported with table format but no exact number provided	1. Repetitive use of arms and hands; 2. Awkward working posture; 3. Very frequent and

						long-distance lifting.
10	Tsou et al., 2009 (Taiwan)	Cross sectional	47 employees working in one medical center kitchen	Cooks' mean age: 48; Wait staff mean age: 49.7	3-40%	Hours of cooking and washing
11	Yeung et al., 1997 (Hong Kong)	Cross sectional	102 Chinese restaurant workers	Chinese restaurant workers	86%	Manual material handling with loads up to 51kg
12	Yuichiro et al., 1998 (Japan)	Case control	209 nursery school cooks and 366 control workers	Aged 40-59	11.5%	Job title of cook

Case Definitions of WMS and Disorders

WMSD are disorders and diseases of the musculoskeletal system with a proven or hypothetical work-related causal component, such as cumulative trauma disorder (CTD), RSI, and so on (Kuorinka & Forcier, 1995).

WMSD are the single largest category of work-related illness and include a wide range of inflammatory and degenerative conditions affecting the ligaments, tendons, muscles, peripheral nerves, and supporting blood vessels (Punnett & Wegman, 2004; Armstrong et al., 1993). They accordingly give rise to two clinical syndromes; specific and nonspecific. Specific syndromes include nerve compression disorders (such as carpal tunnel syndrome and sciatica), osteoarthrosis, and tendon inflammations (such as tenosynovitis and epicondylitis). For instance, pain at the base of the finger or thumb is the first symptom of tenosynovitis, followed by painful clicking or snapping when the finger performs a flexion or extension movement. The nonspecific syndromes, such as myalgia, lower back pain, and other regional pain syndromes without known pathology, are less well defined. These conditions often involve pain, discomfort, numbness, and tingling sensations throughout the neck, shoulders, upper limbs, and lower back. They may all result in physical impairment and disability. The ranges of diagnosis for WMSD therefore covers many components of the locomotor system (see Table 4 and Armstrong et al., 1993).

Table 4

Relationships between WMSD Description, Affected Body Parts, and Associated Work-related Tasks

Description	Affected body parts	Associated work-related tasks
Inflammations of tendons (tendinitis and tenosynovitis)	Forearm, wrist, elbow, and shoulder	Prolonged periods of repetitive and static work
Myalgias (pain and functional impairment of muscles)	Shoulder-neck region	Large static work demand
Compression of nerves (entrapment syndromes)	Wrist and forearm	Computer work with prolonged sitting posture
Degenerative disorders	Spine, hip, or knee joint	Manual handling or heavy physical work

Following the 10th revision of the International Classification of Diseases (ICD-10), those disorders with clear signs and symptoms are mainly classified in the ICD-10 *Chapter XIII: Diseases of the musculoskeletal system and connective tissue* (codes from M00-M99) and *Chapter VI: Diseases of the nervous system* (codes from G00-G99). Since the leading causes of WMSD and RSI or other disorders are the key concern, the most common WMSD can be defined as carpal tunnel syndrome (ICD-10 code G56.0), trigger finger (ICD-10 code M65.3), radial styloid tenosynovitis (ICD-10 code M65.4), lower back pain (ICD-10 code M54.5), rotator cuff syndrome (ICD-10 code M75.1), medial epicondylitis (ICD-10 code M77.0), and lateral epicondylitis (ICD-10 code M77.1).

WMSD: Occupational or Work-related?

Whether or not WMSD should be characterized as occupational or work-related diseases has been a subject of debate since the 1980s. According to the Protocol of 2002 annexed to the International Labor Organization Occupational Safety and Health Convention 1981 (No. 155), the term occupational disease covers any disease contracted as a result of an exposure to risk factors arising from working activity. There are two main elements present in the definition of an occupational disease:

- the causal relationship between exposure within a specific working environment or work activity and a specific disease; and
- the fact that the disease occurs among a group of exposed persons with a frequency above the average morbidity of the rest of the population.

In the third edition of the ILO's *Encyclopedia of Occupational Health and Safety*, a distinction is drawn between pathological conditions caused by an occupation that could affect workers (occupational diseases) and diseases aggravated by work or having a higher incidence owing to certain working conditions (work-related diseases). Both can be separated from conditions having no connection with work. The WMSD in the list of occupational diseases (ILO, 2010) are as follows:

a. Radial styloid tenosynovitis due to repetitive movements, forceful exertions, and extreme postures of the wrist;
b. Chronic tenosynovitis of hand and wrist due to repetitive movements, forceful exertions, and extreme postures of the wrist;
c. Olecranon bursitis due to prolonged pressure of the elbow region;
d. Prepatellar bursitis due to prolonged stay in kneeling position;
e. Epicondylitis due to repetitive forceful work;
f. Meniscus lesions following extended periods of work in a kneeling or

squatting position;

g. Carpal tunnel syndrome; and

h. Any other musculoskeletal disorder not mentioned in the preceding items where a link has been established between exposure to risk factors arising from work activity and the disorder contracted by the worker.

Work-related diseases have multiple causes, and various factors in the working environment may play a role in their development alongside other risks, (WHO, 1985). Accordingly, they have three features when compared with occupational diseases; firstly, they are partially caused by adverse work conditions; secondly, they can limit or lead to a total loss of earning capacity because of exacerbation or cumulated effects of workplace exposure; and thirdly, personal characteristics and environmental and sociocultural factors usually play a role (Armstrong et al., 1993). Nowadays, WMSD are the single largest category of work-related diseases and represent the majority of registered occupational diseases in the US and Europe. In the US, 388,060 WMSD were reported in 2012, accounting for 34% of all injury and illness cases (Bureau of Labor Statistics, 2012). In European countries, according to the Eurostat EODS figures, musculoskeletal disorders are the most common form of occupational disease, accounting for about 39% of all reports in 2005. In Hong Kong in 2012, 39,907 work-related injuries were reported, compared with only 280 cases of confirmed occupational disease. Among the latter, occupational deafness, silicosis, and tenosynovitis of the hand or forearm were the most common. It has been suggested that WMSD are underreported (see Table 5).

Table 5

Number of Confirmed Occupational Diseases Reported in Hong Kong in 2012

Occupational Disease	Number of Cases
Occupational deafness	99
Tenosynovitis of the hand or forearm	69
Silicosis	44
Tuberculosis	15
Gas Poisoning	14
Mesothelioma	12
Compressed air illness	12
Poisoning by halogen derivatives of hydrocarbons of the aliphatic series	5
Occupational dermatitis	3
Asbestosis	3
Brucellosis	1
Carpal tunnel syndrome	1
Streptococcus suis infection	1
Leptospirosis	1
Total	280

Outcome Measures for WMS

Generally, there are three forms of outcome measures used in studies of WMS; administrative data (such as compensation claims), clinical diagnosis or examination, and self-reported symptoms. Each has advantages and disadvantages (Table 6).

Table 6

Comparison of WMS Outcome Measures

Measure	Sources	Advantages	Disadvantages
Administrative data	Compensation claims (Shiue et al., 2008); Visits to health units (Gleeson, 2001); 3. Occupational Hospitalization Register (Hannerz et al., 2002)	Exact diagnosis	Data are incomplete: • Not all WMSs are compensable; • Not all WMSs are subject to mandatory reporting or recording; Data are underreported: • Reporting at work is influenced by multiple factors such as culture, job insecurity, and so on (Azaroff et al., 2002; Rosenman et al., 2000); • May exclude cases in the early stages of development of WMSD.
Clinical diagnosis or examination	Palpation and passive, active, and resisted maneuvers (Yuichiro et al., 1998; Hales et al., 1992)	Well defined and objective	1. Diagnostic criteria are not standardized; 2. Interrater reliability problems during diagnostic process; 3. Only a small proportion of WMSDs have morbidity with well-defined and identifiable pathology, such as carpal tunnel syndrome.
Self-reported symptoms	Musculoskeletal discomfort surveys or Nordic	1. Easy to use; 2. Capture impact on the	1. Symptoms may be specific or nonspecific;

	Musculoskeletal Questionnaire (NMQ) (Dempsey & Filiaggi, 2006; Chyuan et al., 2004)	worker more effectively; 3. More informative; 4. Standardized.	2. Symptoms are often intermittent and episodic; 3. Subjective.

Although defining cases based on self-reported symptoms has generated substantial discussion, as shown in Table 6 it is still a major stream of research on WMS. This systematic review of the prevalence of, and risk factors for, WMS in the catering industry shows that the majority of studies use self-reported symptoms, particularly the standardized NMQ, to define potential or developing WMSD cases (Dempsey & Filiaggi, 2006; Chyuan et al., 2004). This is consistent with the long-standing practice of studying chronic pulmonary obstructive disease (COPD) using a standardized questionnaire (Ninot, Soyez, & Préfaut, 2013; Miravitlles et al., 2013; Struik et al., 2013). Not only may self-reported symptoms be more informative, studies using this approach have also found that they are highly correlated with physical findings of WMSD (Baron, Hales, & Hurrell, 1996; Punnett, 1998). Furthermore, there is a strong correspondence between self-reported high symptom prevalence and administrative data such as compensation claims (Silverstein et al., 1997) and visits to medical services because of WMS (Westgaard & Jansen, 1992). Therefore, the use of self-reported symptoms in the study of WMSD remains important and indeed is becoming even more common. A case in this study is therefore defined as someone reporting WMS. Symptoms reported in the fingers, hands, wrists, forearms, elbow, neck, lower back, knee, and ankle areas may be as follows (Hales et al., 1992):

- Pain, aching, stiffness, burning, tingling, or numbness;

- Symptoms lasting more than one week or occurring at least once a month within the past year;
- Symptoms having developed since commencing the current job.
- No previous injury or trauma to the symptomatic area.

Promotion of Safety Behaviors in the Workplace

There is increasing interest in the promotion of safety behaviors for the purposes of injury prevention, given the significant costs associated with the high incidence of WMSD in the workplace. It is known that injuries do not usually occur by chance. Instead, they are the result of a chain of causation involving some kind of maladjustment between the person and their environment and the interaction between a number of contributing factors, whether organizational, psychosocial, and/or physical (Bullock, 2000). Since the 1970s, individual error, misuse or abuse of equipment, carelessness, and negligence have been considered as the most common causes of injury. Accordingly, changing such human actions and improving safety behaviors have been the core components of injury prevention strategies (Barry, 1975). Safety behavior can be interpreted as compliance with safety routines in the workplace or participation in safety activities. For instance, Olsen (2010) defines safety behavior as knowing when to stop working in dangerous situations. Moreover, dimensions of such behavior have been identified including safety culture, the effect of worker experience, judgment and decision-making ability, and behavioral and organizational controls (Kowalski-Trakofler & Barrett, 2007). Obviously, the promotion of safety behaviors is a complicated process which operates in association with different levels of interaction among different actors.

Role of the Government

Safe workplaces are fundamental to the social and economic wellbeing of any nation. To achieve this, it is necessary for governments to take positive measures to improve health and promote a safety-oriented culture in the workplace. Often, an OSH unit, under the management of a labor department, takes responsibility for promoting safety at work. The ultimate goal is to help employers and employees control their risks at work through inspection and enforcement, education and training, and publicity and promotion (Hong Kong Labor Department, 2013).

Different countries and regions have developed their own measures to promote safety. In the US, both NIOSH and OSHA were created by the Occupational Safety and Health Act 1970. NIOSH focuses on research, information, education, and training in OSH, and is part of the US Department of Health and Human Services. OSHA is responsible for developing and enforcing workplace safety and health regulations and operates within the US Department of Labor. In Europe, the European Agency for Safety and Health at Work (EU-OSHA) was established in 1994 by Council Regulation and is an agency of the European Union. EU-OSHA is responsible for collecting, analyzing, and disseminating relevant information to workers who may need OSH services. It has also created and maintains an evidence base for use by policymakers to establish future policies governing OSH. EU-OSHA also publishes a monthly newsletter and update email covering OSH topics, and provides indepth publications such as detailed OSH reports, with the goal of raising safety awareness among workers. In Hong Kong, occupational safety services are provided by occupational safety officers working within the Labor Department (Hong Kong Labor Department, 2013). Their role is to:

- Enforce the OSH ordinance through inspection of workplaces to ensure the requirements of OSH and welfare are complied with;
- Conduct accident investigations and provide advice to both employers and employees on how to eliminate existing workplace hazards;
- Offer free advice to owners in the planning and layout of factories and workplaces;
- Provide support services to disseminate safety concepts and culture to the public and secure commitment to self-regulation in order to facilitate a safety management approach which will be in keeping with the occupational safety charter; and
- Provide training for government and nongovernment personnel in OSH.

As well as the occupational safety services provided by the Hong Kong Labor Department as outlined above, the Occupational Safety and Health Council (OSHC) provides similar services to the public. The OSHC was established by ordinance in 1988 and is a statutory body tasked with promoting safety and health in the workplace and sustaining the workforce of Hong Kong. The OSHC also provides specific occupational services including promoting OSH in the community; providing education and training; consultancy; research and strategy development; information dissemination; and facilitating exchange among government, employers, employees, professionals, and academics (OSHC, 2013).

As part of their OSH promotional activities, some agencies organize a series of schemes or annual awards, particularly in industries with a high prevalence of occupational accidents or WMSD. The annual EU-OSHA conference is held in

October every year and is a particular focus for these events, including a series of training sessions, conferences and workshops, advertising campaigns, and so on. Other highlights include the Healthy Workplaces Good Practice Awards competition, which recognizes organizations that have found innovative ways of promoting safety and health. In Hong Kong, the OSHC recently launched a two-year *Outstanding OSH Restaurant – Pilot Scheme on Catering Safety Accreditation* program. Under the scheme, catering industry employees are eligible to receive training to enhance their safety awareness. OSHC consultants will also visit restaurants to demonstrate good practice and teach OSH knowledge to staff during breaks, and provide free consultations to help restaurants establish a *5S Good Housekeeping Plan* which aims at enhancing safety and cleanliness. Moreover, over the past decade, the Hong Kong Labor Department has also made a significant effort to promote safety behavior in the workplace using various promotional activities. Specifically, it organizes two long-standing annual safety award schemes, one each for the catering and construction industries. The purpose of these schemes is to inculcate a safety culture and to enhance awareness among employers, employees, and families. The schemes feature a variety of activities including organizing safety performance competitions, roving exhibitions, safety quizzes, award presentation ceremonies, fun days, site visits, producing radio programmes and DVD-ROMs, broadcasting *Announcements in the Public Interest,* and screening promotional films on television and radio and on buses.

Role of Organizations

As noted previously, the safety culture of enterprises plays an important role in the government's prevention strategy and efforts to enhance the safety behavior of employers and employees. The term safety culture first appears in the report on the Chernobyl disaster produced by the International Atomic Energy Agency (IAEA) in

1986, which identifies the root cause of the accident as a “poor safety culture” at the plant and in Soviet society generally. Since then, considerable efforts have been made to investigate the concept and delineate the relationship between safety culture and safety behavior. Ostrom et al. (1993) show that safety culture, or the organization’s beliefs and attitudes as manifested in actions, policies, and procedures, affects safety performance. Pidgeon (1991) points out that safety culture is a set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers, and the public to conditions that could be considered dangerous or injurious. Lee (1998) suggests that safety culture is a product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine commitment to, and the style and proficiency of, an organization’s health and safety management. It can be seen that safety culture is characterized as a multidimensional concept. Typically, the key drivers of it in many organizations are regulation, audits, safety training, and various types of exhortations to employees to comply with safety norms. Wills et al. (2006) use hierarchical regression to identify six dimensions (communication and procedures, work pressures, relationships, safety rules, driver training, and management commitment) and investigate their relationships with various aspects of work-related driving. The results indicate that these factors account for significant amounts of the variance in all dimensions. In addition, a metastudy conducted by Flin et al. (2000) shows that five dimensions or themes pervade many of the studies (see Table 7).

Table 7

Dimensions of Safety Culture

Dimension	Explanation
Management	The most recurrent theme, this denotes the commitment of managers or supervisors at different levels toward safety and the link with the organization's goals.
Safety system	Has various aspects, including respondents' views on safety policies, safety equipment, and permit to work systems as well as their opinions of accident and incident reporting.
Risk	Encompasses perceptions and attitudes towards risk and safety, including risk-taking behavior and perceptions of workplace hazards.
Work pressure	Pace and workload are the main concerns in this area, balancing safety with production and cost. This is probably the most well-known component of safety culture.
Competence	Different aspects of the selection and training of the workforce, and the company's assessment of individual competence.

Many safety studies have been conducted with the goal of enhancing safety culture and reducing occupational injuries. Safe work behaviors are best understood as sociocultural phenomena influenced by organizational, psychosocial, and job factors. Enhancing safety culture in hospitals could be crucial in promoting safe work behaviors among healthcare providers and reducing the risk of occupational injury (Smith et al., 2009). A qualitative study conducted by Skoglind-Ohman and Kjellberg

(2011) shows that whether or not home care service personnel used knowledge and skills in transfer techniques in their daily work, safety culture remains one of the most important factors in the use of safe work techniques. Another qualitative study of healthcare workers adopting patient lifting equipment and the shift to a minimal manual lift environment shows that time, knowledge, staffing, patient characteristics, and the organizational and cultural aspects of work are the main factors driving successful adoption (Schoenfisch et al., 2011). Lee et al. (2010) also report that significant factors in adopting safer work behaviors include better safety climate, higher effort-reward imbalance, less overcommitment, greater social support, and day shift work. In a large cross-sectional survey carried out in Australia in 2007 (n=7423), 73% of respondents reported that organizational policies were followed in the event of a sharps injury, including needle stick. Healthcare organizations are responsible for the provision of safe working practices, policies, safe workplace culture, prevention strategies, and appropriate responses when nurses are injured (Kable et al., 2011). Management support for safety, supervisor/manager expectations, and actions promoting safety are the most significant contributors. These variables indirectly enhance safety behavior through transitions and teamwork across and within units, as well as learning, feedback, and improvement (Olsen, 2010). Similarly, perceived commitment to safety among managers is the most robust predictor of occupational injuries (Beus et al., 2010). Nurses working in departments in which health and safety information are readily available are more likely to report any needle stick injury sustained (OR=4.91), and nurses working in departments with minimal conflict are less likely to underreport such events (OR=0.45) (Smith et al., 2009). In another study of a new 11-step employee safety program introduced in a hospital, a 1-year followup showed that the overall incidence of injury claims, lost-time injuries, and needle stick injuries had decreased and the reporting of incidents within 24 hours had increased (Hooper & Charney, 2005).

In addition to the study of safety culture in healthcare, Porru et al. (2011) conducted a longitudinal study of the foundry industry. The intervention focused on safety procedures, education, health surveillance, fitness for work, and first aid. The results show significantly positive changes in safety culture before and after the intervention. Consistent with previous studies, safety training, driver scheduling autonomy, opportunity for safety input, and management commitment to safety have been shown to influence individual perceptions of safety culture, with evidence that implementation results in fewer accidents (Arboleda et al., 2003).

More and more studies now emphasize that management has an impact on workers' safety behavior. Management attitudes and group norms are both direct and indirect predictors of violation behavior (Fogarty & Shaw, 2010). Supportive safety policies and programs should have an impact on organizational commitment, whereas perceived organizational support is predicted, and partially mediated, by the relationship between organizational commitment and safety culture (DeJoy et al., 2010). Managers also play an important role in the promotion of employees' safety behaviors, which is directly influenced by managers' attitudes and behaviors, and the direct development of a safety management system (Fernandex-Muniz et al., 2007). Most often, at the company level, management support and a well-developed health and safety management system will be significantly associated with high compliance among employees. At the worker level, compliance with health and safety routines is significantly associated with both management and social support. It is therefore suggested that in a work environment, changing both individual and contextual factors may increase workers' participation in health and safety activities (Torp & Grogaard, 2009).

As well as organizational support, social support from colleagues or group members is also significant, and has been shown to be significantly correlated with workers' safety behavior. Jiang et al. (2010) show that safety culture is significantly associated with colleagues' perceived safety knowledge/behavior (PCSK/B), with the effect of the latter on injuries being mediated in turn by safety behavior. Management and coworker safety, and the work-safety tension, is significantly associated with safety behavior. Workers with positive views of colleagues' support and behavior were also more positive about workplace safety in this study. Employees who express greater job satisfaction are more compliant with safety management policies and report lower accident rates (Gyekye & Salminen, 2007). One metaanalysis shows that safety knowledge and motivation are related to safety performance behaviors. Group safety perception has the strongest association with accidents and injuries (Christian et al., 2009).

In summary, a large volume of information about safety behavior in the workplace has been disseminated to employers and employees through various channels over a period of several years according to the OSH ordinance. Education and training are the core components of promotional activities. However, challenges remain, since rates of occupational injuries and WMSD are still increasing annually. In today's competitive business environment, building a self-sustaining safety culture is one of the biggest challenges for organizations all over the world (Rao, 2007). Organizational behavior in building a safety culture in the workplace aims at encouraging compliance with safety routines and participation in safety activities, with the goal of reducing occupational injuries. Eventually, building a safety culture in itself is considered to be a mental process influencing workers' safety behavior and safety performance in order to prevent injury. Within this process, beliefs, attitudes, and perceptions are important in determining response to workplace hazards result which may result in occupational injuries and WMSD.

Models of Injury Prevention and Safety Behaviors

Governments and businesses have made extensive efforts to create and promote a safety culture in society and the workplace to improve injury prevention. Nevertheless, simplistic safety campaigns that rely heavily or solely on mass media information like poster displays, training videos, or accident graphics to promote safe behaviors are doomed to fail (Cohen & Colligan, 1997). Traditional strategies to reduce workplace hazards or encourage risk-reducing behaviors include the use of administrative and engineering controls, and personal protective equipment. Nevertheless, the actions and behaviors that workers carry out in the workplace are important components of any injury prevention program (Cohen & Colligan, 1997). Cohen and Colligan (1997) lists eight forms of behavior that affect safety performance in the workplace:

- Proper use and operation of the hazard control systems in place, thus realizing their maximum protective benefit;
- Work habits in performing job tasks, including acts that unnecessarily increase the risk of injury or illness;
- An increased awareness and recognition of workplace hazards;
- Acceptance and use of personal protective equipment;
- Observance of housekeeping and maintenance measures to keep work areas clear of agents that could pose additional risks of illness or injury;

- Following good personal hygiene practices;
- Proper responses to emergency situations;
- Self-monitoring and early recognition of any signs or symptoms of hazardous exposure.

These show that worker involvement and cooperation are essential to workplace injury prevention. Behavioral change is a difficult and complicated process involving the interplay of numerous factors, both internal and external.

As referred to above, a number of behavioral change models have been developed as a basis to understand and modify various health-related behaviors. Table 8 summarizes these models in terms of their theoretical concepts, constructs, and applications.

Table 8

Health-related Behavioral Models

Model	Theoretical Concept	Theoretical Constructs
HBM (Hochbaum, 1958)	Health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to reduce its occurrence.	1. Perceived seriousness; 2. Perceived susceptibility; 3. Perceived benefits; 4. Perceived barriers; 5. Cues to action; 6. Modifying variables; 7. Self-efficacy.
Theory of Reasoned Action (TRA) and TPB (Fishbein, 1967; Ajzen & Fishbein, 1980)	Health behavior is based on the concept of intention (the extent to which someone is ready to engage in a certain behavior or the likelihood that someone will do so).	1. Attitudes; 2. Subjective norms; 3. Behavioral control.
Self-Efficacy Theory (Bandura, 1977, 1994)	Self-efficacy is the belief in one’s own ability to successfully accomplish something. The theory assumes that people will generally only attempt things they believe they can accomplish	1. Mastery experience; 2. Vicarious experience; 3. Verbal persuasion; 4. Somatic and emotional states.

	and will not attempt actions they believe they will fail to complete.	
Attribution Theory (Weiner, 1986)	There is a cause or explanation for things that happen. Success or failure is relative to a specific behavior and the internal factors or external situations that influence the outcome.	1. Locus of control; 2. Stability; 3. Controllability;
Protection Motivation Theory (Rogers, 1975)	Fear has an effect on health-related attitudes and behaviors. This theory explains the cognitive mediation process involved in creating protection motivation in terms of threat and coping appraisals.	1. Threat appraisal; 1.1 Perceived threat; 1.1.1 Severity; 1.1.2 Vulnerability; 1.2 Perceived rewards; 1.2.1 Intrinsic; 1.2.2 Extrinsic; 2. Coping appraisal; 2.1 Perceived efficacy; 2.1.1 Self-efficacy; 2.1.2 Response efficacy; 2.2 Perceived costs; 2.2.1 Response costs.
Transtheoretical Model (Prochaska, DiClemente, & Norcross, 1992)	Behavioral change is a process that occurs in stages, with people moving through these stages in a very specific sequence.	1. Precontemplation; 2. Contemplation; 3. Preparation; 4. Action; 5. Maintenance.
Social Cognitive Theory (SCT; Bandura, 1986)	That people learn by observing others, and the social environment, individual characteristics, and behavior interact and influence each other in this process.	1. Knowledge; 2. Perceived self-efficacy; 3. Outcome expectations; 4. Goal formation; 5. Sociostructural factors.

These models can be further classified into two types, the intrapersonal and interpersonal. At the intrapersonal or individual level, behavioral models typically focus on individual cognitions and corresponding factors such as intention, decision making, knowledge, attitudes, beliefs, past experience, and so on. These models include the HBM and the Transtheoretical, and Protection Motivation Models, as well as the Attribution and Self-Efficacy Theories and the TRA/TPB. Models at the interpersonal level, particularly the SCT, place much emphasis on the multiplicity of complex interactions affecting safety behaviors. Compared with the intrapersonal level, behavior at the social-ecological perspective is viewed as a result of a multitude of social influences, not just personal intentions or attitudes (Nilsen et al., 2008).

What all these models consistently present is the view that behavior is the result of a cognitive process, and one which is often triggered by intentions and attitudes with deliberate planning and information processing. For instance, White et al. (2012) use a questionnaire developed from the TPB to investigate intention to learn the correct safe landing technique among junior community netball players. The results show that players' attitudes and subjective norms were associated with strong intentions to learn the correct technique, with the exception of perceived behavioral control. Similarly, another study of sports injury prevention (Deroche et al., 2009) shows that instrumental attitude and subjective norms make significant contributions to the prediction of intention to wear safety equipment among adult inline skaters. In one study of injury prevention strategies with teenage restaurant workers, the SCT was used to prevent occupational injuries. The key strategy was an innovative collaboration with occupational nurses, business professionals, educators, and government officials to promote injury prevention through classroom safety education and internship skills reinforcement (Ward et al., 2010). Moreover, one study of preventing cycling-related head trauma in children proposes a modification of the HBM by using injury control experts to explain the cognitive, social, and environmental factors that influence preventative health behaviors (Marsh et al., 2000). It incorporates the Theory of Self-Efficacy into the structure of the HBM to address key variables in health-related decision making.

In a review by Trifiletti et al. (2005) of the use of behavioral and social science theories and models in injury prevention research, only the HBM, TRA, and TPB have been used to guide program design and implementation or to develop evaluation measures. Such behaviorally based injury prevention strategies have had only limited success, partly because of the failure to properly apply the models to the design and prediction of the intervention and the explanation of the desired health-related behaviors (Gielen & Sleet, 2003; Liller & Sleet, 2004).

All these models stress that individual cognitions such as attitudes and intentions trigger behavior and hence are important predictors of it. Moreover, behavior is considered as a result of information processing and deliberate planning, or a rational weighing of potential costs and benefits (Edwards, 1954; Lucas & Lloyd, 2005). However, workers rarely weigh up the benefits and costs in such a precise and methodological way before performing work-related tasks because the behaviors in which they engage most frequently are already automatic. Applying such behavioral change models in the workplace to improve safety is unlikely to be effective if these deliberative, unconscious habitual behaviors are not addressed (Bennett et al., 1995).

Other than the health-related models described above, the Workstyle Model (Feuerstein, 1996) was developed as a new concept to explain the occurrence of upper extremity disorders from behavioral, cognitive, and psychological perspectives (see Figure 1). This model proposes that the cognitions, behaviors, and physiological reactivity of a worker performing job tasks in the workplace will cooccur and constitute an individual pattern called a workstyle. This develops through learning and is consolidated or reinforced by experience. It is assumed that a characteristic style or pattern of behaviors and cognitions exists for any given individual which is evoked in response to a set of work demands. Workplace psychosocial stressors (that is, work stress), work demands (such as pace), and ergonomic stressors (such as the height of a workstation) may create a problematic work environment and lead to negative changes in the worker's behavioral, cognitive, and psychological responses. Consequently, he/she may develop symptoms of disorders of the upper extremity, eventually leading to work disability. The model suggests that individual workstyle or the work methods one adopts are the key factors in developing WMS or WMSD. It therefore implies that good working practices and methods can ensure that hazards are contained before they become a problem (Alli, 2008)

Work Behavioral Automaticity

Intention is considered the proximal determinant of behavior in many health-related models, yet the intention-behavior discordance is high (Rhodes, Fiala, & Nasuti, 2012; de Bruijn, Wiedemann, & Rhodes, 2014). In recent years, there has been increasing interest in how habits function to create such discordance, particularly in understanding how habits are acquired and controlled (de Bruijn et al., 2013; de Bruijn, Wiedemann, & Rhodes, 2014; Berplanken, 2006; Hinsz, Nickell, & Part, 2007; Rhodes, Fiala, & Nasuti, 2012; Lally, Wardle, & Gardner, 2011; Neal et al., 2011; Sheeran et al., 2005). In earlier work, habit is defined as a firmly established behavioral pattern marked by increasing automaticity, decreasing awareness, and partial independence from reinforcement (Hunt et al., 1979). Lately, it has been more concisely represented as a form of goal-directed automatic behavior (Aarts & Dijksterhuis, 2000; Bargh, 1989). Habit can also be thought of as a learned sequence of acts that has become an automatic response to specific cues, and which is functional in obtaining certain goals or end states (Verplanken & Aarts, 1999).

Similarly, Orbell and Verplanken (2010) point out that a habit is a behavior that is frequently repeated, has acquired a high degree of automaticity, and is cued in stable contexts. All these definitions simultaneously stress that automaticity is the active component of habit-behavior relationships and is also a key feature of habits themselves (Gardner et al., 2012). Since a habit is a behavior, such a form of behavior is therefore proposed to be a form of automaticity, which is triggered by situational cues and thus can be enacted with little conscious awareness (Orbell & Verplanken, 2010).

Automaticity is a higher cognitive process with widespread application across all domains of psychological research in recent years, particularly in the field of decision making, moral judgment, relationships, emotional processes, facial perception and social judgment, motivation and goal pursuit, conformity and behavioral contagion, embodied cognition, and the emergence of higher level automatic processes in early childhood (Bargh et al., 2012). Although a multitude of views of automaticity has emerged from studies of different topics, suggesting that it is a multidimensional concept, two types of actions consistently emerge, namely voluntary (conscious) or involuntary (unconscious) (Dijksterhuis & Aarts, 2010). The term automaticity can therefore be defined as an automatic psychological process which is involuntary, unconscious, or both (Dijksterhuis, 2013). Moors and de Houwer (2007) propose that automatic processes have five features, namely that they are unintentional, unconscious, uncontrollable, efficient, and fast. Drawing on this, Dijksterhuis and Arts (2010), and Dijksterhuis (2013) proposes two domains for automaticity; whether or not the behavior requires conscious guidance or relies on active goals and if so, whether it is goal directed or merely goal dependent. The latter domain also includes the role of attention, effort, and control, because such behaviors are largely driven by goals. All these concepts of automaticity and its associated domains are underpinned by the evolution of cognitive processes and have mechanism-based features. The process of evolution of automatic psychological processes is often divided into three stages (Carver & Scheier, 2002; Moskowitz, 2001), as summarized in Table 9. This analysis may enable a deeper understanding of the mechanism of human behavior, particularly in the workplace, which may help with the development of prevention strategies for WMS.

Table 9

The Process of Evolving Automaticity

Stage	Content and Interpretation
Initial stage	Emergent bottom-up processes are elicited by stimulus input alone. They require less attention and remain preconscious, and therefore cannot be intentionally controlled (such as stopping, avoiding, altering or engaging in the act) or redeployed in other ways.
Middle stage	The processes become consolidated in memory as recognized by a conscious processor with extensive practice or repetition, which may invoke and adjust them as a guide to behavior.
Established stage	The processes become well established and accurate with more top-down use, to the point where top-down guidance is no longer required and the behaviors drop out of consciousness again.

Conscious and Unconscious Automaticity

Being conscious (or aware) and unconscious (or unaware) are two features of automaticity. In daily life, people routinely do things without being conscious of the reasons for their actions, or even the action itself, even if the behavior is relatively important (Dijksterhuis, 2013). Understanding the conscious and unconscious elements in behavior and decision making could help us to develop a better construction of automaticity itself.

Unconscious activity can be regarded as the implicit repository of an individual's long-term experience. If skills require less and less conscious attention, and are engaged in more frequently and consistently, one can get to a point where no conscious attention at all is required to operate (Bargh & Barndollar, 1996; Atkinson & Shiffrin, 1968; Newell & Rosenbloom, 1981). A skillful pingpong player is an example of such unconscious movement. During a match, all movement is carried out instinctively on the basis of the relevant cues; speed, angle, and the expectation of landing. This is an example of the established stage of the psychological process of automaticity. However, in preconscious automaticity, the mechanisms of behavioral contagion and conformity are triggered by the perception of other people's behavior, and then proceed to mimicry or imitation as increased by self-focus, ingroup membership, need to affiliate, and liking of others (Bargh, 1989; Bargh et al., 2012). Postconscious automaticity, also called goal-dependent higher-level automatic processing, denotes skills and efficient thought processes (in relation to limited attentional capacity or processing resources) that require a goal or intention to engage in them. Over time, such processes can begin to operate very well with less attentional guidance (Bargh, 1989; Bargh et al., 2012). In such goal-dependent automatic processes, decision making often plays an important role to guide the next action.

Traditionally, decision-making processes have been considered as a form of conscious and deliberate thought. However, Dijksterhuis and Nordgren (2006) propose the Unconscious Thought Theory (UTT) which suggests that decisions made unconsciously are superior to those made consciously. The UTT claims that initially, conscious thought is acquired for judging relevant information, and such conscious intention is developed or formed to make a good decision. After that, using the unconscious in decision making leads to better outcomes than conscious deliberation.

Memory, Learning, and Skill Acquisition

According to the SCT, human behavior is to some extent triggered and influenced by social cues in the environment, and automaticity is considered as a learning phenomenon in this context (Cowan, 1995). Attention is also embodied in this learning process. In the early stages of the automatic processing sequence, the preattentive processes are involved, and therefore the behavior cannot be intentionally controlled or employed, or made more efficient in other ways. In the goal-dependent stage, however, the learned automatic processes are those that have become impervious to attentional capacity as a result of practice. Logan (1988) and Anderson (1992) propose that learning mechanisms are therefore dependent on consistent practice. In this learning mechanism, Logan (1988) articulates a theory of automaticity based on the learning of instances. This proposes that there are often two ways of accomplishing a task, namely by applying an algorithm or by retrieval of learned information. Schneider and Detweiler (1988) suggest that repetition increases memory strength rather than the number of instances of memory representation.

Bargh (1996) suggests that skill acquisition is a different type of automatic process from those normally characterized as unintentional, unconscious, uncontrollable, efficient, and fast. Skill acquisition is a form of goal-dependent automaticity in which the automatic processes require a processing goal and a conscious input to trigger the starting point, but once started run autonomously. Examples of this are skilled activities such as going downstairs and knitting (Moors & de Houwer, 2007). Necka (1999) also points out that the automatic processes occur as a function of learning:

> Consecutive learning trials result in two concurrent effects: (a) the transition of cognitive processing from being controlled at the highest conscious level of cognitive organization to a more local level of organization and (b) increased efficiency of response production and performance, understood in terms of speed, accuracy, or both. Consequently, learning permits an investment of attentional resources in other processes that are not yet automatized. As automatization proceeds, these newly automatic processes in turn require less conscious effort, and so on (p. 162).

This highlights the learning and mechanism of memory in such cognitive processing. Some neuroscientists suggest that more research is required to understand the mechanism of brain functions. Since the nineteenth century, it has been reported that long periods of practice gradually make skills reflexive (Sherrington, 1906). This has led to the dominant theory of the twentieth century, namely that novel behaviors require conscious attention and flexible thinking and therefore are dependent on the cortex, whereas automatic behaviors are not mediated primarily by the cortex (Ashby, Turner, & Horvitz, 2010). Initial skill acquisition relies heavily on the striatum, but its activity decreases as the person engages in more training or practice (Ashby & Ennis, 2006; Packard & Knowlton, 2002). The striatum is a major input structure within the basal ganglia consisting of a large collection of subcortical nuclei and is active in "here and now" skills like thinking, learning, and talking (Ashby, Turner, & Horvitz, 2010; Westen, 2002).

In terms of the application of automaticity, the majority of studies focus on activities of daily living such as fruit intake (de Bruijin, Wiedemann, & Rhodes, 2014) and exercise (de Bruijn et al., 2014; Rhodes, Fiala, & Nasuti, 2012). All of them use automaticity or habitual behavior as an independent variable to predict behavior such as action control. They also use health-related models like the TPB as a conceptual framework or use one construct as the dependent variable to examine whether it is predicted by automaticity or habitual behavior. For instance, de Bruijn, Wiedemann, and Rhodes (2014) investigate the relevance of action planning, TPB concepts, and automaticity for fruit intake action control. Rhodes, Fiala, and Nasuti (2012) evaluate automaticity and cross-behavioral regulation as predictors of exercise action control. As things stand, no study has applied the concept of automaticity to the field of prevention strategies for WMS.

The idea of automaticity shifts our attention toward those areas of the environment in which one has considerable experience and familiarity. A given environmental cue can cause a person to behave in a certain way because it has become permanently associated with the cue. Recently, Bargh et al. (2012) raised a question for researchers: "How do automatic processes influence health-related behaviors? Can health-supportive automatic behavioral influences be developed to help improve mental as well as physical health? (p. 602)" These two questions support the importance of understanding automaticity in the context of health-related behavior.

Eventually, it may be assumed that workers generally tend to use their own ways or methods of completing tasks. Such methods could be considered as learning processes or learned work behaviors. During the evolution of cognitive processes, workers may experience a series of steps in which they learn, modify, and adapt cognitive and behavioral processes over time. This could be considered a dynamic decision-making process. When repeated over and over again, the work behavior develops a high degree of automaticity in stable context. It is triggered by situational cues and thus can be enacted with little conscious awareness. If so, when presented with a new work method or injury prevention strategy, the worker may relearn the process but meet with resistance from the previously learned behavior. This may be the reason why workers can understand the importance of OSH or know about many OSH practices but rarely apply them to real work tasks.

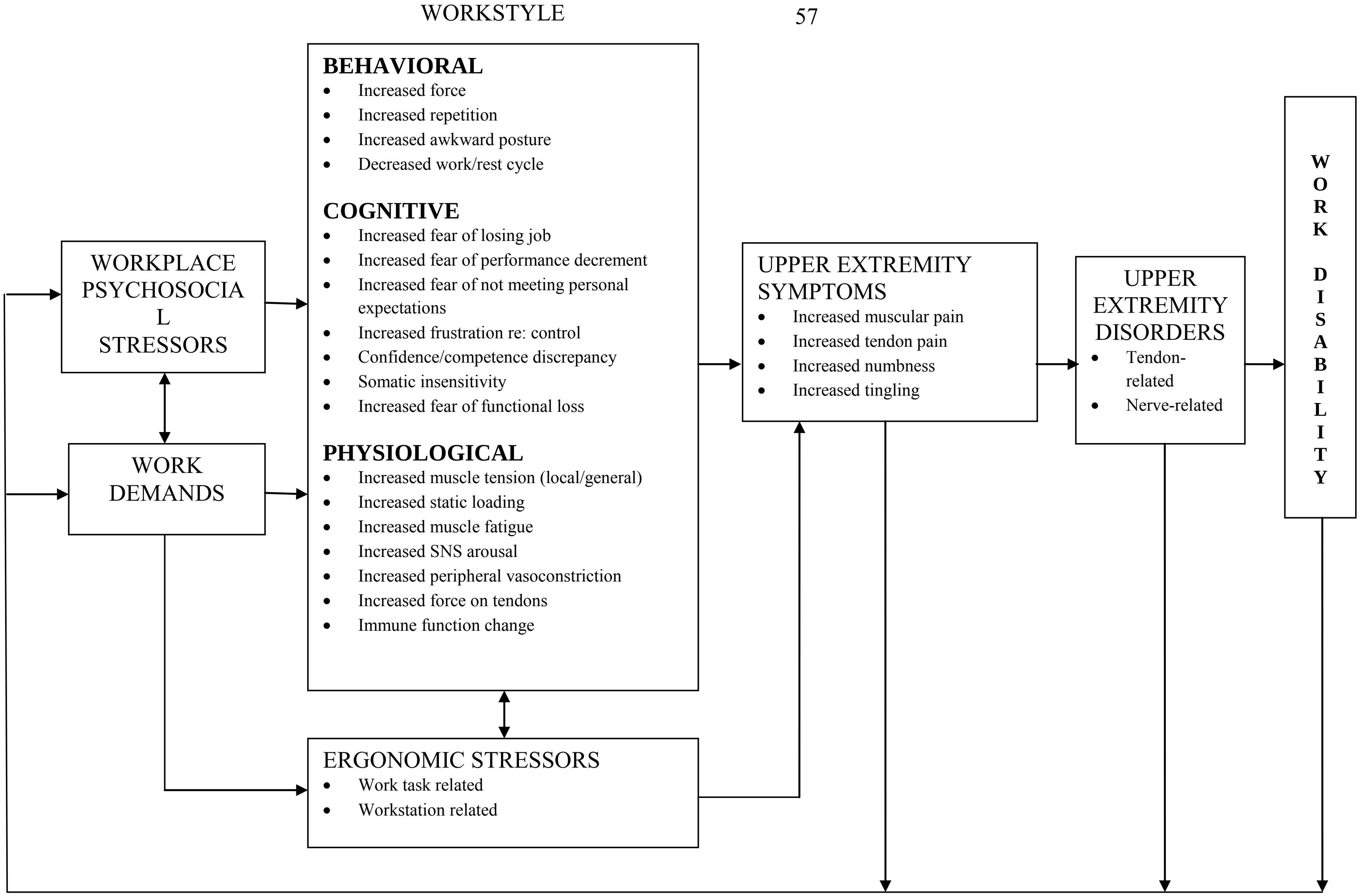


Figure 1. Workplace psychosocial stressors; work demands; workstyle; and upper-extremity symptoms, disorders, and disability. Figure cited with permission from Professor Feuristein.

Chapter III - Study 1: Prevalence of, and Risk Factors for, WMS in the Hong Kong Catering Industry

The literature review presented in the previous chapter has shown that WMS are of serious concern to Western countries not only because of their high prevalence among all occupational injuries, but also the consequences such as compensation costs, lost wages, and lost productivity (National Research Council and the Institute of Medicine, 2001; Bureau of Labor Statistics, 2004; Schneider & Irastorza, 2010). For instance, WMSD led to the loss of seven million workdays, worth about EUR 710 million of enterprises' contributions, in France in 2006 (Schneider & Irastorza, 2010). This situation places substantial financial burdens on individuals and their families, companies, the insurance industry, and society as a whole.

Hong Kong is an international city and like other cities worldwide has suffered from the impact of WMSD. Such disorders have a significant impact on society, particularly in jobs involving strenuous manual handling operations and repetitive movements as found in the social and personal services, wholesale, retail, restaurant, and hotel industries (Hong Kong Labor Department, 2012). As reported in Chapter I, Hong Kong's catering industry employs about 0.27 million workers, accounting for 7% of the total workforce (Hong Kong Census and Statistics, 2013). However, in 2013, a total of 38,207 work-related injury cases were reported, with the catering industry ranking first among all sectors. This situation has led to interest being expressed in how to prevent WMS in the Hong Kong catering industry.

Literature Review

Chapter II has explained in detail the reported causes of WMS and their prevalence in the catering industry using a systematic review methodology. Repetitive manual work, lifting, forceful movements, and awkward posture are well-known risk factors contributing to the development of WMS (Malchaire, Cock, & Vergracht, 2001; Armstrong & Chaffin, 1979; Latko et al., 1999; de Zwart et al., 2001). Posture, force, repetition, and duration are the four main risk factors for kitchen workers (Kuorinka & Forcier, 1995; Hannerz et al., 2002; European Agency for Safety and Health at Work, 2009).

In the catering industry, cooks are at higher risk of developing WMS (Shiue et al., 2008). A retrospective case-control study on a cohort of 52,261 Chinese restaurant cooks in Taiwan reports an annual prevalence of confirmed and diagnosed WMSD of around 25% (Shiue et al., 2008). In the only reported cross-sectional study of the catering industry in Hong Kong so far, Yeung et al. (1997) report that BBQ cooks have the highest prevalence of musculoskeletal discomfort (86%), significantly higher than servers in a Western-style restaurant (42%) (Dempsey & Filiaggi, 2006) and cooks in Japanese nursery schools (11.5%) (Yuichiro et al., 1998).

This chapter will not repeat the findings of the systematic review of the prevalence of, and risk factors for, WMS in the catering industry. It is sufficient to note that very little research on this topic has been conducted in the Hong Kong catering industry even though it is known to have high accident rates and to put workers at risk of several causes of occupational injuries. This chapter aims to identify which job position has the highest prevalence of WMS and why, so as to identify areas which might require indepth ergonomic analysis in future study.

Method

Research Design

Study 1 was a territorywide survey using a cross-sectional design. It adopted the techniques and procedures for data collection and analysis set out by Chyuan, Li and Sung (2005) and Chyuan, Ho and Sung (2005). Cross-sectional studies are used more often than longitudinal because of their efficiency (Portney & Watkins, 2009). Such a design is not threatened by testing or history effects because subjects are tested only once, all at the same time. For these and other reasons, 75% of the studies identified in the previous chapter adopted this approach. Even though cross-sectional studies cannot identify causal relationships between risk factors and WMS, they can provide valuable information for use in developing a longitudinal study to explore these links further.

Participants

The population for the survey was identified using a datafile provided by the Hong Kong Census and Statistics Department which included information about all restaurants registered as of the second quarter in 2009 (such as Chinese and non-Chinese restaurants, fast food cafes (not including takeaways), and Hong Kong-style tea cafes).

Measures

To identify the prevalence of WMS in the catering industry as well as the relationship between WMS and work factors, the questionnaire had to address three themes. The first part collected demographic information about the respondents, the second surveyed their WMS (if any), and the third collected data on work factors.

The demographic characteristics covered in the first part were gender, age, weight, height, dominant hand, work experience, monthly income, and education level.

For part two, the NMQ was adopted, for the following reasons. Firstly, it was developed from a project funded by the Nordic Council of Ministers in 1987 for the purpose of developing and testing a standardized questionnaire methodology allowing comparison of lower back, neck, shoulder, and general musculoskeletal complaints for use in epidemiological studies (Kuorinka et al., 1987). This is exactly the same purpose as this study. The NMQ contains two sections. The first comprises 40 forced-choice items to identify areas of the body with musculoskeletal problems, with a body map provided to assist completion. Respondents are asked if they have had any musculoskeletal trouble in the last 12 months and last 7 days which has prevented normal activity. The second section contains additional questions relating to the neck, shoulders, and lower back to obtain further detail on any relevant issues. Twenty-five forced-choice questions cover any accidents affecting each area, functional impact at home and work (such as change of job or duties), duration of the problem, assessment by a health professional, and musculoskeletal problems in the last seven days.

Secondly, the NMQ has been shown to be replicable, sensitive, and useful as a screening and surveillance tool (Dickinson et al., 1992). Thirdly, it has been applied to a wide range of occupational groups to evaluate WMS, including computer and call center workers (Bergqvist et al., 1995; Cook et al., 2000), car drivers (Porter & Gyi , 2002), coopers in the whisky industry (Macdonald & Waclawski, 2006), nurses (Smith et al., 2004), forestry workers (Hagen et al., 1998), and catering workers (Chyuan et al., 2002; Chyuan, Li, & Sung, 2005). Hence, the NMQ satisfied all the requirements of a measure for use in this cross-sectional, territorywide survey.

Part three of the survey concerned work factors. Two similar studies by Chyuan et al. (2002) and Chyuan, Li and Sung (2005) conducted in Taiwan used a questionnaire with the same structure (demographic items, NMQ, and work factors) to survey the prevalence of WMS in two samples drawn from the catering industry (905 food-service workers from 24 hotel restaurants, and 328 banquet servers serving Chinese cuisine). Their tests of validity and reliability show that the questionnaire was valid and replicable.

Since the research area of this study is the same as that of Chyuan et al. (2002) and Chyuan, Li and Sung (2005), their questionnaire was adopted after obtaining consent. However, some items were modified to enhance their local relevance and representativeness, and others added to measure WMSD. A content validity analysis of the modified questionnaire was therefore conducted. An expert panel, which consisted of one OSH professional and one occupational therapist (both with Masters' degrees and more than seven years' experience in ergonomic evaluation), one member of the catering labor union, and two Chinese restaurant cooks (all with nine or more years of formal education and more than thirty combined years of experience in the catering industry) was formed. A guided review questionnaire was developed and sent to them with the original questionnaire after consent had been obtained. New items such as including the elbow in the body site section, plus other including the width of the aisle, work shifts, working speed, use of a vibration tool, environment (such as freezing or hot), and work injury were added. Likewise, some items were eliminated or modified to measure work factors. For instance, two items 低頭彎頸屈身操作職務 (handling tasks with neck flexion) and 持續搬抬重物達 1 分鐘以上 (continue lifting heavy objects for more than a minute) were eliminated because these tasks would be unusual or infrequent in the catering industry. Other items, such as 手腕持續旋轉搓繞 (repeatedly wrist twisting), 用手指反覆撿取細小物品 (repeatedly picking up small objects with the fingers) were changed to 手腕持續旋轉 (repeatedly rotating the wrist) and 用手指反覆製作物品 (repeatedly making products with the fingers). Some new items were added, such as 彎腰伸手向前拿取物品 (reaching for objects with the back forward), 雙手持物向前推 (pushing with both hands), and so on.

After the panel had completed its review, all its findings were considered by the researcher. Most of the modifications proposed by the expert panel were adopted with the exception of items dealing with the environment (freezing or hot) and work injury information. The reason these items were removed is because they are not related to the causes of WMSD and would have added length to the questionnaire, putting the response rate at risk. It was also considered too sensitive to include questions relating to injury at work and compensation, which might have encouraged respondents to overstate their WMS and lead to speculation about the research from the restaurants' human resource staff and owners.

Content Validity: Relevance and Representativeness

Since the questionnaire had been amended, another two groups of experts were then invited to rate the relevance and representativeness of the new items. One panel consisted of healthcare professionals, who were invited to rate the content validity of part two (items on WMS) and the other comprised workers in the catering industry who were asked to look at the content validity of part three (work factors). Table 10 summarizes the demographic characteristics of the panelists.

Table 10

Demographic Characteristics of the Expert Validation Panels

Expert panel	N	Age (yrs)	Members	Work Experience (yrs)
Healthcare professionals	7	34.0±7.7	3 occupational therapists; 2 physical therapists; 2 physicians.	11.1±7.4
Workers in catering industry	7	49.6±5.7yrs	2 cooks; 1 waitress; 4 restaurant managers.	24.0±8.9

After obtaining consent, a semistructured questionnaire was sent to all members of both panels by email or post. Responses to each item were collected using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Space was provided for them to add further comments. When the completed surveys were returned, the mode of the rating score and the Content Validity Index (CVI) were used to calculate the percentage of agreement or disagreement (Lynn, 1986; Waltz, Strickland, & Lenz, 1991).

The CVI of the relevance and representativeness of the items and domains ranged from 0.86 to 1.00, with the exception of two items in the work factors section; vibration (CVI=0.71) and job shift (CVI=0.43). The explanation from the experts was that because vibrating apparatus is fitted with a supplementary component to prevent injury, the worker does not need to come into contact with it when it is running. Another debate focused on whether day or night shifts are more characteristic of the catering industry in Hong Kong and its potential to cause WMS. Eighty percent of the experts disagreed. As a result, a revised questionnaire was produced (see Appendix 2). For more details of the content validity ratings, see Appendix 3.

Pilot Study

A pilot study was then conducted to test the administrative and data collection processes. A total of 165 questionnaires were disseminated to 4 catering firms identified through personal networks. A brief introduction regarding the purpose of the current project and the explanation of each item were presented to the supervisors for data collection. Two weeks were allowed for completion and collection of the questionnaires, based on the comments from restaurant staff. Table 11 summarizes the characteristics of the restaurants and the distribution of questionnaires.

Table 11

Characteristics of Pilot Study Restaurants and Survey Distribution

Order	Type of Restaurant	Number of Questionnaires Issued	Number of Questionnaires Returned	Response Rate
1	Fast food, Chinese restaurant, Western restaurant	100	9	9%
2	Fast food	35	31	89%
3	Chinese restaurant	25	19	76%
4	Japanese restaurant	5	5	100%

A total of 64 completed questionnaires was returned, giving an overall response rate of 38.8%. The low rate from the first caterer was due to only one manager being initially involved in distribution to all three restaurants. When only nine surveys had been returned after two weeks, the manager said he did not know if staff in the other two restaurants had completed their questionnaires. In addition, according to the feedback from all the managers who took part in the pilot, all the questionnaires had been disseminated to employees after work, so the majority had taken them home and then returned them a few days later. This could have been the reason why there was a low response rate and around 10% of missing data. At the item level, no further suggestions were made by these managers.

Sample Size Calculation

According to the annual reports of the Hong Kong Census and Statistics Department in Hong Kong, around 200,000 employees work in the catering industry. This is the study population and clearly, not every individual in that group could be realistically surveyed. Accordingly, two methods were used to calculate the sample size, one based on similar previous research and the other using a professional software calculation method (PASS 2008). The systematic review of prevalence reported in Chapter II shows that cross-sectional studies in the US, Finland, and Taiwan, and previous studies by the Hong Kong Occupational Safety and Health Council (2000-2001), all employ a maximum sample size of 905. Meanwhile, the results from PASS 2008, with alpha 0.05, power 0.8, and OR 1.5 (p1=0.5; p1=0.4, p denotes prevalence, with values obtained from a previous study), indicated the required sample size was 198 for each job title in the catering industry. According to feedback from the catering labor union, there are 10 main job titles in the Hong Kong catering industry (such as chef, kitchen assistant, waiter, and so on). A sample of 2000 would therefore meet the first criterion for representativeness.

Procedures and Data Collection

The purpose of this study was to survey the prevalence of, and risk factors for, WMS among employees in the Hong Kong catering industry. It also set out to identify which restaurant sector (such as Western or Chinese) and job titles might be worthy of indepth ergonomic analysis in future studies, by comparing prevalence rates across these categories. Two methods were considered hierarchically in the data collection process so that the sample would meet the assumption of representativeness.

Method one: random sampling. A disproportional sampling method was used to recruit participants from the catering industry to meet the other criterion for representativeness, namely random sampling (see Table 12). Firstly, the data file provided by the Hong Kong Census and Statistics Department and referred to earlier was used as a source. This file contains four types of information (registration code, employment size class with corresponding number of persons employed, style of restaurant, and address). Secondly, as the number of employees varied from 1-4 to over 100, disproportionate sampling was required. Having concluded that a final sample of 2000 would be reasonable, the anticipated response rate also required to be taken into consideration. With reference to the pilot study, it was assumed that a 30% response rate was feasible. If so, then it would be necessary to distribute the surveys to around 6700 participants. Thirdly, it was necessary to calculate how to distribute this sample across the restaurants in each size category. Using Microsoft Excel's random number generating function and sorting the results by ascending order, a hierarchy from 1^{st}-67^{th} in the small-sized group (having 20-49 employees), 1^{st}-29^{th} in the medium group (50-59) and 1^{st}-5^{th} in the large group (100 or more staff) was randomly selected. Finally, all 101 randomly selected restaurants were sent an invitation to take part in the study with a response form and prepaid reply envelope enclosed. Moreover, to engage the interest of respondents, and demonstrate how simple it would be to take part in the project, a copy of the study questionnaire was also sent to all the restaurants.

Table 12

Calculation of Sample

	Small (20-49)*	Medium (50-99)*	Large (>100)*
Number of restaurants in category	246	107	35**
Average number of employees	(20+49)/2=34.5	(50+99)/2=74.5	
Estimated total number of employees	246*34.5=8487	107*74.5=7972	24*150+4*250+2*350+2*450+550+650+750=8200
Total number of employees in sample	8487+7972+8200=24659		
% of total employees in category	8487/24659 =34.4%	7972/24659 =32.3%	8487/24659 =33.3%
Expected sample size from each category	6700*34.4 =2305	6700*32.3 =2164	6700*33.3 =2231
Number of restaurants in each category to be contacted	2305/34.5 =67	2164/74.5 =29	2231/450 =5
Total number of restaurants to be contacted	101		

* denotes number of employees
** The 35 in this category comprised 24 restaurants with 100-199 staff; 4 with 200-299; 2 with 300-399; 2 with 400-499; and 1 each with 500-599, 600-699, and 700-799 employees.

Unfortunately, after 2 weeks, only 5 restaurants (all large Chinese restaurants with about 100 employees) had indicated an intention to participate, giving a response rate of 5% (see Table 13). The other seven (2 Chinese, 1 Western restaurant, 1 fast food, 3 cafés) were contacted again to check that they had received the invitation. Staff in all these establishments declined to take part on the basis of comments such as “please wait for our reply,” “the manager is not here,” “I am too busy and do not have time to talk with you,” and so on.

Table 13

First and Second Round Sampling Results

	Number	
	Trial One	Trial Two
Total number of invitation letters sent	101	285
Returned by the Post Office	9	24
Telephone feedback from restaurants	3	5
Written feedback from restaurants	1	4
Faxed feedback from restaurants	0	1
Final participating restaurants*	5	7
Response rate	5%	2.5%

*One participating restaurant was a group containing four branches, all of whom were willing to join the project after negotiation.

This response rate was not as good as expected. It was inferred that this was due to the timing of sending out the invitation letters (24 January 2010), as this date is very close to the Chinese Lunar New Year which is a busy period for the catering industry. This may have reduced employers' motivation to take part. Accordingly, a second round of sampling was implemented after the New Year had ended, on 8 May 2010. A similar method was used, but this time the inclusion criterion was set as having more than 20 employees. This was based on a similar study by OSHC in Hong Kong which found that if there were fewer staff than this, there was a higher chance that the restaurant would actually have closed down or moved, resulting in a lower response rate. Therefore, according to the datafile provided by the Hong Kong Census and Statistics Department, 388 restaurants matched this inclusion criterion. Once the 101 restaurants already used in the first round of sampling were removed, 287 remained. Two restaurants' address codes were unreadable, so a total of 285 invitation letters with stamped return envelopes was sent out. After two weeks, only seven restaurants (three Japanese, three bars, and one Chinese) had confirmed that they would take part, giving a response rate of 2.5%, similar to the first round. More details are shown in Table 13.

Method two: convenience sampling. Because of the poor response to the random sampling method, convenience sampling was also used by means of calling different restaurants, seeking help from the labor unions, and using personal networks. A total of 10 labor unions operating in the catering industry were contacted by telephone or in person to seek their assistance with data collection. However, only two were interested in joining the project, namely The Federation of Hong Kong Food and Beverage Industries Trade Unions and the Eating Establishment Employees' General Union. This gave a response rate for this subgroup of 20%. The first union has eight sublabor unions and the second has five. The data collection was managed by the unions at their monthly meeting. In order to ensure reliability of the administration of the survey and encourage a high response rate, the researcher attended the meeting to give a brief introduction to the study and an explanation of the questionnaire, and then fixed a time for data collection. During this period, the researcher kept in touch with the union staff responsible for the survey through phone and text messaging.

Statistical Analysis

A descriptive analysis was then performed to analyze the demographic and work-related characteristics of the sample, and their reported WMS. The prevalence rate of WMS was reported as a percentage. Two-way analysis of variance (ANOVA) was used to analyze differences between pain intensity, prevalence, and frequency of movements. A hierarchical multiple linear regression was then constructed to explore the risk factors affecting frequency of body movement, pain location, and intensity.

The controlling independent variables were age, gender, working hours per day, working days per week, and years in the current job.

Results

A total of 902 completed questionnaires were collected, 53% of which came from the labor unions (Chinese restaurants). The response rate within subsamples ranged from 28.9% to 95.0%, much higher than for the disproportionate random sampling. Table 14 sets out the sources of data in detail. The geographical distribution of participants (see Table 15) was 17.1% from Hong Kong Island, 55.4% from Kowloon, and 21.6% from New Territory.

Table 14

Sources and Classification of the Returned Questionnaires

	Number (%)	Questionnaires Issued	Response Rate
Pilot study	84 (9.3%)	165	51.0%
The Federation of Hong Kong Food and Beverage Industries Trade Unions	189 (21.0%)	500	37.8%
Eating Establishment Employees' General Union	289 (32.0%)	1000	28.9%
Chinese Restaurants (4)	173 (19.2%)	320	54.1%
Japanese Restaurants (3)	65 (7.2%)	70	86.7%
Bars (3)	57 (6.3%)	60	95.0%
Seafood Restaurant (1)	25 (2.8%)	80	31.2%
Western-style Fast Food Restaurant (1)	20 (2.2%)	22	90.9%

Table 15

Locations of Participants

Location	Number	Percentage
Hong Kong Island	154	17.1
Kowloon	500	55.4
New Territory	195	21.6

Demographic Characteristics

As shown in Table 16, 55.1% of respondents (n=497) were male and 41.5% (n=374) female. The average age was 38.03 (S.D=11.51), but around 23.8% were over 45. In terms of education, 89.3% had completed schooling to level F5 or less. As for work location, 59.6% (n=538) worked in Chinese restaurants, 18% (n=162) in Western, and 22% (n=202) in other types of establishment.

Table 16

Demographic Characteristics and Work Profile of Participants

	Total N = 902		Chinese N = 538		Western N = 162		Other N = 177	
	n	%	*n*	%	*n*	%	*n*	%
Job title								
Kitchen staff	97	10.7	228	44.6	57	35.8	61	35.9
Floor service staff	249	27.5	214	41.9	79	49.7	37	21.8
Other	61	6.7	69	13.5	23	14.5	72	42.4
Gender								
Male	497	55.1	361	88.7	6	14.6	128	28.0
Female	374	41.5	46	11.3	35	85.4	329	72.0
Age								
< 25	93	10.3	15	4.2	45	30.2	32	21.1
25-29	71	7.9	22	6.1	34	22.8	15	9.9
30-34	99	11.0	50	13.9	29	19.5	16	10.5
35-39	105	11.6	79	22.0	14	9.4	10	6.6
40-44	99	11.0	67	18.7	7	4.7	22	14.5
$\geq$ 45	215	23.8	126	35.1	20	13.4	57	37.5
$\overline{X}$ (SD) [1]	38.03(11.51)		40.09(10.26)		31.19(10.76)		37.39(12.73)	
Education level								
Primary 6 or below	150	16.6	99	20.3	8	5.5	40	23.0
F1-F3	322	35.7	231	47.4	28	19.3	51	29.3
F4-F5	267	29.6	123	25.3	63	43.4	76	43.7
F6-F7	58	6.4	25	5.1	25	17.2	6	3.4

Diploma	23	2.5	5	1.0	17	11.7	1	0.6
Bachelor degree or above	8	0.9	4	0.8	4	2.8	0	0
Months of current work experience								
＜6	82	9.1	25	5.3	23	14.9	32	19.4
6 - ＜12	57	6.3	27	5.7	16	10.4	14	8.5
12 - ＜24	65	7.2	39	8.3	17	11.0	9	5.5
24 - ＜36	83	9.2	44	9.4	16	10.4	22	13.3
36 - ＜48	68	7.5	36	7.7	16	10.4	15	9.1
48 - ＜60	59	6.5	34	7.2	9	5.8	13	7.9
$\geq$ 60	395	43.8	265	56.4	57	37.0	60	36.4
$\overline{X}$ （SD）	107.26(115.85)		124.56(121.76)		76.60(92.56)		76.84(93.96)	
Working hours/day								
$\overline{X}$ （SD）	10.26(1.76)		10.70(1.84)		9.52(1.04)		9.61(1.60)	
Working days/week								
$\overline{X}$ （SD）	5.79(0.96)		5.79(1.07)		5.87(0.7)		5.77(0.67)	
Daily break arrangement?								
Yes	514	57.0	264	57.5	137	86.2	99	58.6
No	292	32.4	192	41.8	22	13.8	70	41.4
Frequency of exercise（times/month）								
0	300	33.3	182	39.7	47	29.7	65	37.6
1-3	427	47.4	236	51.5	80	50.6	101	58.4
≧4	78	8.6	35	7.6	31	19.6	7	4.0

Work Profile

The majority of the participants had been in their current role for around four years. Among the Chinese restaurant workers, 56.4% (n=265) had been in the same job for more than five years. Generally, across all restaurant types, the average working day lasted about 10 hours for 6 days a week. In terms of breaks, 57.5%, 86.2%, and 58.6% in Chinese, Western, and other types of restaurant, respectively, had arrangements to take breaks during the working day. The data also showed that staff in the catering industry generally do not take much exercise, with over 90% of participants doing so only occasionally (1-3 times a month).

Prevalence of WMS

The purpose of this aspect of the analysis was to identify which job role in which type of restaurant was associated with the highest prevalence of WMS. This would enable future interventions to target this work type as well as providing insights into ergonomic workplace assessments. Prevalence refers here to the number of cases of WMS at the time of data collection (Checkoway, 2004).

Initially, the restaurants were divided into three groups to screen for the overall prevalence of WMS; group one was Chinese, group two Western, and group three other restaurants. Secondly, within each group, job titles were categorized into three subgroups; kitchen staff (senior chef, chef, *dim sum* chef, BBQ chef, and kitchen assistant); floor services (floor manager, floor foreman, and waiter/waitress); and other (dishwasher, cleaner, cashier, and so on). The prevalence of WMS could then be assessed by both restaurant type and job title. A further comparison at the job level was performed if the difference in prevalence was not distinct, using the analysis of pain intensity in different body parts.

In general, the prevalence of WMS among the 902 participants ranged from 11.6% (forearm) to 63.3% (lower back), with an intensity of around 5.0 (Visual Analogue Scale 0-10, with a higher score indicating greater intensity). However, in terms of the classification described above, the highest prevalence of WMS was 63.3% (n=50, lower back) in the floor services staff of the Western restaurant, followed by 62.3% (n=142, shoulder), for the kitchen staff of Chinese restaurants. Since the difference between these two groups was only 1%, the corresponding pain intensity was also analyzed in order to compare them more closely. The lower back pain intensity for the floor services staff in the Western restaurant was 5.36±2.15, which was similar to the shoulder pain intensity for the kitchen staff of the Chinese restaurant (5.32±2.29). More details can be found in Tables 17 and 18. To identify precisely which job title was associated with the highest prevalence of WMS among these two staff subgroups, the analysis then looked at prevalence in terms of job title (that is, specific role rather than staff subgroup). The results indicated that in Chinese restaurants, the prevalence rate of shoulder pain was 71.7%, 69.8%, 68.8%, and 54.6% for senior chefs, *dim sum* chefs, BBQ chefs, and chefs, respectively. There was also a 62.5% prevalence rate for finger or wrist pain among kitchen assistants. In contrast, lower prevalence was found in the Western restaurant, with only 63.5%, 60%, and 58.8% for the shoulder and as 60% for the lower back. More details can be found in Table 19.

Table 17

Prevalence Rates for Different Body Parts by Restaurant Type

Body Part	Prevalence of WMS																	
	Chinese Restaurant						Western Restaurant						Other Restaurant					
	Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Neck	110	48.2	100	46.7	25	36.2	26	45.6	40	50.6	7	30.4	26	42.6	16	43.2	32	44.4
Shoulder	142	62.3	97	45.3	30	43.5	30	52.6	49	62.0	12	52.2	32	52.5	21	56.8	39	54.2
Upper arm	99	43.4	61	28.5	12	17.4	22	38.6	26	32.9	5	21.7	25	41.0	14	37.8	22	30.6
Elbow	109	47.8	54	25.2	11	15.9	20	35.1	15	19.0	3	13.0	33	54.1	11	29.7	23	31.9
Forearm	79	34.6	46	21.5	8	11.6	18	31.6	20	25.3	3	13.0	16	26.2	12	32.4	24	33.3
Finger or wrist	131	57.5	76	35.5	18	26.1	20	35.1	31	39.2	4	17.4	32	52.5	14	37.8	40	55.6
Upper back	84	36.8	69	32.2	13	18.8	21	36.8	34	43.0	8	34.8	14	23.0	11	29.7	23	31.9
Lower back	94	41.2	95	44.4	24	34.8	24	42.1	50	63.3	9	39.1	20	32.8	12	32.4	27	37.5
Thigh	72	31.6	70	32.7	9	13.0	19	33.3	29	36.7	3	13.0	17	27.9	13	35.1	15	20.8
Knee	85	37.3	71	33.2	18	26.1	16	28.1	29	36.7	5	21.7	16	26.2	11	29.7	15	20.8
Leg	113	49.6	108	50.5	17	24.6	22	38.6	42	53.2	5	21.7	23	37.7	18	48.6	23	31.9
Ankle	95	41.7	97	15.3	22	31.9	19	33.3	40	50.6	5	21.7	12	19.7	12	32.4	21	29.2

Table 18

Pain Intensity in Different Body Parts by Restaurant Type

Body Part	Pain intensity of WMS																		
	Chinese Restaurant						Western Restaurant						Other Restaurant						
	Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others		
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*D*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	*P**
Neck	5.06	2.19	4.38	2.29	5.17	2.57	4.95	2.34	4.47	1.78	3.29	1.25	5.72	2.56	3.81	1.42	3.93	1.91	0.002
Shoulder	5.32	2.29	4.74	1.92	5.41	2.56	5.20	2.25	4.86	2.10	3.73	1.68	5.87	2.25	4.16	1.57	4.22	2.15	0.002
Upper arm	5.31	2.46	4.94	2.41	6.25	2.93	5.00	2.50	4.54	2.15	4.00	3.00	6.29	2.20	3.86	1.99	5.00	1.97	0.022
Elbow	5.52	2.46	4.72	2.17	7.11	2.20	5.65	2.25	4.07	2.13	5.67	3.21	6.06	2.12	4.09	2.07	4.77	1.72	0.001
Forearm	5.68	2.49	4.14	1.72	6.13	2.70	5.50	2.17	4.95	2.30	5.33	2.52	6.50	2.07	3.18	1.60	4.74	1.86	<0.01
Finger or wrist	5.21	2.32	4.43	2.04	5.13	2.68	6.18	2.14	5.21	2.53	2.25	1.26	5.84	2.37	4.50	1.88	4.61	1.91	<0.01
Upper back	5.85	2.55	4.74	2.07	6.75	2.01	5.11	2.20	5.16	1.90	3.67	1.86	6.62	2.50	3.64	2.01	4.64	2.24	<0.01
Lower back	6.00	2.67	4.97	2.36	6.87	2.32	5.45	2.39	5.36	2.15	4.38	2.26	7.05	2.44	4.25	1.91	4.50	2.20	<0.01
Thigh	5.41	2.37	5.27	2.41	4.88	2.75	5.86	2.39	5.44	1.89	4.00	2.65	6.13	2.20	4.08	2.50	3.73	1.71	0.017
Knee	5.97	2.49	5.20	2.28	5.41	2.55	5.46	2.70	5.27	2.13	5.20	2.59	6.25	2.34	4.82	2.23	4.00	1.75	>0.05
Leg	5.05	2.30	5.26	2.45	5.44	2.16	5.76	2.50	5.78	2.15	4.00	2.34	6.48	2.38	3.94	1.89	4.23	1.63	0.017
Ankle	5.53	2.57	5.46	2.44	5.00	2.55	5.38	2.45	5.66	2.34	5.25	2.22	6.33	2.39	4.17	2.12	4.50	1.99	>0.05

*Two-way ANOVA, the p level is mainly presented for the main effect of type of job level.

Table 19

Prevalence Rates for Different Job Titles by Restaurant Type

Body Part	Prevalence of WMS															
	Chinese Restaurant										Western Restaurant					
	Senior Chef		Chef		*Dim sum* Chef		BBQ Chef		Kitchen assistant		Floor manager		Floor foreman		Waiter/Waitress	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Neck	32	60.4	37	38.1	28	60.9	7	43.8	6	37.5	9	52.9	4	40.0	27	51.9
Shoulder	38	71.7	53	54.6	32	69.6	11	68.8	8	50.0	10	58.8	6	60.0	33	63.5
Upper arm	28	52.8	30	30.9	25	54.3	8	50.0	8	50.0	3	17.6	2	20.0	21	40.4
Elbow	31	58.5	39	40.2	23	50.0	10	62.5	6	37.5	1	5.9	4	40.0	10	19.2
Forearm	23	43.4	22	22.7	21	45.7	8	50.0	5	31.3	3	17.6	2	20.0	15	28.8
Finger or wrist	29	54.7	56	57.7	26	56.5	10	62.5	10	62.5	5	29.4	5	50.0	21	40.4
Upper back	23	43.4	27	27.8	20	43.5	7	43.8	7	43.8	5	29.4	4	40.0	25	48.1
Lower back	23	43.4	32	33.0	20	43.5	10	62.5	9	56.3	9	52.9	6	60.0	20	38.5
Thigh	18	34.0	25	25.8	17	37.0	7	43.8	5	31.3	4	23.5	5	50.0	20	38.5
Knee	24	45.3	25	25.8	21	45.7	9	56.3	6	37.5	6	35.3	5	50.0	18	34.6
Leg	25	47.2	47	48.5	24	52.2	9	56.3	8	50.0	7	41.2	5	50.0	30	57.7
Ankle	31	58.5	29	29.9	21	45.7	8	50.0	6	37.5	6	35.3	5	50.0	29	55.8

Two-way ANOVA was then used to analyze differences in pain intensity across the 12 included body parts by restaurant and job title. There were statistically significant differences at the $p<0.05$ level in the pain intensity scores by job title for the neck [$F(2,522)=46.25$, $p<0.01$], shoulder [$F(2,379)=6.10$, $p=0.002$], upper arm [$F(2,242)=3.88$, $p=0.022$], elbow [$F(2,237)=6.95$, $p=0.001$], forearm [$F(2,189)=10.03$, $p<0.01$], finger or wrist [$F(2,310)=7.82$, $p<0.01$], upper back [$F(2,233)=5.71$, $p=0.004$], lower back [$F(2,303)=5.98$, $p=0.003$], thigh [$F(2,204)=4.14$, $p=0.017$], and leg [$F(2,316)=4.11$, $p=0.017$]. In terms of restaurant type, the main effect was found in the upper back [$F(2,233)=3.77$, $p=0.025$] and lower back [$F(2,303)=3.05$, $p=0.049$]. An interaction effect was also found for the upper back [$F(4,233)=3.83$, $p=0.005$], lower back [$F(4,303)=4.80$, $p=0.001$], and leg [$F(4,316)=3.99$, $p=0.004$].

To tackle the problem of the interaction influencing the main effect, the sample was separated by restaurant type and the analyses repeated for each job category. The results of a one-way ANOVA showed that there was a significant difference in upper back pain between Chinese restaurant workers [$F(2,138)=5.60$, $p=0.005$] and those in other types of establishment [$F(2,43)=5.57$, $p=0.007$]. The same was found for the lower back, with the corresponding figures for the Chinese restaurant being $F(2,182)=6.42$, $p=0.002$ and for other types $F(2,54)=8.90$, $p<0.01$. For leg pain, there was a significant difference between job titles within the classification of other restaurant type [$F(2,58)=9.90$, $p<0.01$]. These results showed that the majority of kitchen workers had statistically higher levels of pain intensity than the other two groups. In terms of the severity of WMS, the results also indicated that in Chinese restaurants, 38.6%, 22.9%, and 24.6% of participants in the kitchen, floor services, and other positions groups, respectively, who reported WMS had sought medical treatment during the 12 months prior to survey. In the Western restaurant, the equivalent figures were was 22.8%, 24.1%, and 13% and for the other types 34.4%, 29.7%, and 23.6%. These results further confirmed the severity of WMS among kitchen workers in Chinese restaurants.

In conclusion, the highest prevalence of WMS among workers in the catering industry in Hong Kong was found among senior chefs (71.7%), *dim sum* chefs (69.6%), and BBQ chefs (68.8%) in Chinese restaurants. The reported pain intensity among these three groups was 5.39±2.16, 6.08±2.31 and 5.78±2.82, respectively (see Table 20). Staff in kitchens experienced more pain than those who worked in floor and other roles. Consistently; the most affected body part was the shoulder.

Table 20

Pain Intensity by Job Title and Restaurant Type

Body Part	Pain intensity of WMS															
	Chinese Restaurant										Western Restaurant					
	Senior Chef		Chef		*Dim sum* Chef		BBQ Chef		Kitchen assistant		Floor manager		Floor foreman		Waiter/Waitress	
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*
Neck	5.10	2.48	4.91	2.05	5.58	2.00	4.60	1.82	3.80	2.59	5.00	1.93	5.00	2.16	4.23	1.70
Shoulder	5.39	2.16	4.86	2.22	6.08	2.31	5.78	2.82	4.83	2.48	4.50	2.45	4.83	1.72	4.97	2.13
Upper arm	5.65	2.56	4.70	2.27	5.60	2.33	5.83	2.48	5.00	3.52	3.67	2.08	6.50	2.12	4.47	2.14
Elbow	5.87	2.47	4.80	2.29	6.06	2.34	6.43	3.10	6.60	2.70	8.00	---	4.25	2.22	3.56	1.81
Forearm	5.95	2.09	4.95	2.54	6.06	2.64	6.25	4.11	5.75	2.22	5.50	3.54	6.50	2.12	4.67	2.26
Finger or wrist	5.60	2.02	4.94	2.18	5.95	2.44	5.88	2.85	3.33	2.40	5.50	3.00	5.80	2.59	5.00	2.54
Upper back	6.00	2.45	5.58	2.45	6.22	2.71	6.20	3.56	4.80	2.49	3.25	2.06	6.75	1.26	5.22	1.73
Lower back	6.10	2.71	5.77	2.45	6.53	2.76	6.25	3.15	5.14	3.18	5.50	2.95	5.67	2.42	5.27	2.00
Thigh	5.59	2.69	5.58	2.30	4.93	2.16	5.80	2.95	4.67	2.08	4.00	4.24	6.40	1.82	5.33	1.64
Knee	5.52	2.29	6.65	2.72	5.73	2.46	6.29	2.69	4.75	1.71	5.00	2.55	6.20	1.64	5.06	2.17
Leg	5.00	2.30	5.04	2.43	5.74	1.94	4.17	2.23	3.80	2.39	5.00	3.67	6.20	1.79	5.85	1.92
Ankle	5.50	2.60	6.11	2.90	5.47	1.64	4.50	2.51	3.50	2.52	5.20	3.42	5.20	1.92	5.82	2.26

Risk Factors for WMS

A two-way between-groups ANOVA was then carried out to explore the impact of restaurant type and job title on frequency of movement. The results indicated job category had a statistically significant main effect on wrist twisting [F(2,522)=46.25, p<0.01], wrist bending [F(2,502)=40.48, p<0.01], prolonged wrist exertion [F(2,335)=14.51, p<0.01], grasping and pinching objects with thumb and other fingers [F(2,516)=5.27, p<0.01], repeated finger movement [F(2,496)=11.12, p<0.01], [F(2,493)=5.41, p=0.003], twisting back to take objects from behind [F(2,493)=6.01, p=0.003], pushing forward with hands holding objects [F(2,499)=5.27, p=0.005], and vibration [F(2,288)=6.11, p=0.003]. Post-hoc comparisons using the Tukey test indicated that the frequency of these movements among the kitchen staff group was significantly different from that in the other two groups, with two exceptions; kitchen and other staff in repeated finger movements, and kitchen and floor staff in pushing forward with hands holding objects.

The results also identified a statistically significant main effect for restaurant type on prolonged wrist exertion [F(2,335)=4.44, p=0.01], twisting back to take objects from behind [F(2,493)=5.41, p=0.005], lifting heavy objects from floor with waist bending [F(2,527)=7.51, p=0.001], forward reaching with waist bending [F(2,523)=9.37, p<0.01], and pushing forward with hands holding objects [F(2,499)=19.02, p<0.01]. Post-hoc comparisons using the Tukey test indicated that these movements were found significantly more often among Chinese restaurant workers than those in the other two subgroups (see Table 21).

Table 21

Frequency of Movement by Job Title and Restaurant Type

Bodily Movement	Frequency of Bodily Movement																		
	Chinese Restaurant						Western Restaurant						Other Restaurant						
	Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others		Kitchen Staff		Floor Staff		Others		
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	*P**
1#	3.47	1.38	1.74	1.08	2.19	1.60	2.91	1.43	1.83	1.06	2.05	1.16	3.28	1.41	2.05	0.94	2.32	1.24	<0.01
2	3.47	1.35	1.87	1.23	1.89	1.66	3.16	1.13	2.09	1.15	2.05	1.19	3.13	1.38	2.35	0.67	2.18	1.27	<0.01
3	2.95	1.61	1.86	1.20	1.56	1.33	2.50	1.28	2.12	1.22	1.85	1.04	3.43	1.43	2.56	0.96	2.15	1.25	<0.01
4	2.88	1.34	2.61	1.29	2.75	1.65	2.73	1.34	2.54	1.21	2.00	1.17	3.13	1.28	2.64	0.56	2.40	1.20	<0.01
5	3.17	1.32	2.16	1.34	3.19	1.78	3.09	1.26	2.23	1.20	2.45	1.54	2.90	1.30	2.59	0.85	2.71	1.27	<0.01
6	2.29	1.20	2.06	1.04	2.82	1.76	2.42	1.31	1.94	1.04	2.00	1.12	2.18	1.19	2.39	1.03	1.82	1.08	<0.01
7	2.80	1.39	2.35	1.32	2.64	1.58	2.38	1.09	1.89	1.01	1.95	1.05	2.74	1.39	2.33	0.91	1.98	0.97	<0.01
8	2.53	1.15	2.70	1.28	3.37	1.83	2.37	1.12	2.24	1.11	2.35	1.23	2.37	1.04	2.64	0.83	2.55	1.09	<0.01
9	2.77	1.29	2.93	1.30	3.32	1.66	2.45	1.13	2.39	1.24	2.25	1.12	2.74	1.27	2.70	0.87	2.37	1.01	<0.01
10	2.33	1.18	2.78	1.41	4.08	1.46	2.27	1.12	2.08	1.18	2.25	1.16	2.36	1.13	2.88	0.93	2.20	1.12	<0.01
11	2.13	1.23	1.50	0.73	1.67	1.32	2.27	1.04	1.56	0.90	2.00	1.25	2.38	0.96	2.13	0.83	1.83	0.91	<0.01

*Two way ANOVA, $p<0.01$ means either a main effect for restaurant or job title, or at the interaction level.
#1. Wrist twisting; 2. Wrist bending; 3. Prolonged wrist exertion; 4. Grasping and pinching objects with thumb and other fingers; 5. Repeated finger movement; 6. Getting heavy objects from or above shoulder level; 7. Twisting back to take objects from behind; 8. Lifting heavy objects from floor with waist bending; 9. Forward reaching with waist bending; 10. Pushing forward with hands holding objects; 11. Vibration.

In addition, a two-way ANOVA showed that two body movements were subject to interaction effects, requiring reconsideration of the main effects. This affected restaurant type and job title for getting heavy objects from or above shoulder level [$F(4,482)=3.24$, $p=0.01$] and pushing forward with hands holding objects [$F(2,499)=10.70$, $p<0.01$]. After splitting the sample by restaurant type and repeating the analyses for each job title category, the one-way ANOVA showed that there was only one main effect in body movement (getting heavy objects from above shoulder level) by job title when the classification was set at the Chinese restaurant level [$F(2,253)=3.91$, $p=0.021$]. There were two main effects in movement type for pushing forward with hands holding objects when the classification was set at Chinese [$F(2,7)=7.79$, $p=0.017$] and Western restaurant levels [$F(2,99)=3.73$, $p=0.027$]. In conclusion, the results of the two-way ANOVA tests indicated that the 12 types of movement considered to be risk factors for the development of WMS were reported more often among kitchen staff in Chinese restaurants. This difference was statistically significant.

A hierarchical multiple linear regression was then performed to explore the interaction between risk factors, frequency of movement, and different locations for pain. The first block of independent variables were age, gender, working hours per day, working days per week, and years of current job experience; the second block was the frequency of the 12 movements. The dependent variables were the 12 location of pain. The collinearity statistics showed that the assumption was not violated. The results showed that elbow pain was related to wrist twisting ($t=2.06$, $p=0.043$), and lower back pain was related to grasping and pinching objects with the thumb and other fingers ($t=2.24$, $p=0.028$). These statistics are reported in Table 22.

Table 22

Results of Multiple Linear Regression Analysis

Location	Body Movement	t	p
Elbow	Wrist twisting	2.06	0.043
Lower back	Grasping and pinching objects with thumb and other fingers	2.24	0.028

Discussion

The purpose of this cross-sectional study was to survey the prevalence of, and risk factors for, WMS among employees in the catering industry in Hong Kong. Furthermore, it also set out to identify the impact of industry sector (such as Western or Chinese) and job title by comparing prevalence rates, so as to identify areas which might require indepth ergonomic analysis in future studies. The results showed that the highest prevalence of WMS among catering industry workers in Hong Kong was found among senior chefs (71.7%), *dim sum* chefs (69.6%), and BBQ chefs (68.8%) in Chinese restaurants. Kitchen workers reported greater pain compared with those working on the floor and in other roles. The shoulder was consistently the most affected body part.

Representativeness

Concerns about representativeness center on the randomness of the sampling and the sample size. At the outset, an attempt was made to account for the fact that the catering industry has disproportionate numbers of people working in certain roles; for example, only 10% of the employees in a restaurant might be chefs. The disproportionate sampling method was therefore used to recruit participants. Two rounds were employed but yielded only a 2.5-5% response rate from 386 invitation letters. Given this low response rate, experts in the field of OSH, particularly the catering industry, were consulted and agreed that this level of response was common in the sector because staff work long hours and are under pressure. Employers might also have had concerns about the project affecting their business, or stimulating greater concern about WMSD amongst staff, resulting in more claims for compensation. As a result, convenience sampling had to be used to boost the sample. This is common in catering industry studies. Indeed, the systematic review reported in the earlier chapter found that convenience sampling was the most common method used in this type of study. However, the drawback is that selection bias may have been introduced as a result, which must be acknowledged as one of the limitations of this study.

In terms of sample size, 902 participants were recruited. It is common in scientific research to carry out a power calculation to evaluate whether the size of a sample is sufficient. PASS2005 was used in this study to calculate the statistical power, with the alpha set as 0.05 and the sample size for the three subgroups as 538, 162, and 177, respectively. The mean of the pain intensity for each subgroup was 5.16, 4.60, and 4.75, and the standard deviation 2. The result of the PASS2005 calculation was as follows:

> In a one-way ANOVA study, sample sizes of 538, 162, and 177 are obtained from the 3 groups whose means are to be compared. The total sample of 877 subjects achieves 90% power to detect differences among the means versus the alternative of equal means using an F test with a 0.05000 significance level. The size of the variation in the means is represented by their standard deviation which is 0.24. The common standard deviation within a group is assumed to be 2.0.

In conclusion, the results of the one-way ANOVA generated by PASS2005 resulted in a power of 0.90, which means the sample size was sufficient.

Prevalence of, and Risk Factors for, WMS

This study has shown that the highest prevalence of WMS among catering industry workers in Hong Kong was found among senior chefs (71.7%), *dim sum* chefs (69.6%), and BBQ chefs (68.8%) in Chinese restaurants. This is similar to the findings of other studies conducted in Taiwan and Hong Kong. Yeung et al. (1997) report that BBQ cooks have the highest prevalence of musculoskeletal discomfort (86%). Chyuan, Li and Sung (2005) show that the prevalence of WMS in the left foot was 59.8% for a sample of 328 banquet workers serving Chinese cuisine. Another study Chyuan et al. (2002) shows that among 905 food-service workers in 24 hotel restaurants in Taiwan, lower back pain was most prevalent (52.6%) among kitchen staff whereas both sanitation suffered mostly from shoulder pain with prevalence rates of 63.4% and 64.3%, respectively. Additionally, the findings of this study as regards the most frequently affected body parts are similar to these studies.

The frequency of movement, which can be defined as a physical factor, makes the greatest contribution to the development of WMS. Again, this confirms the findings of previous studies. Risk factors can generally be classified into three groups, namely personal, physical, and psychological. The findings of this study may benefit ergonomic workplace assessments conducted in future work.

Conclusion and Limitations

This study has showed that the highest prevalence of WMS among catering industry workers in Hong Kong was found among senior chefs (71.7%), *dim sum* chefs (69.6%), and BBQ chefs (68.8%) in Chinese restaurants. People who worked in kitchens reported more pain than those who worked on the floor and in other sectors.

The consistently most affected body part was the shoulder. Due to the cross-sectional nature of the study design, however, no conclusions can be drawn about causality and a temporal relationship between the risk factors and the occurrence of WMS cannot be established. However, the study has provided valuable information on which to base a longitudinal study exploring the causal factors of WMS in catering staff. These findings can provide only basic information about the development of WMS in the catering industry. There is a clear need to conduct further work involving ergonomic workplace assessments to quantify the risk factors and explore their relationship with the development of WMS.

Chapter IV – Study 2: An Onsite Ergonomic Assessment of Risk of WMS among Chinese Restaurant Chefs

The findings reported in Chapter III show that chefs in Chinese restaurants reported the highest level of WMS and pain intensity compared to those working in other roles, with the shoulder being the most affected body part. They also demonstrate that repeated movements such as wrist twisting and grasping and pinching objects with thumb and other fingers may result in the development of WMS. However, given the limitations of a cross-sectional study design and the possibility of recall bias in a self-administered questionnaire, a further field study is required to quantify the risk factors for WMS.

This chapter reports on a case study of an onsite ergonomic assessment of the risk factors for WMS among three chefs working in a medium-sized Chinese restaurant in Hong Kong. Their workload was measured during an onsite assessment and OWAS, RULA, and NIOSH lifting equation used to assess the risk of developing WMS.

Literature Review

Hong Kong is an international city where, culturally, East meets West. Tourism is one of the key components of its economy. Although a considerable variety of restaurants can be found in Hong Kong, more than 55% are Chinese (Hong Kong Census and Statistics Department, 2010). According to the latest figures from the Hong Kong Census and Statistics Department, around 200,000 workers are employed in the catering industry, including hotels, Chinese and non-Chinese restaurants, and fast food takeaways. They make up 10% of the total Hong Kong workforce (Hong Kong Census and Statistics Department, 2010) and 50% are employed in Chinese restaurants.

A high prevalence rate of WMS has been reported among staff in Chinese restaurants in Taiwan and Hong Kong. One survey in Taiwan reports a high prevalence of WMS among restaurant workers, showing that of 905 participants, the shoulder (57.9%) and neck (54.3%) as well as the lower back/waist (52.7%) were the most affected regions compared with other body sites (22.3-46.5%) (Chyuan et al., 2004). Another survey shows that the annual reported incidence of WMSD among restaurant chefs involving insurance claims is 25% (Shiue et al., 2008). In Hong Kong, Yeung et al. (1997) show that BBQ chefs in Chinese restaurants report the highest prevalence of musculoskeletal discomfort (86%) , which is significantly higher than chefs in Japan (11.5%: Ono et al., 1998), servers in Western-style restaurants (42%: Dempsey & Filiaggi, 2006), and servers in Chinese restaurants (64.3%: Chyuan, Li, & Sung, 2005).

The work carried out by a chef consists of tasks that typically contribute to the development of WMS. These include prolonged grasping of cooking utensils, tossing a wok, and roasting meat, all of which require forceful exertion of the hands, wrists, and forearms. In addition, a chef often has to keep moving the wrist (flexion and extension, or circumduction) in repetitive meat cutting. This movement may induce muscle strain, placing undue mechanical stress on muscles, tendons, and nerves over the long term and eventually causing WMS (Armstrong et al., 1993). This chapter presents a case study of an onsite ergonomic assessment carried out to identify the risk factors for WMS in chefs working at a medium-sized Chinese restaurant in Hong Kong. The assessment was conducted by a research student who had been trained to use all the ergonomic measures in this study and who had no relationship with the chefs or the Chinese restaurant involved.

Case Description and Method

Demographic Information

The staff who participated in this study were general, BBQ, and *dim sum* chefs. These three roles are found in almost every Chinese restaurant and have the highest prevalence of WMS in the catering industry (Xu, Cheng, & Li-Tsang, 2013). The restaurant in this study employs around 90 staff and provides mainly Cantonese food to customers in the Kowloon district. It is managed by a firm with six branches of similar size located in different areas of Hong Kong. The three chefs were recruited by convenience sampling with consent being obtained from their head of department. They were all male and the main household earners, with more than three years' experience in their current role.

Kitchen Layout

In general, the kitchen floor was covered by anti-slip tiles. However, wet and oily floor surfaces were still easily identified elsewhere in the kitchen. The workstation of the general chef was 95cm in height and 105cm wide. A shelf without a cover was installed above it on which he placed utensils for cleaning and filtering. When the chef used these utensils, he bent forward at around a 10-20 degree angle to reach them. The height of the shelf was 134cm, which was generally at shoulder level. Another overhead cupboard was installed above the workstation, on which was placed some seldom-used utensils (Figure 2).

Figure 2. Example workstation of general cook.

The height of the workstation used by the BBQ chef was 100cm and the width 57cm. The height of the oven was 130cm and the diameter 80cm. There was a metal hanger to hold roasted pig, duck, pork, goose, and so on. This hanger had two levels set at 184cm and 206cm. The BBQ chef therefore had to lift the roasted meats above shoulder level using both arms (Figure 3).

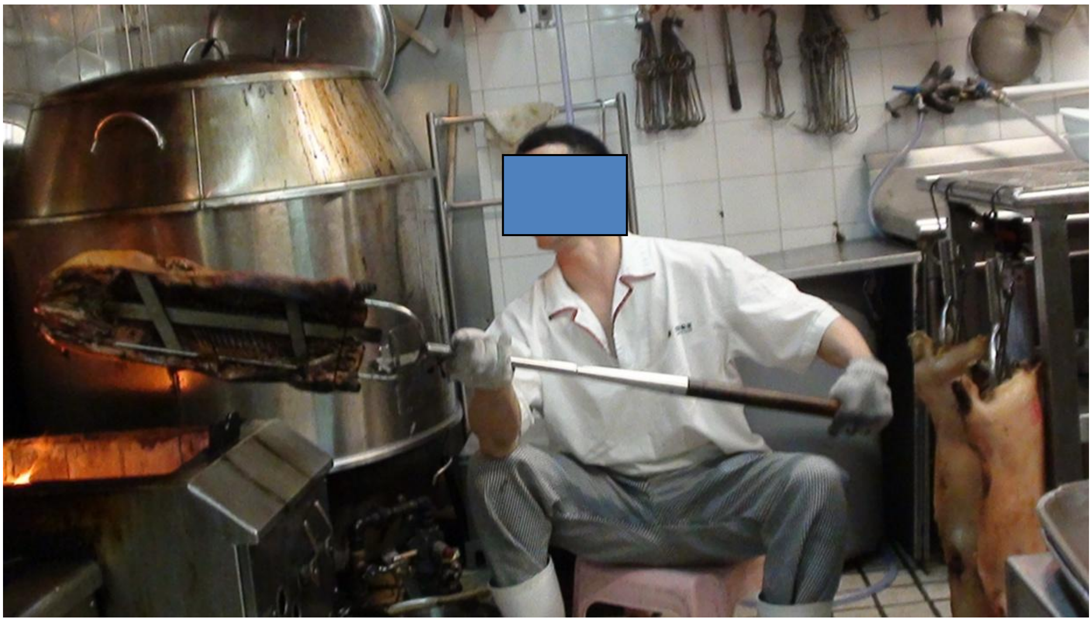


Figure 3. Example workstation of BBQ cook.

Finally, the workstation of the *dim sum* chef was 84cm high and 80cm wide. It was used for making different sorts of *dim sum* dishes. An order machine sat next to the steaming area. When the *dim sum* chef received an order from the machine, he would select the appropriate dishes and place them in the steamer (Figure 4).

Figure 4. Example workstation of *dim sum* cook.

Onsite Ergonomic Assessment

Having obtained written consent from the human resource department of the restaurant firm, an initial visit was carried out. The purpose of this was to explain the procedures of onsite ergonomic assessment to the manager and to get a general idea of the work tasks and workstations of the chefs. The initial visit was guided by the restaurant manager and lasted 20 minutes.

The onsite ergonomic assessment involved making video recordings of all three chefs at work. The filming angle was positioned in order to give the best view of the chefs' whole-body movement, unobstructed by other workers, and the equipment used. At some workstations, since there was absolutely nowhere to place the video camera, the recording had to be performed using a hand-held camera. Over five hours of video were shot in total.

The weight of the workload was also measured during the onsite assessment using three ergonomic tools designed to assess the risk of WMS.

OWAS. The OWAS is used to determine postural load and categorize the potential harmfulness of work postures to the back and the upper and lower limbs. It is based on work sampling, which identifies the frequency of each posture and the time spent in it (Karhu et al., 1981; Park et al., 2009). Video recordings were made of each chef performing routine tasks. Based on the definitions relating to the back, upper, and lower limbs, one of the four action categories, indicating a need for ergonomic change, was selected.

RULA. RULA is used specifically to identify the risk of WMS associated with shoulder, hand, and wrist postures. A coding system is used to generate an action list, which indicates the level of intervention required to reduce the risk of injury due to the physical loading on the subject. Sampling was conducted at variable intervals and a number of tasks identified from the videotapes and direct observation (McAtamney & Corlett, 1993; Dockrell et al., 2012).

NIOSH lifting equation. The revised NIOSH lifting equation (Waters et al., 1993; 2011) is used to determine the level of risk associated with manual handling activities. The calculation considers various factors including horizontal and vertical distances, frequency of lifting, asymmetry, and coupling (grip) in order to determine a Recommended Weight Limit (RWL) for a particular set of circumstances. A weight load constant of 23kg was used as a standard maximum for the ideal condition, which was then altered by multipliers to give the specific lifting condition for the chefs. As a result, a lifting index was computed and used to compare the actual weight handled with the RWL for all the manual handling tasks performed by each chef. An estimation of the risk of lower back injury was then performed.

According to the guidelines for ergonomic job analysis (Keyserling, Armstrong & Punnett, 1991) and a previous study on postural analysis for visual display terminal (VDT) users (Siu, 1999), a 30-minute peak-hour observation was extracted from the video recording of each chef. This was determined on the basis of subjective feedback gathered from interviews with the chefs, then confirmed with the restaurant manager. Using this 30-minute observation, the postural work demands and movements of each chef were analyzed at 1-second intervals using the facilities of the Ergonomics and Human Performance Laboratory, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University.

Results

OWAS Results

General chef. The OWAS analysis found that the most typical work postures adopted by the general chef were straight back, arms both below shoulder level, standing on both legs, with load less than 10kg. The risky postures for the back were bent (4%), twisted (2%), and bent and twisted (1%), accounting for 5% in category 2.

BBQ chef. The most typical work postures adopted by the BBQ chef were straight back, arms both below shoulder level, standing on both legs, with load less than 10kg. The risky postures for the back were bent (32%), bent and twisted (1%), one arm above shoulder (6%), both arms above shoulder (1%), standing on one leg (4%), standing on two bent knees (10%), and loading greater than 20kg (11%), accounting for 22% in category 2, 10% in category 3, and 1% in category 4.

***Dim sum* chef.** The most typical work postures adopted by the *dim sum* chef were straight back, arms both below shoulder level, standing on both legs, with load less than 10kg. The risky postures for the back were bent (19%), one arm above shoulder (1%), and standing on two bent knees (8%), accounting for 11% in category 2, and 8% in category 3.

Table 23 summarizes the results of the OWAS analysis for all three chefs.

RULA Results

The RULA analysis for all three chefs revealed that a large amount of their tasks relied on repetitive movement of the upper limbs, particularly chefing, cutting, stirring, roasting, and making *dim sum*. Table 24 lists the high-risk tasks likely to contribute to the development of WMS in the upper limbs, neck, and back, and the associated loads and forces. The RULA scoring criteria found that each of the risks significantly exceeded acceptable limits, with immediate investigation and change recommended. Of the three chefs, the general and BBQ scored highest (both 7), whereas the *dim sum* chef scored 5 in the action category.

NIOSH Lifting Equation Results

According to the field observation and video recordings, no heavy manual handling tasks were identified for either the general or *dim sum* chef since cooking is their primary task. The lifting index for both was less than 1.00. For example, only one lifting task by the *dim sum* chef was observed. This involved lifting the container of the food mixer which weighed only 5kg, and was repeated five times within 3 hours. However, for the BBQ chef, it was noted that the most common manual handling task was to roast a pig. With reference to the NIOSH lifting equation, the RWL for lifting a pig is 15.767kg. This assumes that the lifting conditions are optimal; that is, one is close to the load, has a good grip, and minimal twisting is required. As the average weight of a pig is 19kg the lifting index is 1.205 which indicates that this task presented a risk of lower back injury to the BBQ chef.

Discussion

The results of this case study show that most of the work postures adopted by the chefs were acceptable. Only10% and 8% of the postures of the BBQ and *dim sum* chefs, respectively, were in action category 3 (indicating that their backs were bent when twisted, two arms lifted above shoulder level, and they were standing with both knees bent). However, it is also quite clear that prolonged standing is the most undesirable work posture for chefs since prolonged isometric contraction of the calf muscle causes fatigue or muscle cramps of the lower limbs. This is in line with the findings of previous studies that WMS of the lower limbs are prevalent among Chinese restaurant chefs (Chyuan et al., 2004; Chyuan, Li, & Sung, 2005).

The RULA findings confirmed that the movements of all three chefs were fast and repetitive. Most of the tasks involved scored a 7, which means immediate investigation or change is required. On average, a general chef spends around 2 minutes cooking a single dish. From the video recordings, this chef spent 4-5 hours a day cooking. Upper limb functions such as finger pinching, hand grasping, elbow flexion and extension, and forearm pronation and supination were frequently employed during this activity, particularly when grasping a wok (weighing 2.8kg) and tossing it in order to ensure the contents were evenly heated. Repetitive use of the upper limbs was also seen in the work of the BBQ and *dim sum* chefs, such as roasting meat and making *dim sum*. It has been reported that the repetitive use of arms and hands is the main risk factor for WMS (Barr & Barbe, 2002; Madeleine, Voigt, & Mathiassen, 2008; Latko et al., 1999).

The characteristics of repetitive movements in manual tasks stress the importance of prevention, especially in terms of methods for risk assessment and the management of such tasks. In order to achieve the goal of maintaining a satisfactory level of productivity while safeguarding workers' health, the use of the Occupational Repetitive Action (OCRA) method is encouraged (Colombini & Occhipinti, 2006, 2007). This facilitates the interaction between job, machinery, and ergonomics in the design of work processes and workplaces. Further study of its feasibility in the Chinese restaurant environment is required. Future research should also look at the implementation of effective prevention measures, including administrative and ergonomic controls, to reduce the problems associated with the performance of high-risk tasks in this context.

The results of the NIOSH lifting equation showed that only one manual handling task, namely roasting a pig, had a lifting index above the cut-off value of 1.00. Nevertheless, it was also observed that regardless of the actual value of the lifting index, all three chefs adopted an awkward posture. They preferred to use a torso rather than a leg lift. This is quite common in the catering industry, even when workers know and understand how to perform manual handling tasks correctly. This might be because they overlook the consequences of using incorrect postures, and have got into the habit of doing so over a long period. They may not experience any discomfort, pain, or injury; or, putting it the other way around, they may suffer discomfort but have become used to it (Vink & Kompier, 1997) and come to regard it as the price of working.

The approach used in this study did not consider psychosocial factors. The assessment of risk calculated here may be significantly lower than if consideration had been given to this aspect. Given the significant time pressures in the catering industry, a further, large-scale epidemiological study investigating both physical and psychosocial risk factors on the development of WMS in chefs working in Chinese restaurants is recommended.

Conclusion and Limitations

The case study presented in this chapter exemplifies a practitioner's approach to the assessment of the physical ergonomic factors affecting the development of WMS in Chinese restaurant chefs. The findings indicate that high-speed working is a feature of the Chinese catering industry. Workers have to maintain a standing posture for long hours and engage in repetitive movement of the upper limbs. Given that a stressful working atmosphere is becoming increasingly common, however, practical methods are needed that will extend the consideration of the risk of developing WMS to include psychosocial factors as well. There is a clear need to develop effective preventive strategies for this specific industry, including training and education.

Table 23

Summary of OWAS Analysis for the Cooks

	General Cook	BBQ Cook	*Dim sum* Cook
Back			
Straight	93%	67%	81%
Bent	4%	32%	19%
Twisted	2%	0%	0%
Bent and twisted	1%	1%	0%
Arms			
Both arms below shoulder level	100%	93%	99%
One above shoulder level	0%	6%	1%
Both arms above shoulder level	0%	1%	0%
Legs			
Sitting	0%	0%	0%
Standing on two legs	100%	86%	91%
Standing on one leg	0%	4%	0%
Standing on two bent knees	0%	10%	8%
Standing on one bent knees	0%	0%	0%
Kneeling	0%	0%	0%

Walking	0%	0%	0%
Loading			
< 10kg	100%	89%	100%
<20kg	0%	11%	0%
>20kg	0%	0%	0%
*Action category (1-4)	Category 2 (5%)	Category 2 (22%) Category 3 (10%) Category 4 (1%)	Category 2 (11%) Category 3 (8%)

*Note: Category 1. Normal posture: no intervention required; Category 2. Slightly harmful: corrective action should be taken during next regular review of work methods; Category 3. Distinctly harmful: corrective action should be taken as soon as possible; Category 4. Extremely harmful: corrective action should be taken immediately

Table 24

RULA Analysis of WMS Risk Factors Affecting Different Work Tasks

Task	Risk Factors	#Score
Cooking (general cook)	1. left upper arm raised and abducted, neck flexed; 2. left upper arm rotate the wok quickly; 3. left hand hold the wok statically and for a long period; 4. left wrist extended and flexed alternatively and quickly; 5. right upper arm raised and abducted; 6. right upper limb stir food in the wok; 7. right wrist pronated and supinated quickly; 8. task done repeatedly and quickly; 9. often neck flexion; 10. often right arm at shoulder level to reach objects.	7
Food preparation, particularly slicing pig (BBQ cook)	1. awkward lifting posture: trunk bent > 60 degrees, 2. often neck flexion >20 degrees; 3. force load > 19kg; 4. right forearm pronated and supinated quickly; 5. task done repeatedly and quickly; 6. wrist flexion and extension >15 degrees.	7

Roasting (BBQ cook)	1. upper arms raised above shoulder level when hanging roasted pig; 2. wrist position often flex and extend greater than 15 degrees; 3. use of awkward posture (forward bending) to put the pig, goose, meat, and so on in and out of the big oven.	7
Dim sum preparation (*dim sum* cook)	1. awkward lifting posture: trunk bent > 60 degrees; 2. often neck flexion >20 degrees; 3. task done repeatedly and quickly; 4. right wrist pronated and supinated quickly when making *dim sum.*	5
Steaming *dim sum* (*dim sum* cook)	Both upper arms or one upper arm often raised above shoulder level.	5

[#]Note: 1 or 2=Acceptable; 3 or 4=investigate further; 5 or 6=investigate further and change soon; 7= investigate and change immediately

Chapter V – Study 3: Development and Mechanism of WBA in the Workplace: A Qualitative Study

The previous chapter has shown that the three chefs studied usually had to hold utensils for extended periods of time, toss woks, and barbecue meat. All these tasks demand a lot of repetitive movement of the upper limbs, with many risky and poor postures being observed. This supports the findings of Study 1 showing that the highest prevalence of WMS in the catering industry in Hong Kong (around 70%) is found among chefs in Chinese restaurants. Moreover, the onsite ergonomic assessment identified pain intensity among these chefs of around 5 (scores ranging from 1-10, with higher scores meaning more intense pain), which is also higher than that reported by staff working on the floor and in other roles. Consistently, the most affected body part was the shoulder, which may be caused by repetitive movement of the upper limbs.

Over the past decade, given the severity of WMS in the catering industry, the Hong Kong government has launched a series of schemes or annual awards to promote a safety culture in the workplace and enhance workers' safety awareness and knowledge of how to prevent injuries (Hong Kong Labor Department, 2013), featuring a range of activities as discussed in Chapter II. However, although there has been a slight reduction in the number of reported occupational accidents in the catering industry, the findings discussed in previous chapters show that WMS among catering workers, particularly Chinese chefs, continue to account for a large proportion of reported cases. It can therefore be assumed that this group of workers has developed work habits which lie beyond the reach of traditional prevention strategies and which impede them from applying these lessons in real-life workplaces.

Literature Review

It has been argued in previous injury prevention strategies that as the effectiveness of many OSH intervention programs is still unknown, it is essential to assess them (LaMontagne et al., 2004). For instance, the regulation of hazards is one of the most important forms of OSH intervention (Stayner et al., 1996). However, Verbeek et al. (2012) conducted a systematic review of studies of the effectiveness of nonpharmaceutical interventions for preventing occupational hearing loss. The results show that overall, the methodological quality of the 25 studies included was low or very low. Information campaigns, such as implementation of legislation, using cluster-randomized controlled and longitudinal study designs found no significant differences in hearing loss. Meanwhile, training and education of workers or imposing engineering controls did not show similar effects. Another review study (van der Molen et al., 2007) shows that there is no evidence that regulations for reducing fatal and nonfatal injuries in the construction industry are effective. Both studies provide evidences that firstly, OSH efforts which focus simply on presenting safety rules, guidelines, and legislation are ineffective; secondly, although workers may understand the safety instruction messages they receive, they still frequently engage in learned risky behaviors in the workplace; and last but not least, the transmission and learning of knowledge, and worker attitudes toward OSH knowledge, are crucial in successful prevention strategies (Cole, 2002).

Frequent and learned risky behaviors in the workplace eventually become habits. Habits are formed though associative learning and develop by satisfactorily repeating behaviors in a stable context (Wood & Neal, 2007). Habits can also be thought of as acquired behavior patterns followed regularly until they become almost involuntary. They are cued relatively directly by the environment, with a minimal amount of purposeful thinking and often without any sense of conscious awareness (Verplanken, 2005). Verplanken and Aarts (1999) define habits as learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end states. Such acquired behavior and learned automatic responses may play an important role in OSH prevention strategies, particularly in the development of WMS.

Feuerstein (1996) has developed the Workstyle Model to explain the relationship between individual workstyles and WMS/WMSD. The Workstyle Model proposes that as a worker performs tasks in the workplace, cognitions, behaviors, and physiological reactivity cooccur to constitute an individual pattern or workstyle. A workstyle may be a preexisting and characteristic approach to a given requirement which is triggered or exacerbated by psychosocial stressors, work demands, and ergonomic stressors. Workstyles have three components; behavioral, cognitive and physiological. The behavioral component is constructed by force, repetition, awkward posture, and work/rest cycle, all of which are well-known risk factors for WMS. The cognitive component represents fears (such as losing one's job, functional loss, and so on), frustration, confidence, and somatic insensitivity. The physiological component refers to the biological changes associated with behavioral and cognitive reactions. For instance, increased force and fear of losing one's job may increase muscle tension and fatigue. Consequently, changes in all the behavioral, cognitive, and physiological components may increase symptoms such as muscular and tendon pain, numbness, and tingling. If this situation continues, WMSD will develop, eventually resulting in disability (Feuerstein, 1996).

The Workstyle Model suggests that individual style or pattern of behaviors may play an important role in developing WMS, and that this is triggered by the interaction between behavior, cognition, and physiology. Research on workstyle demonstrates that it is a predictor of upper extremity symptoms (Sharan & Ajeesh, 2012; Sharan et al., 2011; Griffiths, Mackey, & Adamson, 2011; Harrington & Feuerstein, 2010). Meijer, Sluiter and Frings-Dresen (2008) examine whether workstyle is a mediating factor for the development of upper extremity pain in a changing office environment. Participants were divided into good and adverse workstyle groups at baseline. The results show that 80% of the adverse and 45% of the good workstyle groups reported pain at baseline. The relative risk (RR) of upper extremity pain for the adverse compared to the good workstyle group was 1.8 (95% CI 1.08-2.86; P=0.055) at baseline, and 3.0 (95% CI 1.76-5.11; P=0.003) 12 months later. All of the adverse workstyle group members and 33% of those in the good group reported upper extremity pain 12 months after baseline. Griffiths, Mackey, and Adamson (2011) report on a survey of 934 computer workers designed to examine whether workstyle is an important factor associated with WMS. They show that individual workstyle in response to workload demands and stressors, including working with heightened muscle tension and mental fatigue, was significantly associated with WMS. Another large-scale randomized controlled trial of office workers is reported by Bernaards et al. (2007). The study involved four intervention groups; one received a lifestyle physical activity intervention; another a workstyle intervention focusing on behavioral change such as body posture, workplace adjustments, breaks, and coping with high work demands; a third received both interventions; and a fourth group received the usual care measures. The results show that modifying certain elements of workstyle was independently effective in reducing pain outcomes, while the other interventions were ineffective. All these studies suggest that workstyle, or how an individual worker behaves in response to work demands, captures interactions between behavior, cognition, and physiology that have a strong relationship with the development of WMS.

Adverse workstyle is considered to be triggered by high work demands. A particular, self-generated workstyle may be developed involving a high need for achievement and acceptance, increased fear of losing one's job or function, or avoidance of a job-related negative consequence of inadequate or improper training, all potentially becoming high risk as a result of time pressures (Feuerstein, 1996). Such an adverse workstyle constitutes a risky work behavior and may often lead to WMS. However, the workstyle approach places sole emphasis on individual reactions to behavior, cognition, and physiology. The mechanism of how such reactions interact has not been properly characterized. Furthermore, it is unclear whether an individual style or pattern such as this may be associated with learned behaviors or social learning in the workplace which result in the formation of learned automatic responses. As these responses or acts may be the result of unintentional, unconscious, uncontrollable, efficient, and fast responses to work demands, this may be the reason why chefs (for example) do not apply sound prevention strategies at work, eventually leading to WMS.

With the exception of the Workstyle Model, as discussed in Chapter II, there is no overarching theory or model which explains the role of learned automatic responses or acts at work – otherwise known as WBA – in preventing WMS. A qualitative methodology was therefore adopted for this study with the aim of achieving a deeper understanding of the development and mechanism of WBA in order to facilitate the future implementation of WMS prevention strategies.

Grounded theory is one of the qualitative research methods used in theory development and is particularly suitable for areas where there is little knowledge of a phenomenon (Glaser &Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1994). In social science research, Glaser and Strauss (1967) developed grounded theory to generate inductively derived theories through systematic data collection and analysis. They also sought to explain that quantitative research, while widely used, is not the only tool for model development in social science (Wells, 1995; Charmaz, 2000; Glaser & Strauss, 1967). The underlying assumption of grounded theory is that

> people make sense of and order their social world even though, to the outsider, their world may appear irrational. Individuals sharing common circumstances (for example, clients with mental illness) experience common perceptions, thoughts and behaviors, which are the essences of grounded theory (McCann & Clark, 2003, p. 8).

During the development of their approach, Glaser and Strauss came to hold different views on grounded theory, resulting in the emergence of two approaches; the Glaserian inductive and the Straussian inductive-deductive (Glaser, 1978; Strauss and Corbin, 1990). However, both approaches aim to develop theories to explain a given phenomenon through systematically collecting and constantly comparing data (McCann & Clark, 2003; Charmaz, 2000).

Grounded theory has been widely used in the past decade (Kumar, Little & Britten, 2003), particularly in the field of nursing research (Jacobsson et al., 2004; Brandburg et al., 2013). Study 3 therefore aims to explore the formation of WBA and its underlying mechanism using grounded theory. The results may also shed light on the subject matter of the fourth study in order to develop a theory of WBA which can be employed in an overall theoretical model of WMS prevention.

Method

Grounded theory is an approach used for analyzing processes (Glaser, 1978). It was chosen for this study as it allows a theory or theoretical model to be generated within a more or less unknown area (Charmaz, 2000). In this case, the theory is based on statements made by Chinese chefs working in the catering industry in Hong Kong. A theory is “a set of interrelated concepts, definitions, and propositions that present a systematic view of events of situations by specifying relations among variables in order to explain and predict events of situations” (Glanz, Rimer, & Lewis, 2002, p. 25). A model is “a composite, a mixture of ideas or concepts taken from any number of theories and used together” (Hayden, 2009, p.1). Both theories and models help us to explain, predict, and understand behavior and hence suggest ways to change it (Glanz et al., 2002). In Study 3, emphasis is placed on the questions of *why* and *how* Chinese chef have developed certain learned work behaviors, particularly when doing hazardous tasks which, as shown in the previous chapter, are likely to lead to the development of WMS. Such a theory or conceptual model generated by this qualitative study may help us explain, predict, and understand learned work behaviors among these chefs in order to suggest strategies for preventing WMS by enabling workers to change their behavior in the workplace.

Research Design

This study was conducted between May and December 2011 and adopted the grounded theory methodology. The techniques and procedures for collecting and analyzing data used by Charmaz (2006) were adopted. This approach is similar to the work of Brandburg et al. (2013) who set out to identify strategies used by older adults to adapt to living in long-term care settings.

Participants

A total of 13 participants joined this study (see Table 25 for details). All were male and ranged in age from 21 to 63. All but one were married and their education level ranged from primary to middle school. They were purposefully recruited from three labor unions, one representing BBQ chefs only and the other two for all Chinese professional chefs. Participants were recruited with the assistance of their labor union's general affairs committee. The recruitment procedure was as follows. Firstly, an invitation letter was sent to the labor unions (see Appendix 4) and secondly, the author visited the union offices, explained the invitation to the staff, and answered their questions. Most of their concerns were about the time and place of the interview. To maximize credibility, the proposed time was often after the participants had come off duty; around 7 pm for BBQ chefs, and around 9 pm for Chinese chefs. Lastly, if potential participants were interested in the study and met the inclusion criteria, they were asked to sign a consent form (see Appendix 5) and the committee staff would then help to arrange an appointment for the interview. Nine participants chose the labor union' training room as the place to be interviewed, and four participants preferred to come to a university classroom. They were given the freedom to select a venue in order to maintain the credibility of the interview. The inclusion criteria were being aged 18 or above and being a Chinese chef working in a Chinese restaurant.

Theoretical sampling was adopted in this study. Theoretical sampling is defined by Glaser and Strauss (1967) as the process of data collection by firstly generating theory where data are analyzed, and then deciding which data to collect next in order to develop an emerging theory. For instance, some participants in the early stages recalled their learned work behavior and reflected that the influence of senior staff and colleagues was important. This issue was then explored further with the next round of participants. Sampling was completed once theoretical saturation had been achieved, which means that no new patterns, concepts, or points were emerging from the analysis (Strauss & Corbin, 1998). In this study, that point was reached after the 12th participant. To ensure theoretical sampling had been achieved, one further participant (the 13th) was recruited. This interview confirmed that no new concepts had emerged, and therefore that theoretical sampling had been reached.

Table 25

Characteristics of Participants

Case	Name	Age	Marital Status	Education	Position
A	Mr Kuang	42	Married	Middle School	Chef
B	Mr Leung	56	Married	Primary School	Chef
C*	Mr Qing	49	Married	Middle School	Chef
D	Mr Hong	53	Married	Middle School	Chef
E*	Mr Jing	62	Married	Primary School	BBQ chef
F	Mr Cheung	34	Married	Middle School	Chef
G	Mr Chan (A)	58	Married	Middle School	Chef
H	Mr Yu	41	Married	Middle School	Chef
I	Mr Chan (B)	47	Married	Middle School	BBQ chef
J	Mr Xiu	33	Married	Middle School	BBQ chef
K	Mr Chow	63	Married	Primary School	Chef
L	Mr Wang	44	Married	Middle School	Chef
M	Mr Zhang	21	Single	Middle School	BBQ chef

*Only case C (lower back) and case E (shoulder) suffered from chronic pain and had sought medical treatment.

Procedure and Data Collection

With the assistance of the labor union committee staff, the researcher met the participants in the locations of their choosing. Written informed consent was obtained from all of them. To encourage the participants to express their deeper thoughts on WBA and to compensate them for their time and effort, each received HKD 150 (USD 20) after completion of the interview. The duration of the interviews was 60-75 minutes. The interviews were audiotaped and a verbatim transcription made as soon as possible afterwards by the researcher. Participants were asked exploratory questions dealing with their experience of work tasks and the associated physical demands, and their reflection on how this kind of work behavior is formed (see Appendix 6). The questions were developed according to a holistic view of WMSD based on the literature review, as well as the results of a discussion with the author's supervisor and two independent reviewers. Both reviewers are occupational therapists with more than 5 years' experience in rehabilitation and OSH. The questions were modified as indicated by the emerging findings to form a full range of categories (Brandburg et al., 2013). A pilot interview was carried out to enable the author to practice interviewing skills, as well as to validate the questions in terms of comprehensibility, ease of answering, and so on.

Ethics

This study was approved by The Hong Kong Polytechnic University. Written informed consent was obtained from all participants. Implied consent was also obtained from the labor unions through the invitation letter and their assistance with recruitment.

Data Analysis Procedures

Data collection and analysis were conducted in parallel and began with the first interview. The author and both independent reviewers were involved in all stages of the process. The pilot was regarded as the first interview and gave the researcher more confidence in conducting future sessions. It emerged that many of the technical terms in use in the catering industry were not as difficult to understand as had been anticipated, such as 打荷(chef assistant) and 福食 (cooking for restaurant staff). The pilot also showed that the questions were easy to understand and that participants could answer them according to their working experiences. Therefore, the pilot interview data were also included in the data analysis.

The constant comparative method of grounded theory was adopted during the data analysis process as a whole. The researcher collected, analyzed, coded, and compared the data as part of a single, simultaneous exercise. These actions commenced with the first interview and continued until completion, with the purpose of identifying coded ideas and comparing them with those generated next from new data (Burns & Grove, 2001; Chenitz & Swanson, 1986). All verbatim transcriptions were sent to the two independent reviewers to assist in the data analysis. Data were analyzed and coded with three numbers; the first being the sequence of the case, the second the page number of the transcription in the Microsoft Word file, and the third the line number of the relevant paragraph. For instance, the code 1,1,6 stood for the analysis segment in case 1, page 1, sixth line (see Table 26 and Appendix 7). The transcripts were read line by line in order to develop a sensitivity to the content of the data at the lowest analytical level while still thinking about it at an abstract level (Strauss & Corbin, 1990). The data analysis was carried out in three stages, namely open, axial, and selective coding. Open coding means making a list which captures the substance of the data using the participants' own words and phrases (see Appendix 7 and Table 27). Smaller segments are then identified or combined with other substantive codes or concepts to form abstract categories (Jacobsson et al., 2004). Substantive codes consist of statements such as "I get familiar with the work content," "My supervisor has an impact on my awareness of safety," and "I am so strong that I do not care if I use the correct posture or not." These statements were also intended to be used in a future phase of the study to develop a questionnaire to characterize participants' safety behaviors and their impact on WMS.

The next stage is axial coding. Its purpose is to sort the information and to search for patterns. Categories and subcategories are combined according to their associations, which emerge from the transcribed texts of the interviews (Burns & Grove, 2001; Chenitz & Swanson, 1986). The final stage is selective coding, in which the categories are further classified into the themes emerging from the analysis, which have particular defining factors. All categories are then compared with the core categories so as to validate these relationships through comparison with existing and new data. Saturation was reached after 12 interviews. One further interview was conducted to ensure that the themes, categories, and subcategories were relevant.

Table 26

Coding Statistics of Interview Transcripts

Case	Line by Line Verbatim Transcript	Number of Open Codes
A	8 pages, 209 lines	118
B	4 pages, 110 lines	58
C	5 pages, 129 lines	92
D	6 pages,160 lines	71
E	6 pages, 184 lines	86
F	5 pages, 145 lines	69
G	4 pages, 121 lines	58
H	4 pages, 126 lines	63
I	4 pages, 107 lines	41
J	4 pages, 109 lines	45
K	4 pages,111 lines	57
L	3 pages,71 lines	45
M	3 pages, 67 lines	46
Total	60 pages, 1649 lines	849

Table 27

Sample Open Coding Template from a Single Case

Open Coding (highlighted text)	Conceptual Label
做事態度 - working attitude	Attitude toward safety
受到師傅影響而養成不好的習慣 - bad habits were formed by the influence of my master	Environmental influence of senior staff/mentors
師傅不説就不知道一些預防的措施 - you know little about prevention strategy without a master’s teaching	
師傅教會我很多 OSH 知識 - I learned a lot of OSH knowledge from my master	
拍檔之間的配合- cooperation with coworkers	
注意到細微的東西 - aware of the small things	
自我感覺很好的安全意識 - self-perceived safety awareness	Environmental influence of coworkers
從學徒開始做起- start working as a trainee	Awareness
訓練中能不能學會及應付 - learning and coping during training）	
從開始工作就需要去學守門的東西- start to learn safety from the start of working	Learning process in the formation of habits
形成了好的習慣就不用經常提醒自己 – you do not often remind yourself of safety issues if good habits are formed	
守門的形成可能與性格有一點關係 - a weak relationship between formation of habit and personality	
工作時行為的控制 - behavior control	
知道自己的能力水平- understanding one’s own capabilities	Controllability
很累了就需要停下來休息一下- I take a short break if fatigued	Coping as a prevention strategy

Results

A total of 13 interviews were completed which yielded 60 pages and 1649 lines of transcript and generated 849 open codes.

The analysis showed that all participants consistently mentioned the same outcome expectation in the workplace: 快靚正 (fast, efficient, good). All their work behaviors were strongly correlated with this term. This is the key feature of automaticity so the theme of WBA was established accordingly. WBA refers to a form of habitual behavior which is a cognitive and learned process because it is acquired and presented with little conscious awareness; it is uncontrollable, efficient, and fast. Table 28 presents a summary of the core categories and subcategories which construct WBA. The formation of WBA seems to follow a particular process; learning, reinforcement, formation, and modification. The learning step refers to the category of acquiring an attitude toward safety knowledge and the environment. It also includes learning about OSH and safety behaviors from supervisors and coworkers, as well as deriving information from the physical environment of the workplace. This kind of learning results in the gradual development of an attitude toward OSH (such as whether or not it is considered useful) and the environment (such as changes to the workplace or working methods). Such an attitude further supports decision making, which is reinforced by safety awareness, the importance of working for a living, and risk-taking beliefs. As a result, the habitual behavior is formed over time. Experience gained from others or with WMS may trigger modification of such habits.

Table 28

The Emerging Theory of WBA

Category	Subcategory
Attitude toward knowledge and environment	Effectiveness of OSH knowledge
	Environmental factors
Decision making	Safety awareness
	Importance of working for a living
	Risk-taking beliefs
Learning from experience of WMS	-
Work habitual behaviors	-

Attitudes toward Knowledge and the Environment

This consists of two subcategories; the effectiveness of OSH knowledge and environmental factors. The sources of such knowledge may be varied, such as television, radio, workshop, newspapers, roadshows, and so on. Many participants said that they had learned about OSH and mastered the requisite skills on the job. However, they had experienced difficulties in using this knowledge at work even though some of them understood that it was important to do so. They also doubted the necessity of using OSH skills in real work tasks because they were unable to do them in the prescribed way. For example, Participant B spoke about OSH knowledge in the context of restaurants:

> I thought that the OSH knowledge was useful and I followed OSH guidelines at work. Some of my colleagues did not accept this knowledge because they were too busy to use OSH skills in the workplace.

Other participants also commented on OSH knowledge in the workplace:

> I don't care about OSH requirements; I will do things my own way if the physical movement is convenient for me to complete the work task.

> It wastes too much time if I follow OSH's steps to do the work task.

> Although I have learned how OSH knowledge prevents WMSD, in reality it doesn't work in the workplace.

These participants pointed out that attitudes toward OSH knowledge are influenced by the demands of work, particularly in terms of pace and the working environment. The environment has physical (such as layout, height of workstations, and so on) and social (supervisors and coworkers) aspects. Learning about OSH from supervisors and coworkers is an interactive process. Such learned experiences gradually form attitudes toward safety behavior. One participant (I) spoke about the kitchen environment:

> The [kitchen] workplace was too small and my employer did not provide enough equipment, which increased the difficulty of completing tasks. For example, the burner and workstation were designed to be rather high, so you

> had to stand on a chair to work because the employer did not want to reduce the height of the workstation.

> I asked my employer to change the big fan in the kitchen, because it had been used for more than ten years. It made a lot of noise. The employer did not want to change it. I quit that job because I couldn't tolerate the noise.

> The trainee has little safety knowledge and you have to teach them how to do the work. They will learn which skills are better for them. They may learn from this master or that master or from coworkers; it depends on their attitude. You teach them what is safe behavior and they will listen, but put it away. They think that the best skills are those that will make them work fast and they don't care if the posture is correct or not.

> I feel ashamed if I use a trolley to move goods in the workplace because my supervisor and colleagues do not use it.

Decision Making

This consists of three subcategories; safety awareness, importance of working for a living, and risk-taking beliefs. The participants had more or less developed an awareness of safety at work, particularly when dealing with so-called hazardous tasks. Safety awareness may be developed from one's learning about OSH and the interaction with environmental factors. All participants regarded their jobs as very important for making a living, particularly for those who were married with children.

They would try to keep their jobs however hard they were. Therefore, when dealing with hazardous tasks at work, such as lifting a heavy container, the importance of retaining the job and the use of learned skills may induce risk-taking beliefs, and therefore trigger risky work behaviors. The participants spoke about these issues:

> When lifting heavy objects in the workplace, I try to transfer them separately so that I can avoid injury.

> While I am working, I think that it is easy for me to complete the manual handling operation; very simple.

> I have been working for a very long time (to earn more money to support the family).

> Although the job is hard for me, in order that I can have a better life, I have to do this job better however hard it is.

> I don't worry about injury at all if I lift a heavy object by myself, because I strongly believe that I can handle it alone.

> Although I clearly understand that if I do it in this way it may cause me injury, I will still perform this task, because it is not 100% guaranteed that I will be injured.

Work Habitual Behaviors

The data suggested that in this category, the formation of work habitual behaviors involves a higher level of cognitive and learned processes. Work habitual behavior consists of cues simulated in a relatively stable context. For instance, once a habit is formed, when facing risky tasks in the same context, the automatic response will immediately kick in quickly and unconsciously. Participant C spoke about his experiences of forming a work habitual behavior:

> When I was a trainee working in a restaurant, I didn't realize the severity of WMSD, therefore I made little conscious effort to use safe work behaviors all the time. Then I got used to such work methods in my daily routine. Now that I am becoming a master, I will firstly educate my trainees in the correct working posture. I must always train them and remind them to form good habits in the workplace … A trainee can become a master after a few years training. Because you have to manage changes at work, experience is important. In fact, after several months of teaching from your master, posture is gradually forming. The style or pattern is already something you are used to. So, at the very beginning of the teaching, it is crucial to instill knowledge and safety awareness in the trainees. Of course, it depends on the trainee's attitude toward safety … Because I have had a painful experience caused by the wrong working habits [lifting a heavy object led to a back injury], I have learned how to improve my work practices.

Learning from Experience of WMS

The work habitual behavior that has been formed can, however, be modified if the participant has learned from the experience of suffering from WMSD. Participant C, who reported lower back pain, spoke about his painful experience:

> I have worked as a Chinese chef for more than 30 years. I suffered lower back pain when I lifted a heavy container of boiling soup two years ago. In the past, I usually used incorrect postures to perform lifting tasks. I learned correct lifting posture, but I considered that WMSD were not a severe problem, and I had to work fast, so I was not alert to that incorrect lifting posture … After the painful experience of suffering from lower back pain, now I am quite serious about the lifting posture. But other people do not think like that. They often consider that if an injury is bleeding, then it is serious. However, lower back pain does not present with bleeding that people can see, so they underestimate the severity of WMSD.

Other participants also discussed WMS and how they had learned from the experiences of their coworkers:

> Because my colleague had WMSD and cannot return to work, I understand the seriousness of WMSD, so I follow the correct work methods and posture to do tasks at work.

> My colleague can continue his job even though his shoulder joint is swelling, so I therefore consider WMSD to be a little thing in the workplace, and I don't need to make any changes.

> I think even though I have WMSD, it will be OK if I take a break, so I don't need to make any changes in the workplace.

Therefore, if the correct message is sent to workers to enable them to change their views or attitudes toward the severity of WMSD, their habitual behaviors may change accordingly.

Discussion

The results of this qualitative study show that the key outcome expectation in the workplace – 快靚正 (fast, efficient, good) – was the main driving force behind the development of work habits. In other words, WBA is a mechanism for explaining the occurrence of safe and risky work behaviors. WBA is a higher cognitive and learning process because it is acquired and presented with little conscious awareness. It is uncontrollable, efficient, and fast. Learning, reinforcement, and modification are three steps towards the formation of WBA. Workers learn OSH knowledge from the government, organizational, and individuals (such as supervisors and coworkers). The interaction between such knowledge and their environment may then lead them to develop a style or attitude, which in turn supports their decision making. This is then reinforced by safety awareness, the importance of working for a living, and risk-taking beliefs. As a result, the work habitual behavior is formed over time in a stable context. The experience of from others with WMS may be reflected on to result in further modification of work habitual behaviors.

Attitudes to OSH Knowledge and Environment

As noted in Chapter II's description of OSH measures and regulations, the top-down transition of OSH knowledge from the government to organizations and individuals has been implemented by many countries worldwide. It is assumed that the more OSH knowledge given to workers, the fewer risky work behaviors they will perform. This is one of the strategies for injury prevention in the workplace. Another form of transferring OSH knowledge is parallel or interactive. The findings of this study support the SCT. This theory stresses that learning is a dynamic interaction among personal factors (knowledge, skills, experience, culture, and so on), the environment, and behavior (Bandura, 1977). The SCT defines the concept of observational learning, which is learning by watching others and mimicking their behavior to gain knowledge. Observational learning is most powerful when the individual modeling the behavior is considered to be authoritative or well respected (NCI, 2003). In the catering industry, chef trainees are under the supervision of the kitchen master, who is a powerful person in the restaurant. Trainees learn many skills (cutting, cooking, and so on) and safety behaviors from their master or coworkers. Unfortunately, such learning does not always lead to safety behavior and in fact can result in incorrect or risky behavior.

Attitude toward work behaviors are therefore developed during the learning process. If participants believe that OSH knowledge is positive, valuable, and beneficial, the more likely it is that they will perform tasks using the correct methods. If they believe that using incorrect methods could speed up a task, and their coworkers also behave in this way, it is more likely that they will adopt risky behaviors. These findings are also supported by the TRA and TPB (Ajzen, 2002).

It is therefore suggested that current means of imparting OSH knowledge in the catering industry are not effective in replacing incorrect or risky behaviors with safe work methods (Cole, 2002). Meanwhile, such attitudes toward OSH are also caused by time pressures, a rushed environment, and a fast pace of work. These demands may trigger cognitive changes (Feuerstein, 1996) in association with decision making.

Decision Making

The participants in this study said that their jobs were very important because they relied on them to support their families. Some also pointed out that they tended to use rapid but incorrect methods for daily work tasks as this might enable them to get through their work and go home on time. This outcome expectation strongly encouraged participants in their risk-taking beliefs (Bandura, 1986), namely that "if I can complete the job quickly, efficiently, and well, my supervisor may praise me and I can also go home on time." Accordingly, they did not always care what was correct and incorrect, and took risks with their usual methods even though they understood the possible consequences.

Training is an important component in prevention strategies. The main purpose of training is to raise safety awareness among target groups, but it does not always result in a greater appreciation of potential risks in the workplace (Bradshaw et al., 2011). Entzel, Albers, and Welch (2007) in their study of WMSD in masonry settings propose that successful efforts must not only raise awareness but also address practical skills. Training and workplace interventions should allow the worker to use their tools more effectively through increased knowledge and skills as well as raising awareness (Robertson & O'Neill, 2003).

At the early stages of decision making, individual cognitions such as attitudes trigger the occurrence of behavior as a result of information processing and deliberate planning, or a rational weighing of the potential costs and benefits of a behavior (Edwards, 1954; Lucas & Lloyd, 2005). This happens because workers lack the knowledge and skills to perform. At a later stage, a decision can be made quickly as skills have been acquired and their frequent performance is already becoming automatic.

Work Habitual Behaviors

Participants pointed out that they had already learned and formed their own patterns of behavior in performing hazardous tasks in the workplace. Such firmly established behavioral patterns are marked by increasing automaticity, decreasing awareness, and partial independence from reinforcement (Hunt et al., 1979). The outcome expectations reported by the participants were very clear and it was apparent that their automatic behavior was goal directed (Aarts & Dijksterhuis, 2000; Bargh, 1989), specifically to cues in a stable context. For instance, Chinese chefs work day after day in the same kitchen with the same equipment, and do the same tasks daily. Such repetition already makes them very skilful in handling tasks. When they see the orders, a series of automatic response or actions (such as putting the ingredients into a wok, grasping the spatula to stir the ingredients, and throwing the wok) occur with unconscious, uncontrolled, fast, and efficient movements. If such automatic responses have been formed with incorrect methods (such as lifting while bending the waist), it is harder to change these habitual behaviors with an injury prevention strategy. Therefore, before work habitual behaviors have been formed, knowledge and attitude are two important components in replacing risky work behaviors (Cole, 2002).

It was also found that the participants were stubborn about their behavior patterns. Changing such patterns is challenging. Nilsen, Bourne, and Verplanken (2008) propose four approaches to behavioral change; contextual, enforcement, education, and education plus contextual. Contextual change refers to changing the physical and social environment to prevent unsafe situations and conditions and/or promote safety-enhancing behavior. Enforcement denotes passing legislation to change undesirable habits. Both are upstream strategies to promote the desired behaviors. Education refers to launching the traditional training approaches to injury prevention. The final approach is education plus contextual change, which represents a combination of providing education and information with making contextual changes to increase openness to new information.

Learning from Experience of WMS

Some participants had gained experience of WMS from their own or others' experiences, or from medical information. For example, they spoke about colleagues who could no longer work because of WMS, which showed them the seriousness of this problem and stimulated an intention to change their own incorrect work habits. Some of them said that they had changed their behavior immediately after suffering WMS. Such painful experiences trigger their awareness of promoting safety behavior in the workplace. This finding is similar to that of perceived seriousness in the HBM. Most of the participants who did not have WMS viewed them as a relatively minor ailment which could be addressed by taking a short break or having a massage. Such a view greatly reduces their safety awareness while increasing their risk-taking beliefs. Interestingly, some participants pointed out that the symptoms were not a problem and they could choose to tolerate them while continuing to work. The most important thing for them was to stay in work and maintain their income. Therefore, medical information and knowledge about seriousness could be cues to future action, which would start someone on the way to changing their behavior (Bandura, 1986).

Conclusion and Limitations

WBA is the main theme of this qualitative study. WBA is a higher cognitive and learning process that is acquired and presented with little conscious thought; it is uncontrollable, efficient, and quick. Among the chefs who took part in this study, their WBA may therefore have impeded them in applying injury prevention strategies at work, particularly when facing hazardous tasks. WBA is formed through a process of learning and repetition. Attitudes toward the effectiveness of OSH knowledge and environmental factors operate alongside safety awareness, importance of working for a living, and risk-taking beliefs to develop WBA. Afterwards, learning from experience of the seriousness of WMSD could be considered as cues to future action in terms of changing work habits.

There are some limitations. All participants were asked to recall their past experiences and current situation in the catering industry. Recall may therefore have been a factor affecting what they really intended to share and discuss (Brandburg et al., 2013). The findings should therefore not be generalized to those outside this context.

Trustworthiness

Trustworthiness is often discussed in the context of having confidence about findings, including their truth, the degree to which they are applicable in other contexts, and consistency (Denzin & Lincoln, 2011). The terms credibility, dependability, confirmability, and transferability have been used to establish trustworthiness in qualitative studies (Polit & Beck, 2004). True value is the researcher's ability to establish credibility that the theory accurately represents the phenomenon under study (Denzin & Lincoln, 2011). In this study, member checks were used to ensure that emerging definitions and concepts were shared with all participants to secure credibility. Credibility was also achieved by prolonged engagement in the field and persistent observation. The previous two studies (1 and 2) also paved the way. Constant comparisons were adopted to ensure applicability between the interviewing data and the theory. Dependability refers to the pattern consistency of the data (Denzin & Lincoln, 2011). In this study, two independent reviewers were involved in the whole process of data analysis, including discussion meetings with the researcher. This helped to achieve dependability and confirmability.

Chapter VI – Study 4: The Development of the WBAS to Identify WMS in Chinese Chefs

As shown in the previous chapter, WBA may play an important role in the development of WMS. WBA is a higher cognitive and learning process which is acquired and presented with little conscious thought; it is uncontrollable, efficient, and fast (Moors & de Houwer, 2007). As discussed previously, the findings obtained from the participants in the qualitative study may not be capable of being generalized outside this context. Further examination is required to explore whether WBA can distinguish between those with or without WMS in the context of the catering industry. In this chapter, therefore, the WBAS is developed based on the findings of the qualitative study. Furthermore, it is proposed that workers with or without WMS may develop their own WBA, but only those whose WBA is undesirable will go on to develop WMS as a result of their poor work practices. The development of a WBAS may help us to measure such differences. Based on the results discussed in Chapter V, this chapter reports on the development of a measurement tool to identify undesirable WBA resulting in the development of WMS among Chinese chefs.

Literature Review

As discussed in Chapter II, the causes of WMS symptoms are multifactorial. The high prevalence of WMS and its tremendous costs and burdens to society have prompted considerable research attention to identifying the key risk factors in their development, with the goal of launching tailormade prevention strategies to reduce the likelihood of WMS among targeted workers.

The questionnaire remains a widely-used and common instrument to measure work behaviors. Verplanken and Orbell (2003) propose a 12-item index of habit strength, the Self-Report Habit Index (SRHI) to measure habit. Scores are recorded using a 7-point Likert-type scale ranging from 1 (agree) to 7 (disagree), with higher values indicating stronger habits. The SRHI has been shown to have high internal (pre- and posttest coefficient alphas of 0.89 and 0.92) and test-retest reliability ($r=0.91$). The results of principal components analyses suggest a one-dimensional structure. The SRHI has been widely used to study energy-balance related habits like exercise (De Bruijn & Rhodes, 2011; Rhodes, De Bruijn & Matheson, 2010) andbinge drinking (Norman, 2011). Such measurements can provide baseline information for future intervention strategies. However, no such scale has yet been developed to measure work habits in the field of workplace safety.

Feuerstein et al. (2005) propose a self-report Workstyle Questionnaire. This contains 10 subscales with a total of 91 items; (1) Working Through Pain, (2) Social Reactivity, (3) Limited Workplace Support, (4) Deadlines/Pressure, (5) Self-imposed Workpace/Workload, (6) Breaks, (7) Mood, (8) Pain/Tension, (9) Autonomic Response, and (10) Numbness/Tingling. This instrument has been shown to have good internal consistency (Cronbach's alpha=0.61-0.91) and test-retest reliability ($r=0.90$, $p<0.01$) in a group of office workers. A shorter 32-item version has since been developed as the original was considered to have too many items. The shortened version of the Workstyle Questionnaire, the Workstyle Short Form (WSF) also has good internal consistency (Cronbach's alpha=0.89) and test-retest reliability ($r=0.88$, $p<0.01$). The Workstyle Questionnaire has been used in the specific field of WMS, particularly among office workers (Sharan et al., 2011; Hutting et al., 2013). It has also been translated and cross-culturally adapted for use with Chinese populations (Cheng et al., 2014).

The SRHI is used to measure habit strength in very specific energy-balance behaviors like healthy eating, exercise, and drinking, which differ considerably from workplace scenarios. Most jobs consist of different work tasks and include various functional movements and equipment. Workplace behaviors themselves are a collection of movements toward a specific work task, which proceed to the job as a whole. It may therefore not be enough to identify a single behavior associated with the workplace and use it as a basis to measure habit strength. Doing so may also not enable us to build up a complete picture of work behaviors. Moreover, automaticity is considered to be one of the factors involved in developing habits (Verplanken & Orbell, 2003) so the hidden conceptual structure of WBA is underdeveloped. Although the Workstyle Questionnaire deals with similar concepts in explaining the development of WMS, there is no measurement tool currently in use which can quantify WBA and its effect on developing WMS. Therefore, there is a clear need to develop such a tool.

Chapter V has set out the basis for development of an item pool through its identification of categories and subcategories. All these items are used in the study reported here to develop a validated and reliable questionnaire to measure WBA in a group of Chinese chefs. This is followed by a case-control study which uses the instrument to discriminate between those with or without WMS in the workplace.

Method

A two-stage method was used to develop the WBAS. Stage one consisted of developing the measure itself, including; (1) identifying items based on the qualitative study; (2) a panel review of comprehensibility and readability; and (3) pilot testing and a study of test-retest reliability. Based on these three procedures, a final version of the WBAS emerged. Stage two covered the process of psychometric testing of the scale, consisting of; (1) factor analysis for testing construct validity; (2) internal consistency and item analysis; and (3) validity testing including criterion validity testing using the Chinese WSF (C-WSF), the known-group method for discrimination, and ROC analysis for instrument screening accuracy.

In epidemiological studies, the known-group method, also known as the case-control study design, has been widely used as an observational research method. It enables the identification of risk factors that may develop into a medical condition by comparing subjects who have the condition/disease (the cases) with those who do not have it but are otherwise similar (controls) (Mann, 2003). Examples of it use range from computer keyboard force and upper extremity symptoms (Feuerstein et al., 1997) to knee osteoarthritis and physical workload (Vrezas et al., 2010). A case-control study was selected in this study for three reasons; (1) it is widely used in the study of the epidemiology of WMS and WMSD; (2) it is more powerful than a cross-sectional or case study design in identifying the potential causal relationships among risk factors and outcomes; and (3) it is more cost effective than a cohort study.

Stage One – Developing the Measurement Scale

The purpose of this step was to systematically develop a final version of the WBAS. This involved item identification, evaluation of content validity, and pilot testing and evaluation of test-retest reliability.

Item selection. In the qualitative study, all the substantive codes captured in the open coding were made up of statements. A panel consisting of the researcher; two independent reviewers (those who had been involved in the qualitative study);

and two occupational therapists (one male aged 29 and one female aged 30, both with more than 5 years' experience in OSH and occupational rehabilitation) was formed to group the items in association with the subcategories. To capture as many items as possible in the scale, all those identified after open, axial, and selective coding were reserved. A final total of 94 items was included in the pilot scale.

Evaluation of content validity and pilot testing. In order to review the WBAS items, the comprehensibility and wording were discussed with three members of staff from labor unions, all of whom were male with more than five years' experience in organizing catering skills training. A pilot study was then carried out with eight Chinese chefs to evaluate comprehensibility, readability, and layout. The inclusion criteria for these participants were as follows:-

- Aged 18 or above;
- In full-time employment;
- Chinese, *dim sum*, or BBQ chef;
- In current post for more than a month.

The exclusion criteria were as follows:

- Previous accident or sudden injury that was work-related (such as dislocation, sports injury, fracture, or tendon tear);
- Symptoms before commencing the current job.

The feedback obtained from the labor union staff and the eight chefs was that the scale was easy to understand and had no major problems. The main question was its length, with all of them expressing concern that workers might not have enough time to complete the scale at work. However, it was decided to include all the items at this stage of development, since deletion of any items might lead to construct validity issues. All the items were included at the early stage of questionnaire development.

Evaluation of test-retest reliability. A further 30 catering workers were recruited by convenience sampling through the labor unions to evaluate the test-retest reliability of the WBAS. The inclusion criteria were having more than a year's experience in the current position, and being sufficiently literate to read and understand simple questions. All 30 workers completed the WBAS anonymously and voluntarily. After filling in the scale for the first time, each participant was given a return envelope containing the second form and asked to complete and return it 14 days later. Each survey was given a code in order to track who had responded. The researcher also checked the completion date of the second scale in order to ensure at least 14 days had elapsed between surveys.

The intra-class correlation coefficient (ICC) was used to estimate the test-retest reliability of the scale items. Of the 30 workers who had completed the first survey, 25 sent back the second, giving a response rate of 83.3%. The test-retest reliability indices of the WBAS as estimated using the ICC lay between 0.630 and 0.929 (see Table 29). If the criterion of ≧0.75 is adopted to indicate good reliability (Porney & Watkins, 2009) among the 51 items, 9 (18%) had an ICC of < 0.75, (highlighted in red text in Table 29). However, since content and construct validity were acceptable, and the ICC for these nine items was still close to the cutoff value of 0.75, the expert panel therefore considered it appropriate to adopt the pilot scale as the final version. The table presents those items where the ICC was greater than 0.60.

Table 29

Results of Test-Retest Reliability Evaluation

Category*	Subcategory	Item No.	ICC	95%CI
AKE	EOK	13	0.788	0.518-0.906
		14	0.780	0.501-0.903
		39	0.630	0.160-0.837
		46	0.871	0.708-0.943
		47	0.805	0.557-0.914
		56	0.892	0.755-0.952
		63	0.774	0.488-0.900
		65	0.782	0.506-0.904
		86	0.814	0.578-0.918
		40	0.822	0.596-0.921
		41	0.664	0.237-0.852
		92	0.851	0.662-0.934
		88	0.780	0.501-0.903
		78	0.814	0.578-0.918
		38	0.865	0.693-0.940
	EF	6	0.648	0.201-0.845
		25	0.728	0.382-0.880
		19	0.847	0.654-0.933
		70	0.860	0.683-0.938
		52	0.737	0.404-0.884
		20	0.778	0.496-0.902
		72	0.929	0.840-0.969
		17	0.819	0.590-0.920
DM	SA	29	0.887	0.744-0.950
		49	0.862	0.687-0.939
		50	0.710	0.341-0.872
	IWL	21	0.805	0.558-0.914
		22	0.735	0.400-0.883
		26	0.812	0.574-0.917
		87	0.844	0.646-0.931
	RTB	23	0.769	0.477-0.898
		43	0.744	0.420-0.887
		44	0.755	0.445-0.892
		59	0.919	0.817-0.964
WHB		4	0.738	0.405-0.884

	5	0.761	0.458-0.895
	7	0.812	0.574-0.917
	9	0.712	0.345-0.873
	33	0.923	0.826-0.966
	34	0.823	0.598-0.922
	51	0.804	0.554-0.913
	54	0.750	0.433-0.890
	76	0.747	0.427-0.889
	83	0.844	0.646-0.931
LEM	27	0.757	0.449-0.893
	30	0.858	0.678-0.937
	67	0.758	0.451-0.893
	68	0.770	0.478-0.899
	69	0.814	0.578-0.918
	71	0.837	0.630-0.928
	82	0.816	0.584-0.919

*Note: AKE denotes attitude toward knowledge and environment; DM decision making; LEM learning from experience of WMS; EOK effectiveness of OSH knowledge; EF environmental factors; SA safety awareness; IWL importance of working for a living; and RTB risk-taking beliefs.

Stage Two – Testing the Psychometric Properties of the WBAS

The purpose of this stage was to test the psychometric properties of the final version of the WBAS. Other than the WBA items, the survey contained other elements such as demographic characteristics (gender, age, working hours, exercise habits, and so on) plus a further set of questions, accompanied by a diagram of the body for reference when identifying symptom location, as follows:

- Have you had work-related musculoskeletal pain or discomfort at any time during the last 12 months?
- If yes, please identify the body part and indicate the duration, frequency and intensity of musculoskeletal symptoms:
    - How long does this musculoskeletal pain usually last?
    - How long have you had this musculoskeletal pain in the past year?

- On average, describe the intensity of the musculoskeletal pain using the given scale.

The previous 12-month prevalence of WMS was adopted from the NMQ (Kuorinka et al., 1987). The NMQ was developed in a project funded by the Nordic Council of Ministers in 1987 for the purpose of developing and testing a standardized questionnaire methodology allowing comparison of lower back, neck, shoulder, and general complaints for use in epidemiological studies. It is widely used to evaluate musculoskeletal problems among various populations including computer and call center workers (Bergqvist et al., 1995; Cook et al., 2000), car drivers (Porter et al., 2002), coopers in the whisky industry (Macdonald & Waclawski, 2006), nurses (Smith et al., 2004), forestry workers (Hagen, Magnus & Vetlesen, 1998), and catering staff (Chyuan et al., 2002; Chyuan, Ho, & Sung, 2005).

The questions about duration, frequency, and intensity were adopted from the work of Hales et al. (1992) and Feuerstein et al. (1997) evaluating musculoskeletal problems in workers using video display terminals. These three indices were used to overcome the difficulty, as discussed in Chapter II, of employees over- or underreporting work-related symptoms (Hales et al., 1992). These three indices were used to calculate the Cumulative Symptoms Severity Score (CSSS) as an evaluation of the severity of musculoskeletal symptoms. The CSSS is equal to the sum of the duration, frequency, and intensity scores. The indices range from 1 to 5, with a higher CSSS score denoting more severe symptoms. The Chinese version of the WSF (C-WSF) was also included to examine the criterion validity. The questionnaire as a whole can be found in Appendix 8.

Data collection procedures. Two separate methods were used to recruit participants. The first involved the labor unions, and the second the network established from Studies 1 and 2. The former method of recruitment was similar to that used in Study 3. The author phoned union staff to follow up the invitation letter sent to the labor unions during that study. After further discussion, it was decided to recruit participants through their monthly meeting. The labor unions involved were the Eating Establishment Employees' General Union, The Federation of Hong Kong Food and Beverage Industries Trade Unions, the Chinese and Western Food Workers Union, The Roast and Dried Meat Professional Association, and the Kwan Sang Catering Professional Employees' Association. A briefing session was held which covered the background and aims of the project, and explained how to administer the questionnaire. Written informed consent was then obtained from all participants. To encourage the participants to complete the questionnaires and to compensate them for their time and effort, HKD 50 (USD 7) was given to each after completion. On the basis of the time required to complete the survey, it was decided to administer it face to face. The duration of each interview was around 45 minutes. The questionnaires were completed at night from 22:30-01:00 in the labor unions' meeting or training premises.

Six Chinese restaurants were involved in the second phase of data collection, all of which were part of the same group. After getting permission from the firm's human resources department, the researcher contacted the managers of each restaurant to make an appointment to give them a briefing. Again, the questionnaires were administered via personal interview. The interviews took place during the lunch break (14:30-17:30) in the restaurants.

The response rate for the labor union surveys ranged from 52% to 82%. The main reasons for nonparticipation were that the survey was time-consuming. Some had to leave the meeting early for family reasons. In the second wave of data collection, the main reason given for failing to complete the questionnaire was that participants did not have enough time; either they had to start preparations for the dinner service, or they had personal business to attend to during the lunch period.

Table 30

Response Rate of Labor Unions and Restaurant Staff

Labor Union	Questionnaires Issued	Questionnaires Completed	Response Rate (%)
Eating Establishment Employees' General Union	92	68	74
The Federation of Hong Kong Food and Beverage Industries Trade Unions	23	12	52
Chinese and Western Food Workers Union	22	15	68
The Roast and Dried Meat Professional Association	115	94	82
Kwan Sang Catering Professional Employees Association	24	14	58
CF Restaurant Group	142	107	75

Participants. The inclusion criteria for survey participants were as follows:

- Aged 18 or above;
- In full-time employment;
- Chinese, *dim sum*, or BBQ chef;
- In current job for more than a month;
- Able to read Chinese; and
- Informed consent obtained.

The exclusion criteria were as follows:

- Previous accident or sudden injury that was work-related (such as dislocation, sports injury, fracture, or tendon tear);
- Symptoms before commencing the current job.

Statistical analyses. Descriptive statistics were used to assess the demographic characteristics of all respondents. Exploratory factor analysis (EFA) using the principal component extraction method followed by varimax rotation was used to explore the factor structure of the WBAS items. The internal consistency of the WBAS was assessed by calculating Cronbach's alpha.

Criterion-related reference validity was tested by comparing with CSSS and the C-WSF, which is a standardized test to measure WMS.

Known-groups construct validation analysis (from case and control) was conducted to examine the mean score difference of each subscale/subcategories between case and control, that is between those with and without WMS. The case here was defined as Chinese chefs with WMS. The symptoms reported in the fingers, hands, wrists, forearms, and/or elbow, neck, lower back, knee, and ankle areas could be as follows (Hales et al., 1992):

- Pain, aching, stiffness, burning, tingling, or numbness;
- Symptoms lasting more than one week or occurring at least once a month within the past year;
- Symptoms having developed since commencing the current job;
- No previous injury or trauma to the symptomatic area.

The control was defined as Chinese chefs without WMS.

Finally, ROC analyses were carried out to evaluate the screening accuracy of the WBAS in discriminating between those with and without WMS. Youden's index (Bewick, Cheek, & Ball, 2004) was used to choose a cutoff score as required to calculate the sensitivity and specificity of the WBAS. If the screening accuracy of ROC matched the acceptable level for the WBAS (AUC $\geqslant$ 0.70), hierarchical logistic regression was then used to test the validity of the scale and prediction modeling to assess the predictive accuracy of each subscale.

Hierarchical logistic regression was also used to calculate the OR and 95% CIs. The OR is a key parameter in any case-control study and is defined as "the ratio of the odds that the cases were exposed to the odds that the control was exposed" (Gordis, 2000, p. 164). In other words, it is a measure of association between exposure and disease that can be calculated in a case-control study. Hierarchical logistic regression was also used to explore differences between the case and control groups with the aim of statistically controlling for any confounding variables which may have influenced the scores of the dependent variable. The following confounding variables were adjusted for; age, years of work experience, leisure activities, and reported work demand.

The Pearson product-moment correlation coefficient was used to examine the relationship among categories and subcategories. All statistical analyses were performed using the IBM SPSS program version 20 for Windows with the significance level was set at $p < 0.05$.

Results

Participants' Demographic Characteristics

A total of 310 participants completed the survey, of whom 89% (n=276) were male and 11% (n=34) were female. Their age ranged from 18 to 71 with a mean of 39.44 (SD=11.72). The participants were then divided into a case group (n=217, 70%) and a control group (n=93, 30%).

Gender. Sixty-nine percent of male participants were in the case group, compared to 73.5% of females. No significant gender difference in risk estimates was found in the proportion of participants who reported pain (Pearson χ^2=0.23, *df*=1, p=0.63; OR=1.22; 95% CI=0.54-2.72).

Age. The participants were divided into four groups based on agent; under 30, 30-39, 40-49, and 50 or above. The difference in the number of participants in each group who reported WMS was statistically significant (Pearson χ^2=32.11, *df*=3, p=0.00). The older the participant, the more WMS reported.

Education. The participants were grouped into three categories based on educational level; primary school (P1-P6); junior high school (F1-F3); and high school (F4-F7), diploma, or above. Fifty-two (16.8%) had only attended primary school; 135 (43.5%) had attended junior high; 114 (36.8%) had gone to high school; and 8 (2.6%) had a diploma or above. There were no significant differences between these groups (Pearson χ^2=1.15, *df*=3, p=0.77).

Company size. The number of employees is a proxy for the size of the company. Participants were divided into four groups: very small company (fewer than 20 staff), small (20-49), medium (50-99), and large (100 or more staff). There were statistically significant differences in the number of participants in each group reporting WMS (Pearson χ^2=13.49, *df*=3, p=0.00). Workers in larger companies reported more symptoms.

Working hours. In general, participants reported that they worked 10 hours a day over 6 days a week. These patterns were consistent across both the case and control groups.

Time in current job. On average, the participants in the control group had been in their job for around 10 years, compared with 18 years in the case group. However, both standard deviations were large, indicating a wide discrepancy among participants.

Nature of job. This was defined as full- or part time. There were fewer full-time staff (n=90, 30.8%) in the control than the case (n=202, 69.2%) groups. However, in both groups only a few people worked part time (3 in the control and 10 in the case groups). There were no significant differences between full- and part-time staff in the risk estimates (Pearson χ^2=0.352, *df*=1, p=0.55; OR=1.485; 95% CI=0.39-5.53).

Breaks. More participants were given no breaks (n=171) than those who received breaks (n=134) but there were no significant differences between the two in risk estimates (Pearson χ^2=0.766, *df*=1, p=0.38; OR=0.80; 95% CI=0.49-1.32). Of those participants who did get breaks, all had about 1 per day lasting 30 minutes. Only 13% (n=55) performed stretching exercises during their breaks, but there were no significant differences between stretchers and nonstretchers in the risk estimates (Pearson χ^2=2.15, *df*=1, p=0.14; OR=0.635; 95% CI=0.35-1.17).

Exercise habits. More participants (n=151, 51%) reported they did not habitually exercise, while 18% (n=56) did so rarely (at most once a month) and 17% (n=53) did so occasionally (1-3 times each month). Only 13% (n=40) reported that they exercised frequently, or more than four times a month. No significant differences was found between these groups (Pearson χ^2=2.34, *df*=3, p=0.51).

Professional training. More participants had received no professional training (n=267, 87%) than had (n=39, 13%) in their current job, but there were no significant differences between the two groups in the risk estimates (Pearson χ^2=0.28, *df*=1, p=0.60; OR=0.83, 95% CI=0.40-1.69). Among those who had been trained, the average duration was just a few days with a large standard deviation in both the case and control groups.

Injury history. Participants were asked whether they had been injured in the past 12 months. The majority (n=265, 86%) had not been, although some had (n=43, 14%). There was a significant difference between those who had and had not been injured across the case and control groups (Pearson χ^2=10.09, *df*=1, p=0.001; OR=4.85; 95% CI=1.68-13.99). The average sick leave was 10.90 days (SD=62.75).

Table 31

Comparison of Demographic and Work Characteristics between Case and Control Groups (N=310)

	Group Difference (%)				
Variable	Control	Case	χ^2 (*p*)	OR#	95% CI
Gender Male Female	 84 (30.4) 9 (26.5)	 192 (69.6) 25 (73.5)	 0.23 (0.63)	 1.22	 0.54-2.72
Age ≦29 30-39 40-49 ≧50	34.41±12.62 47 (53.4) 16 (26.7) 19 (17.8) 11 (22.0)	41.65±10.60 41 (46.6) 44 (73.4) 88 (82.2) 39 (78.0)	 32.11 (0.000)	 -	 -
Education					

Primary school F1-F3 F4-F7 Diploma or above	 13 (25.0) 44 (32.6) 34 (29.8) 2 (25.0)	 39 (75.0) 91 (67.4) 80 (70.2) 6 (75.0)	 1.15 (0.77)	-	-
Company size (employees) < 20 20-49 50-99 ≧100	 58 (39.7) 19 (26.4) 10 (15.6) 6 (25.0)	 88 (60.3) 53 (73.6) 54 (84.4) 18 (75.0)	 13.49 (0.004)		
Working hours daily	10.33±1.67	10.55±2.39			
Working days weekly	5.78±0.78	6.054±3.84			
Time in current job (months)	118.88±135.82	211.69±135.17			
Job nature Full-time Part-time	 90 (30.8) 3 (23.1)	 202 (69.2) 10 (76.9)	 0.352 (0.55)	 1.485	 0.39-5.53
Breaks during working day No Yes If yes, then Rest times daily Mins per time Exercise at work No Yes	 47 (27.5) 43 (32.1) 0.69±0.91 28.92±43.74 69 (28.2) 21 (38.2)	 124 (72.5) 91 (67.9) 0.56±0.99 26.37±43.57 176 (71.8) 34 (61.8)	 0.766 (0.38) 2.15 (0.14)	 0.80 0.635	 0.49-1.32 0.35-1.17
Exercise habit No Seldom Occasional Often	 44 (27.8) 17 (30.4) 20 (37.7) 10 (25.0)	 114 (72.2) 39 (69.6) 33 (62.3) 30 (75.0)	 2.34 (0.51)		
Professional training received No Yes If yes, then days	 78 (29.2) 13 (33.3) 2.34±11.22	 189 (70.8) 26 (66.7) 5.58±32.39	 0.28 (0.60)	 0.83	 0.40-1.69
Injured in the					

past 12 months? No Yes	 88 (33.2) 4 (9.3)	 177 (66.8) 39 (90.7)	 10.09 (0.001)	 4.85	 1.68- 13.99
If yes, then Days of sick leave	0.44±2.95	10.90±62.75			

Note: # means risk estimate

Information about Participants' WMS

Of the 310 participants, 70% (n=217) reported that they had suffered some kind of musculoskeletal pain during the last 12 months (see Table 32). The most frequently reported WMS was located at shoulder joint (n=115, 37.1%). The CSSS ranged from 3 to 17 with a mean of 7.87 (SD=5.53).

Table 32

Participants' WMS During Preceding 12 months (N=310)

Variables	% (number)
Have you had work-related musculoskeletal pain or discomfort at any time during the last 12 months? No Yes	 30% (84) 70% (226)
Neck pain No Yes	 77.4% (240) 22.6% (70)
Shoulder pain No Yes	 62.9% (195) 37.1% (115)
Upper arm pain No Yes	 85.2% (264) 14.8% (46)
Elbow pain No Yes	 85.5% (265) 14.2% (44)
Lower arm pain No Yes	 91.0% (282) 9.0% (28)
Wrist pain No Yes	 74.8% (232) 25.2% (78)

Upper back pain		
No	91.0% (282)	
Yes	9.0% (28)	
Lower back pain		
No	73.2% (227)	
Yes	26.5% (82)	
Thigh pain		
No	91.6% (284)	
Yes	8.4% (26)	
Knee pain		
No	80.0% (248)	
Yes	19.7% (61)	
Leg pain		
No	88.7% (275)	
Yes	11.3% (35)	
Ankle pain		
No	83.2% (258)	
Yes	16.1% (50)	
Duration: How long does this pain usually last?		
Less than 1 hour		Score:
1 hour to 1 day	3.9% (12)	1
More than 1 day to 1 week	6.8% (21)	2
More than 1 week to 2 weeks	12.6%(39)	3
More than 2 weeks to 4 weeks	6.1% (19)	4
More than 1 month to 3 months	3.2% (10)	5
More than 3 months	5.2% (16)	6
	32.3% (100)	7
Frequency: How often have you had this pain over the past year?		
Almost never (every 6 months)	3.5% (11)	1
Rarely (every 2-3 months)	13.5% (42)	2
Sometimes (once a month)	18.4% (57)	3
Frequently (once a week)	21.0% (65)	4
Almost always (daily)	16.1% (50)	5
Intensity: On average, describe the intensity of the pain using the scale below.		
No pain	1.6% (5)	1
Mild pain	40.8% (120)	2
Moderate pain	30.6% (95)	3
Severe pain	3.2% (10)	4
Worst pain ever in life	0.3% (1)	5

Factor Structure

EFA was used with two purposes in mind; firstly to extract construct or latent factors, and secondly to refine and reduce the large number of items to a more manageable list before using them in the logistic regression (Pallant, 2007). Principal component extraction with varimax rotation was adopted, with all 94 items included. The Kaiser-Meyer-Olkin (KMO) value was 0.875, and Bartlett's test was significant (p=0.000), confirming that factor analysis was appropriate.

Initially, selecting for eigenvalues above 1 for each component resulted in 22 components explaining 67.476% of the variance. However, using the Kaiser criterion often leads to too many components being exacted (Pallant, 2007), so it was decided to use a scree plot. Figure 5 shows the scree plot of the factor analysis. It can be seen that there was a clear break between the fourth and fifth components, with the percentage of the variance in initial eigenvalues for the third, fourth, fifth, and sixth being 3.779, 3.323, 2.555, and 2.460, respectively). This suggested a four-factor structure which explained 38.441% of the cumulative variance among variables.

The factor loadings for the 94 items are presented in Table 33 and suggest some overlap or duplication across the four components. This is supported by the qualitative study, in that the wordings were drawn from substantive codes making up statements. For example, the statement "my productivity may be affected if I follow OSH guidelines" overlaps with that of "it wastes my time if I follow OSH guidelines." The factor loadings represent the correlations between the items and the component and indicate the extent to which the items purely represent the associated component (Lee, 1998). If there is cross-loading, and the difference is less than or equal to 0.2, it may be appropriate to delete these items (Ferguson & Cox, 1993). In addition, all 30 cross-loading items listed in Table 33 had low to large correlations with their components (ranging from 0.301 to 0.537). It can therefore be suggested that the factor loadings should be applied to retaining the items with a loading value greater or equal to 0.5 (Cohen, 1988). Therefore, those factor loadings with low to moderate correlations with their components (< 0.5) were deleted.

Comparison of the item classification between the qualitative study and the factor analysis showed that it might be difficult to distinguish some items across the four components (see Table 34). For instance, item 59 ("I am used to my own work habits and methods at work and no injury has occurred. It is bad luck if I get injured"), 44 ("I clearly understand I may be injured if I do it this way, but I still do it this way because I am not 100% sure to get injured"), and 45 ("I will take risks to fulfill work tasks") were all originally classified into the subcategory of risk-taking beliefs, but later loaded on to the category of attitudes toward OSH knowledge and the environment. The other three items loading on to risk-taking beliefs also loaded on to the category of learning from experience of WMS. Such distinctions may not be appropriate in the context of formation of WBA. The structure of WBA was therefore provisionally retained as a means to categorize the items generated in the qualitative study. The next phase, reliability analysis (internal consistency) and test-retest reliability, may provide more valuable information about item categorization.

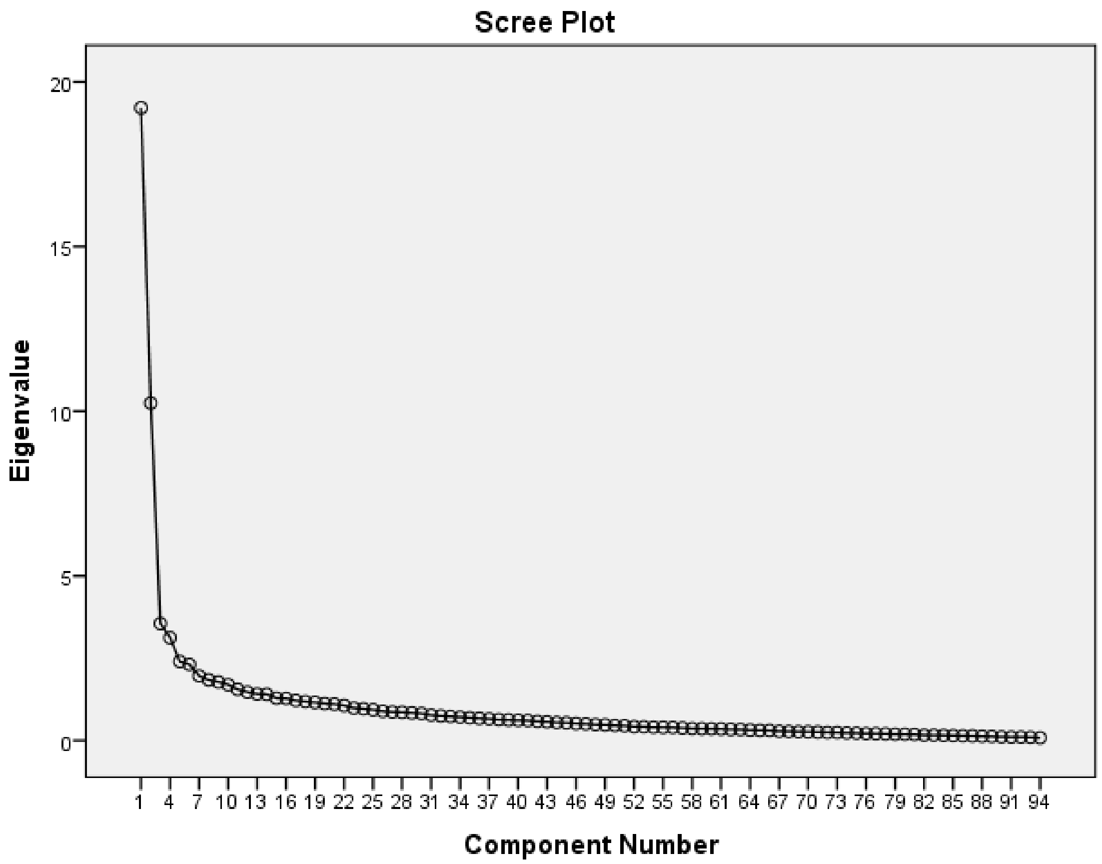


Figure 5. Scree plot of factor analysis.

Table 33

Factor Loadings from Principal Components Analysis

No	Question	Component 1	2	3	4
63	工作時因為工作緊張，所以我經常沒有按照正確的姿勢工作 Because of the work stress at work, I often do not work in the correct posture.	0.675			
59	平時我都是按照自己的工作習慣和方法來做的，結果什麼事情都沒有發生，即使受傷也是時運低造成的 I do my work according to my own ordinary work habits and methods, and nothing happens, even if the injury is due to bad luck.	0.633			
56	我覺得職安健的知識很有用，但是，工作太忙了，根本沒有辦法按照該方法來做 I think the knowledge of Occupational Health & Safety is useful, but I am too busy to work in this way.	0.62			
46	我知道正確的工作行為習慣，但是，實際操作過程中卻很難做到 I know the correct work habits, but in actual operation it is difficult to do.	0.62			
44	工作中我清楚知道這樣做會受傷，但是我仍然會去做，因為我不會百分百受傷 I clearly know that doing so could get me injured at work, but I will still do it, because I won't get injured a hundred percent.	0.606		0.326	
91	在工作上我認為最重要是速度快，不管姿勢是否正確 I think the most important thing at work is the speed, regardless of whether the posture is correct or not.	0.601			
39	因為上司要求快和準時收工，所以我不會按照職安健的方法來做 Because the supervisor demands speed and finishing the work on time, I do not follow the method of OSH.	0.596		0.38	
42	我認為某個工作姿勢適合或方便，我就會用那個工作姿勢，不管符不符合職安健的要求 I will adopt the work posture if I think it is suitable or convenient, whether it meets the requirement of OSH or not.	0.572		0.308	
65	儘管我知道什麼是正確的姿勢，但是因為工作急促就沒有考慮姿勢是否正確了 Even though I know what the correct posture is, because of the speed of work, I have not considered adopting the posture.	0.56			
43	我認為自己做慣的這個動作或姿勢才能完成這項工作，相反正確的姿勢我就做不完 I think I can only complete the work in my habitual movement or posture; I couldn't complete the work in the right posture.	0.558			
45	為了完成工作任務，即使有受傷的危險也要去做 In order to complete the task, even if there is the danger of injury I will also do it.	0.555			
86	我知道自己工作的姿勢不對，但是沒有辦法去改變 I know I'm working in the wrong posture, but there is no way to change it.	0.546		0.332	
40	我認為按照職安健的方法來做就會導致生產力受到影響 I think doing the work according to the methods of OSH will affect productivity.	0.535		0.357	

41	由於上司或老闆給了我很多無形的壓力，促使我形成不正確的工作習慣和方法 Due to a lot of invisible pressure from the boss and the supervisor, I form the incorrect working habits and methods.	0.524			0.347
92	因為在工作上每個人都想表現自己，所以不僅產品品質要高而且生產速度要快 Because everyone wants to show himself on the job, not only production quality should be higher, but production speed should also be faster.	0.518			
88	儘管我知道因為工作環境的原因導致自己的工作方法或習慣不對，但是也只能慢慢去適應 Although I know that the working environment leads to my incorrect working methods or habits, I can only slowly adapt to it.	0.518			0.305
58	我事事親力親為，儘量不給同事添麻煩，所以提舉重物時都不喜歡叫別人幫忙，自己一個人完成 I always do things by myself and try not to bother my colleagues, so when lifting heavy objects I don't like to ask others to help, I do it myself.	0.514			
78	因為工作環境不允許，所以我認為根本上不可能按照職安健的方法來預防筋骨勞損 Because the working environment does not allow it, I don't think we can prevent musculoskeletal disorders according to the methods of OSH.	0.498			
32	我認為工作中按照職安健步驟來做會浪費我好多時間 I think work in accordance with the steps of OSH will waste a lot of time for me.	0.495		0.391	
90	雖然我知道職安健關於如何預防筋骨勞損的知識，但是實際上用不上.Even though I know the knowledge of OSH about how to prevent MSDs, it is not practical.	0.486		0.456	
61	長時間工作讓我感到精神壓力很大 Long work makes me very stressful.	0.483			0.434
48	職安健所講的預防筋骨勞損的方法基本無用，工作中的事情只能靠自己隨機應變處理 The methods of OSH about how to prevent MSDs are useless; what happens during the work can only be dealt with according to the situation.	0.465			0.301
85	我覺得用正確的姿勢工作很不自然 I think working in the right posture is very unnatural.	0.45		0.42	
38	工作中我常常要求自己儘快做完工作，準時收工 I often demand myself to finish my work as soon as possible, and complete it on time.	0.439			
93	我認為工作速度慢就會被上司或同事罵 I think working slowly will lead to being scolded by the boss and coworkers.	0.431			0.413
60	工作時一分鐘就是一分鐘，非常緊張 One minute is a minute at work; very stressful.	0.411			
66	因為在工作中我一直都沒有留意有關姿勢的問題，所以就形成了一個危險的工作習慣 Because I didn't pay attention to posture at work, I developed a risky work habit.	0.407			0.335
31	工作中很多的人力提舉動作，我認為自己都能夠做到，很簡單 There is a lot of manual handling at work. I think I can do it; it is very simple.	0.398	0.318		
64	我認為即使有筋骨勞損，應該休息一下就好了 I think that even if there is MSD, taking a break will be OK.	0.398			
83	工作上我會思考和研究，所以老闆很放心我的工作 I think and research at work, so my boss trusts my work.		0.665		
6	我的工作場所提供了安全操作指引 My workplace provides safe operating guidelines.		0.625		0.319
57	我和同事的關係很好 My colleagues and I have very good relations.		0.618		

4	我的上司會幫助同事一起改善工作方法 My supervisor will help to improve the working methods with colleagues.		0.594		
50	我明白到安全意識終身受用，因為它會幫助我產生一種慣性行為，從而預防受傷 I understand that safety consciousness is beneficial for my lifetime, because it will help me to generate an inertial behavior, so as to prevent injury.		0.592		
51	我明白到付出更大的努力才能比別人積累更多的經驗，從而更好地預防受傷 I understand that I should make greater effort to accumulate more experience than others, so as to better prevent injury.		0.585		
7	我會按照安全操作指引來工作 I will work in accordance with the safety operation guidelines.		0.581		
5	我會向同事學習，從而幫助自己改善工作方法 I will learn from colleagues to help improve my working method.		0.569		
36	我非常熟悉自己的工作要求 I am very familiar with my job requirements.		0.567		
30	我認為筋骨勞損的問題是自己一輩子的事情，很嚴重 I think the MSD is a lifetime thing; very serious.		0.536		
82	假如受傷了，我會問自己為什麼這麼大意，然後思考有什麼更好的方法可以預防出錯 If injured, I would ask myself why I was so careless, and then think about what is the better way to prevent errors.		0.535		
27	因為同事患病，我知道了筋骨勞損的嚴重性，所以工作中我會按正確的方法和姿勢來做 Because of my colleagues getting ill, I know the seriousness of MSDs. I work in the correct way and posture.		0.524	0.377	
10	看見同事因為工作姿勢不對而被人罵，我學會了怎樣做 Seeing colleagues being scolded because of incorrect work postures, I learned how to do it.		0.497		
3	工作中，當我覺得身體不舒服或疼痛時，我會想辦法改善工作方法 At work, when I feel uncomfortable or in pain, I'll think of some way to improve the working methods.		0.494		
2	工作時我很注重安全意識 I pay attention to safety awareness at work.		0.492		
34	我非常關注工作上有關的安全守則 I pay much attention to the safety regulations about the work.		0.486		
76	我會自己研究工作方法來預防受傷 I will study work methods to prevent injuries.		0.485		
55	我有自己的一套方法來預防筋骨勞損 I have my own a set of methods to prevent MSDs.		0.485		
33	我認為工作要講步驟，每個步驟你都要去研究，以防受傷 I think the work should take steps; each step you should study to prevent injury.		0.479		
54	由於明白到在長時間工作下不可以持續發力，所以我會把工作控制在自己的能力範圍內進行 Due to understanding that under long working hours I can't exert force constantly, I will control the work within the scope of my ability.		0.472		
49	我剛開始工作時已經有很好的安全意識 When I began to work I already had good consciousness of safety.		0.46		
9	我會留意上司或同事的工作方法 I will pay attention to the working methods of my supervisor or colleagues.		0.459		

29	因為我的工作經驗豐富，所以我的安全意識十分強 Because of my rich work experience, my safety consciousness is very strong.		0.449		
94	因為我知道筋骨勞損的嚴重性，導致我對它有恐懼感，所以在工作中學會了如何保護自己 Because I know the seriousness of MSDs, I fear it, and I learned how to protect myself at work.		0.441		0.33
81	我經常分析和研究工作方法，慢慢就形成了一個適合我自己的工作行為習慣 I often analyze and research on the work methods; slowly I formed suitable work habits of my own.		0.437		
1	工作場所的佈局和設計適合我工作 The layout and the design of the workplace are suitable for my work.		0.411		0.347
68	對我來說，錢不是最重要的，身體才是最重要 For me, money is not the most important thing; the body is most important.		0.401		
80	工作上我會為自己編排一套自己需要的工作姿勢及動作 At work I will compile a set of postures and movements needed for myself.		0.346		0.33
71	我覺得流血的受傷才嚴重，筋骨勞損其實不嚴重 I think bleeding injuries are severe; MSDs are not serious.			0.685	
14	我有自己的工作習慣和方法，我認為其他方法都是多餘的 I have my own work habits and methods. I think other methods are extra.			0.673	
67	對我來說，筋骨勞損是小問題 For me, MSDs are small problems.			0.623	
87	我不想放假休息，這樣我就可以獲得更多的收入 I don't want to have a holiday, so I can get more income.			0.618	
23	即使我用不正確的姿勢搬東西，受傷也不會這麼巧發生在我身上 Even if I use the incorrect posture to lift things, injury will not happen to me by chance.			0.604	
25	因為更快完成工作可以獲得上司稱讚，所以我會用危險的工作習慣和方法 Supervisor praise can be obtained by finishing the work faster, so I use risky work habits and methods.			0.585	
24	如果我用手推車搬東西就會覺得自己很沒有用，因為其他同事都沒有用手推車來搬東西 If I use the cart to move things I will feel that I am very useless, because other colleagues do not use carts to move things.			0.558	
69	我沒有筋骨勞損的問題，我不需要留意職安健的資訊 I don't have MSDs. I don't need to pay attention to the information of OSH.			0.545	
11	同事的肩膀腫起來了仍繼續正常工作，所以我認為筋骨勞損其實很小事 My colleague's shoulder got swollen, but he still continued to work normally, so I think MSDs are actually small things.			0.532	
47	職安健所講的預防筋骨勞損的方法基本上沒有用，因為老闆不允許我這樣做, because my boss wouldn't allow me to do so.	0.379		0.528	
70	我覺得我的上司不重視職安健 I don't think my boss attaches great importance to OSH.			0.505	0.301
73	我的老闆寧願補錢也不願意我休息，因為我的工作很重要 My boss would rather compensate to me than let me rest, because my job is very important.			0.499	0.366

28	搬重物時我會儘量分開多次來搬，因為我知道搬過重的重物非常容易受傷 When I lift heavy things I try to separate it into several goes, because I know that moving overweight objects is a very easy way to get injured.		0.423	0.49	
74	對於搬抬重物，我認為叫同事幫忙很浪費時間 For lifting heavy things, I think asking colleagues for help is quite a waste of time.	0.435		0.473	
13	我不是很接受職安健預防筋骨勞損的方法，因為我一直都習慣了自己的一套方法 I don't quite accept the methods of OSH, because I have been accustomed to my own set of methods.			0.468	
84	我覺得用正確的姿勢工作很麻煩，很浪費時間 I think working in the right posture is very troublesome; it's such a waste of time.	0.398		0.442	
89	雖然我知道一個人去搬抬過重的重物不對，但是我沒有其他更好的辦法 Although I know that lifting overweight objects alone is wrong, I have no better way.	0.436		0.441	
35	我認為我的同事/上司缺乏安全意識 I think my colleagues/boss lack safety awareness.			0.417	0.397
8	因為我覺得自己的身體可以應付，所以我一點都不擔心獨自搬抬重物會受傷 Because I think my body can take it, I don't worry about whether lifting heavy objects alone could get me injured.			0.413	
77	我很長時間都沒有休息了 I have had no rest for a long time.	0.356		0.379	
22	儘管工作辛苦，但為了家庭，即使痛也要繼續工作 Despite the work being hard, for the sake of my family, even if there is pain I will also continue to work.				0.589
52	我的工作需要長時間操作，這讓我感到很疲勞 My job needs a long time of operation. This makes me very tired.				0.553
20	我工作的環境非常不適合我工作 My working environment is very unsuitable for me to work in.			0.468	0.537
21	儘管工作辛苦，但為了賺更多錢，將來退休沒有那麼辛苦，即使痛也要繼續工作 Despite the work being hard, in order to make more money so that I wouldn't be so painstaking when retiring in the future, I will continue to work even if there is pain.				0.532
72	老闆對我的工作要求特別嚴格，讓我感到壓力很大 The boss is particularly strict with my work. That makes me very stressed.				0.52
16	如果我工作期間休息一下，其他同事就會有意見 If I take a break during work, other colleagues will have bad opinions of me.			0.344	0.52
15	我知道雖然每個人都很怕筋骨勞損，但是為了生活只能繼續做 I know that although everyone is afraid of MSDs, for the sake of our life we can only continue working.				0.509

17	我認為老闆不喜歡同事在工作期間做運動 I think the boss wouldn't like the colleagues doing exercises at work.				0.496
18	如果我知道不正確的工作姿勢會導致受傷或有嚴重後遺症，我就會去改 If I knew the incorrect posture would lead to injury or severe sequela, I would change it.		0.335		-0.495
37	工作時間長讓我覺得很疲勞，尤其在工作後半段時 Long working hours make me feel very tired, especially during the second half of the work.	0.309			0.489
12	工作中，由於人手不足的問題導致我的精神變得很緊張，經常出錯 At work, short-handed problems cause me to be nervous and often make mistakes.				-0.489
19	我認為工作上動作快非常重要，因為動作慢就會被同事/上司說 I think it is important to work fast, because working slowly will lead to being criticized by colleagues/boss.				0.477
79	我很留意自己的工作行為習慣，因為我是家庭的經濟支柱 I really pay attention to my work habits, because I am the economic pillar of my family.		0.373		-0.475
75	我的工作程式很複雜，需要很多的準備功夫，所以我很注意每個工作步驟 My work program is very complicated, it needs a lot of preparation, so I pay great attention to each working step.		0.311		-0.466
62	因為要生活，所以再苦再累也要做好這份工作 In order to live, I should do the job even if it is painful and tiring.	0.377			0.463
53	因為經歷了錯誤的工作行為習慣所帶來的痛苦，所以我學會了如何檢點自己的工作方法 Having experienced the pain resulting from the wrong work habits, I learned how to check my work methods.		0.355		0.46
26	為了生活，即使工作很辛苦我都可以應付 In order to live, even if the work is very hard, I can handle it.				0.439

Table 34

Items Classification in Categories and Subcategories

Category	No	Question	Mat*	Or#
AKE	63	工作時因為工作緊張，所以我經常沒有按照正確的姿勢工作 Because of the work stress at work, I often do not work in the correct posture.	Yes	
	59	平時我都是按照自己的工作習慣和方法來做的，結果什麼事情都沒有發生，即使受傷也是時運低造成的 I do my work according to my own ordinary work habits and methods, and nothing happens, even if the injury is due to bad luck.	No	RTB
	56	我覺得職安健的知識很有用，但是，工作太忙了，根本沒有辦法按照該方法來做 I think the knowledge of Occupational Health & Safety is useful, but I am too busy to work in this way.	Yes	
	46	我知道正確的工作行為習慣，但是，實際操作過程中卻很難做到 I know the correct work habits, but in actual operation it is difficult to do.	Yes	
	44	工作中我清楚知道這樣做會受傷，但是我仍然會去做，因為我不會百分百受傷 I clearly know that doing so could get me injured at work, but I will still do it, because I won't get injured a hundred percent.	No	RTB
	91	在工作上我認為最重要是速度快，不管姿勢是否正確 I think the most important thing at work is the speed, regardless of whether the posture is correct or not.	Yes	
	39	因為上司要求快和準時收工，所以我不會按照職安健的方法來做 Because the supervisor demands speed and finishing the work on time, I do not follow the method of OSH.	Yes	
	42	我認為某個工作姿勢適合或方便，我就會用那個工作姿勢，不管符不符合職安健的要求 I will adopt the work posture if I think it is suitable or convenient, whether it meets the requirement of OSH or not.	Yes	
	65	儘管我知道什麼是正確的姿勢，但是因為工作急促就沒有考慮姿勢是否正確了 Even though I know what the correct posture is, because of the speed of work, I have not considered adopting the posture.	Yes	
	43	我認為自己做慣的這個動作或姿勢才能完成這項工作，相反正確的姿勢我就做不完 I think I can only complete the work in my habitual movement or posture; I couldn't complete the work in the right posture.	Yes	
	45	為了完成工作任務，即使有受傷的危險也要去做 In order to complete the task, even if there is the danger of injury I will also do it.	No	RTB
	86	我知道自己工作的姿勢不對，但是沒有辦法去改變 I know I'm working in the wrong posture, but there is no way to change it.	Yes	
	40	我認為按照職安健的方法來做就會導致生產力受到影響 I think doing the work according to the methods of OSH will affect productivity.	Yes	
	41	由於上司或老闆給了我很多無形的壓力，促使我形成不正確的工作習慣和方法 Due to a lot of invisible pressure from the boss and the supervisor, I form incorrect working habits and methods.	Yes	
	92	因為在工作上每個人都想表現自己，所以不僅產品品質要高而且生產速度要快 Because everyone wants to show himself on the job, not only production quality should be higher, but also production speed should be faster.	Yes	
	88	儘管我知道因為工作環境的原因導致自己的工作方法或習慣不對，但是也只能慢慢去適應 Although I know that the working environment leads to my incorrect working methods or habits, I can only slowly adapt to it.	Yes	
	58	我事事親力親為，儘量不給同事添麻煩，所以提舉重物時都不喜歡叫別人幫忙，自己一個人完成 I always do things by myself and try not to bother my colleagues, so when lifting heavy objects I don't like to ask others to help. I do it myself.	Yes	
	78	因為工作環境不允許，所以我認為根本上不可能按照職安健的方法來預防筋骨勞損 Because the working environment does not allow it, I don't think we can prevent musculoskeletal disorders according to	Yes	

		the methods of OSH.		
	38	工作中我常常要求自己儘快做完工作，準時收工 I often demand myself to finish my work as soon as possible, and complete it on time.	Yes	
	60	工作時一分鐘就是一分鐘，非常緊張 One minute is a minute at work; very stressful.	Yes	
	64	我認為即使有筋骨勞損，應該休息一下就好了 I think that even if there is MSD, taking a break will be OK.	No	LEM
WHB	83	工作上我會思考和研究，所以老闆很放心我的工作 I think and research at work, so my boss trusts my work.	Yes	
	6	我的工作場所提供了安全操作指引 My workplace provides safe operating guidelines.	No	EF
	57	我和同事的關係很好 My colleagues and I have very good relations.	No	EF
	4	我的上司會幫助同事一起改善工作方法 My supervisor will help to improve the working methods with colleagues.	Yes	
	50	我明白到安全意識終身受用，因為它會幫助我產生一種慣性行為，從而預防受傷 I understand that safety consciousness is beneficial for my lifetime, because it will help me to generate an inertial behavior so as to prevent injury.	No	SA
	51	我明白到付出更大的努力才能比別人積累更多的經驗，從而更好地預防受傷 I understand that I should make greater effort to accumulate more experience than others, so as to better prevent injury.	Yes	
	7	我會按照安全操作指引來工作 I will work in accordance with the safety operation guidelines.	Yes	
	5	我會向同事學習，從而幫助自己改善工作方法 I will learn from colleagues to help improve my working method.	Yes	
	36	我非常熟悉自己的工作要求 I am very familiar with my job requirements.	No	EF
	30	我認為筋骨勞損的問題是自己一輩子的事情，很嚴重 I think MSD is a lifetime thing; very serious.	No	LEM
	82	假如受傷了，我會問自己為什麼這麼大意，然後思考有什麼更好的方法可以預防出錯 If injured, I would ask myself why I was so careless, and then think about what is the better way to prevent errors.	No	LEM
	27	因為同事患病，我知道了筋骨勞損的嚴重性，所以工作中我會按正確的方法和姿勢來做 Because of my colleagues getting ill, I know the seriousness of MSDs, so I work in the correct way and posture.	No	LEM
	10	看見同事因為工作姿勢不對而被人罵，我學會了怎樣做 Seeing colleagues be scolded because of incorrect work postures, I learned how to do it.	No	LEM
	3	工作中，當我覺得身體不舒服或疼痛時，我會想辦法改善工作方法 At work, when I feel uncomfortable or in pain, I'll think of some way to improve the working methods.	No	LEM
	2	工作時我很注重安全意識 I pay attention to safety awareness at work.	No	SA
	34	我非常關注工作上有關的安全守則 I pay much attention to the safety regulations about the work.	Yes	
	76	我會自己研究工作方法來預防受傷 I will study work methods to prevent injuries.	Yes	
	55	我有自己的一套方法來預防筋骨勞損 I have my own set of methods to prevent MSDs.	Yes	
	33	我認為工作要講步驟，每個步驟你都要去研究，以防受傷 I think the work should take steps. Each step you should study to prevent injury.	Yes	
	54	由於明白到在長時間工作下不可以持續發力，所以我會把工作控制在自己的能力範圍內進行 Due to understanding that under long working hours I can't exert force constantly, I will control the work within the scope of my ability.	Yes	
	49	我剛開始工作時已經有很好的安全意識 When I began to work I already had good consciousness of safety.	No	SA
	9	我會留意上司或同事的工作方法 I will pay attention to the working methods of my supervisor or colleagues.	Yes	
	29	因為我的工作經驗豐富，所以我的安全意識十分強 Because of my rich work experience, my safety consciousness is very strong.	No	SA
	81	我經常分析和研究工作方法，慢慢就形成了一個適合我自己的工作行為習慣 I often analyze and research the work methods. Slowly I formed suitable work habits of my own.	Yes	

	68	對我來說，錢不是最重要的，身體才是最重要 For me, money is not the most important thing. The body is most important.	No	LEM
LEM	71	我覺得流血的受傷才嚴重，筋骨勞損其實不嚴重 I think bleeding injuries are severe. MSDs are not serious.	Yes	
	14	我有自己的工作習慣和方法，我認為其他方法都是多餘的 I have my own work habits and methods. I think other methods are extra.	No	EOK
	67	對我來說，筋骨勞損是小問題 For me, MSDs are small problems.	Yes	
	87	我不想放假休息，這樣我就可以獲得更多的收入 I don't want to have a holiday, so I can get more income.	No	IWL
	23	即使我用不正確的姿勢搬東西，受傷也不會這麼巧發生在我身上 Even if I use an incorrect posture to lift things, injury will not happen to me by chance.	No	RTB
	25	因為更快完成工作可以獲得上司稱讚，所以我會用危險的工作習慣和方法 Supervisor praise can be obtained by finishing the work faster, so I use risky work habits and methods.	No	EF
	24	如果我用手推車搬東西就會覺得自己很沒有用，因為其他同事都沒有用手推車來搬東西 If I use the cart to move things I will feel that I am very useless, because other colleagues do not use carts to move things.	No	EF
	69	我沒有筋骨勞損的問題，我不需要留意職安健的資訊 I don't have MSDs. I don't need to pay attention to the information of OSH.	Yes	
	11	同事的肩膀腫起來了仍繼續正常工作，所以我認為筋骨勞損其實很小事 My colleague's shoulder got swollen, but he still continued to work normally, so I think MSDs are actually small things.	Yes	
	47	職安健所講的預防筋骨勞損的方法基本上沒有用，因為老闆不允許我這樣做, because my boss wouldn't allow me to do so.	No	AKE
	70	我覺得我的上司不重視職安健 I don't think my boss attaches great importance to OSH.	No	EF
	13	我不是很接受職安健預防筋骨勞損的方法，因為我一直都習慣了自己的一套方法 I don't quite accept the methods of OSH, because I have been accustomed to my own set of methods.	No	EOK
	8	因為我覺得自己的身體可以應付，所以我一點都不擔心獨自搬抬重物會受傷 Because I think my body can take it, I don't worry that lifting heavy objects alone could get me injured.	No	RTB
DM	22	儘管工作辛苦，但為了家庭，即使痛也要繼續工作 Despite the work being hard, for the sake of my family, even if there is pain I will also continue to work.	Yes	
	52	我的工作需要長時間操作，這讓我感到很疲勞	No	EF
	20	我工作的環境非常不適合我工作 My working environment is very unsuitable for me to work in.	No	EF
	21	儘管工作辛苦，但為了賺更多錢，將來退休沒有那麼辛苦，即使痛也要繼續工作 Despite the work being hard, in order to make more money so that I wouldn't be so painstaking when retiring in the future, I will continue to work even if there is pain.	Yes	
	72	老闆對我的工作要求特別嚴格，讓我感到壓力很大 The boss is particularly strict with my work. That makes me very stressed.	No	EF
	15	我知道雖然每個人都很怕筋骨勞損，但是為了生活只能繼續做 I know that although everyone is afraid of MSDs, for the sake of our life we can only continue doing it.	Yes	
	17	我認為老闆不喜歡同事在工作期間做運動 I think the boss wouldn't like the colleagues doing exercises at work.	No	EF
	12	工作中，由於人手不足的問題導致我的精神變得很緊張，經常出錯 At work, short-handed problems cause me to be nervous and often make mistakes.	No	EF
	19	我認為工作上動作快非常重要，因為動作慢就會被同事/上司說 I think it important to work fast, because working slowly will lead to being criticized by colleagues/boss.	No	EF
	26	為了生活，即使工作很辛苦我都可以應付 In order to live, even if the work is very hard, I can handle it.	Yes	

Note: AKE denotes attitude toward knowledge and environment; DM decision making; LEM learning from experience of WMS; EOK effectiveness of OSH knowledge; EF environmental factors; SA safety awareness; IWL importance of working for a living; and RTB risk-taking beliefs.

# denotes the original subcategory in which this item was classified in the qualitative study;
* denotes a match between factor loading and the original design in the qualitative study.

Internal Consistency

Internal consistency and item analysis were also employed to test the relationship between items and their subcategories and categories. Cronbach's alpha ranged from 0.653 to 0.755 across all subcategories. Table 35 shows that the analysis of internal consistency suggested deleting 17 items.

Table 35

Items Recommended for Deletion after Internal Consistency and Item Analysis

Item	Category*	Corrected Item-Total Correlation	Cronbach's Alpha (if deleted)	Final Cronbach's Alpha
91	EOK	0.159	0.736	0.755
42		0.178	0.755	
43		0.051	0.746	
58		0.179	0.736	
60		0.130	0.737	
57	EF	0.146	0.623	0.719
24		0.086	0.661	
12		0.110	0.638	
2	SA	0.159	0.680	0.680
15	IWL	0.220	0.684	0.684
8	RTB	0.012	0.656	0.653
55	WHB	0.158	0.735	0.740

81		0.186	0.736	
64	LEM	0.047	0.642	0.700
10		0.197	0.617	
3		0.181	0.621	
11		0.100	0.642	

Note:* LEM denotes learning from experience of WMS; EOK effectiveness of OSH knowledge; EF environmental factors; SA safety awareness; IWL importance of working for a living; and RTB risk-taking beliefs.

Criterion Reference Validity

The C-WSF has been validated and culturally adapted for use with Hong Kong catering workers (Cheng et al., 2014). It was therefore used to test criterion validity for the WBAS. Each subscale across both scales was tested using Pearson correlation analysis. If a correlation is 0.5 or above, the association is large because at least 25% of the variance is shared (Kinnear & Gray, 2010). Table 36 summarizes the results of the descriptive analysis of the C-WSF for the case and control groups.

Table 36

Descriptive Analysis of C-WSF Variables for the Case (n=217) and Control (n=93) Groups

Variable	Control	Case
	Mean (SD)	Mean (SD)
Working through pain	11.57 (5.55)	14.13 (3.86)
Social reactivity	11.19 (4.24)	11.91 (4.30)
Limited workplace support	8.61 (3.04)	9.51 (2.79)
Deadlines/pressure	8.24 (3.27)	9.16 (2.40)
Self-imposed workpace/workload	6.78 (2.14)	6.99 (1.78)
Breaks	3.31 (1.82)	3.81 (1.55)
Mood	0.96 (1.32)	1.47(1.75)
Autonomic	0.02 (0.15)	0.16 (0.52)
C-WSF total score	50.69 (12.92)	57.14 (11.37)

Table 37 presents the Pearson correlation analysis results between the C-WSF and WABS. Significant and large correlations were found between the total scores for both ($r=-0.57$, $p<0.01$) and between EOK and working through pain ($r=-0.534$, $p<0.01$) and limited workplace support ($r=-0.544$, $p<0.01$); EF and working through pain ($r=-0.525$, $p<0.01$); and IWL and social reactivity ($r=-0.501$, $p<0.01$).

Table 37

Pearson Correlation Analysis of C-WSF and WABS

	total	EOK	EF	SA	IWL	RTB	WHB	LEM	1	2	3	4	5	6	7	8	9
WABS total score	1	.859**	.776**	.282**	.641**	.751**	.494**	.669**	-.565**	-.516**	-.400**	-.405**	-.400**	-.025	-.099	-.182**	-.098
EOK		1	.664**	.003	.593**	.716**	.111	.378**	-.655**	-.534**	-.459**	-.544**	-.471**	-.128*	-.122*	-.155**	-.069
EF			1	.005	.628**	.499**	.177**	.348**	-.600**	-.525**	-.411**	-.493**	-.451**	-.035	-.084	-.160**	-.101
SA				1	-.072	.147**	.531**	.353**	.079	.004	.041	.166**	.047	.140*	.074	-.138*	-.002
IWL					1	.434**	.024	.192**	-.542**	-.394**	-.501**	-.428**	-.333**	-.226**	-.016	-.038	-.011
RTB						1	.199**	.416**	-.484**	-.389**	-.371**	-.412**	-.362**	-.064	-.075	-.045	-.098
WHB							1	.563**	.057	-.091	.083	.188**	.053	.210**	-.034	-.146*	-.062
LEM								1	-.118*	-.201**	-.044	.009	-.076	.118*	-.075	-.123*	-.090
1									1	.757**	.770**	.744**	.666**	.397**	.215**	.190**	.120*
2										1	.518**	.382**	.393**	.075	.015	.056	.012
3											1	.522**	.352**	.203**	-.067	-.001	-.010
4												1	.507**	.282**	.132*	.036	.029
5													1	.234**	.129*	.005	-.050
6														1	.180**	-.017	.044
7															1	.060	.058
8																1	.531**
9																	1

Note: 1 denotes C-WSF total score; 2 working through pain; 3 social reactivity; 4 limited workplace support; 5 deadlines/pressure; 6 self-imposed workpace/workload; 7 breaks; 8 mood; and 9 autonomic. * denotes $p<0.05$; ** denotes $p<0.01$.

Correlational Analyses of WBAS Variables

Correlation describes the strength and direction of the relationship between two variables for both interval and ordinal data (Munro, 2001). A correlational analysis of the WBAS variables was performed using the zero-order Pearson's product-moment correlation coefficient. Table 38 presents a descriptive analysis of the WABS variables.

At the category level, the category of attitude toward OSH knowledge and environment (AKE), decision making (DM), risk taking belief (RTB), work habitual behavior (WHB) and learning from experience of WMS (LEM) were significantly correlated with one another; AKE and DM ($r=0.60$, $p<0.01$), AKE and RTB ($r=0.70$, $p<0.01$), AKE and WHB ($r=0.15$, $p<0.05$), AKE and LEM ($r=0.40$, $p<0.01$), DM and RTB ($r=0.47$, $p<0.01$), DM and WHB ($r=0.29$, $p<0.01$), DM and LEM ($r=0.35$, $p<0.01$), RTB and WM ($r=0.20$, $p<0.01$), RTB and LEM ($r=0.42$, $p<0.01$), and WHB and LEM ($r=0.56$, $p<0.01$).

At the subcategory level, EOK and EF were significantly correlated with AKE ($r=0.67$, $p<0.01$). However, in the category DM, there was no significant correlation between SA and IWL ($r=-0.07$, $p>0.05$) (Table 39).

Table 38

Descriptive Analysis of WBAS Variables for Case (n=217) and Control (n=93) Groups

Variable	Control	Case	t*	p
	Mean (SD)	Mean (SD)		
EOK	46.37 (9.80)	42.94 (8.87)	3.01	0.003
EF	25.98 (4.55)	23.00 (4.64)	5.21	0.000
SA	10.30 (2.01)	11.20 (1.67)	4.09	0.000
IWL	12.25 (3.42)	10.47 (3.14)	4.43	0.000
RTB	12.83 (2.95)	12.92 (2.74)	0.26	0.80
WHB	36.94 (5.94)	37.58 (4.35)	1.07	0.29
LEM	25.44 (4.70)	25.78 (3.74)	0.67	0.50

Note: * t value obtained from independent samples t-test.

Table 39

Correlations among WBAS Categories

	AKE	EOK	EF	DM	SA	IWL	RTB	WHB	LEM
AKE	1	.96**	.85**	.60**	.004	.66**	.70**	.15*	.40**
EOK		1	.67**	.54**	.003	.59**	.72**	.11	.38**
EF			1	.57**	.005	.63**	.50**	.18**	.35**
DM				1	.43**	.87**	.47**	.29**	.35**
SA					1	-.07	.15**	.53**	.35**
IWL						1	.43**	.02	.19**
RTB							1	.20**	.42**
WHB								1	.56**
LEM									1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Known-group Validity Testing and ROC

In the known-groups validation design, the results of an independent samples t-test showed that EOK ($t=3.01$, $p<0.01$), EF ($t=5.21$, $p<0.01$), SA ($t=4.09$, $p<0.01$) and IWL ($t=4.43$, $p<0.01$) were all significantly different between participants with and without WMS (see Table 38).

To test the screening accuracy of the WBAS, ROC analyses were also adopted to discriminate between those with or without WMS. The ROC curve is a popular graphical method of displaying the discriminatory accuracy of a diagnostic test which has been widely used in distinguishing between two populations (Fluss, Faraggi & Reiser, 2005). Moreover, Youden's index (Bewick, Cheek & Ball, 2004) was used to choose an optimal cutoff score by calculating sensitivity and specificity for the WBAS.

The WBAS score ranges from 51 to 255 (a total of 51 items with responses captured using a 5-point Likert-type scale ranging from 1=strongly disagree to 5=strongly agree). The higher the score, the more WBA the participant has. The independent samples t-test found a significant difference in WBAS scores between the control (M=170.10, SD=24.34) and case [M=163.90, SD=20.03; $t(308)=2.33$, $p=0.02$] groups.

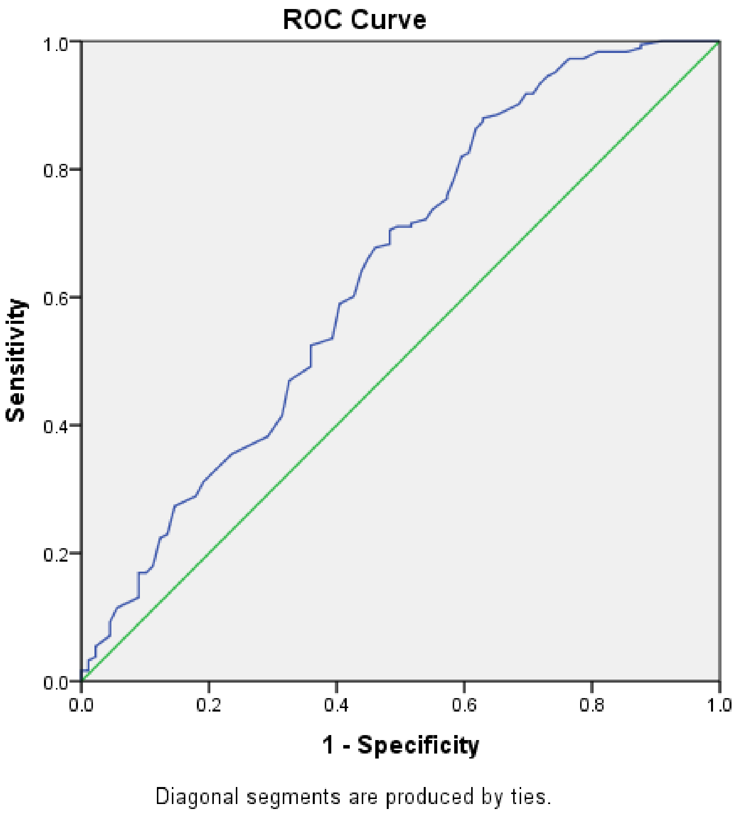


Figure 6. ROC curve analysis for total WBAS score.

The ROC curve analysis showed that the area under the curve (AUC) was 0.65, the asymptotic significance < 0.01, and the asymptotic 95% CI lay between 0.568 to

0.714. The Youden's index can be defined as $J = \max_c \{Se(c) + Sp(c) - 1\}$ and ranges between 0 and 1, so it represents the optimal threshold value for which Se(c)+Sp(c)-1 is maximized (Greiner & Gardner, 2000). According to the ROC analysis, a cutoff value of 179.5 from the result of the curve coordinates generated the maximum value 0.251 for the formula Se(c)+Sp(c)-1, which represents a sensitivity of 0.880 (88%) and a specificity of 0.371 (37.1%).

Logistic Regression Analysis

Given that the screening accuracy of ROC for the WBAS was acceptable, hierarchical logistic regression was used to further test the validity of the scale. Logistic regression is a technique used for predicting the probability of a binary outcome (Munro, 2001). It was employed here to control for the confounding variables and calculate the OR and 95% CI. The adjusted variables are summarized in Table 40.

Table 40

Adjusted Variables in the Hierarchical Logistic Regression Analysis

Step	Confounding Variables	Dependent Variable	Independent Variable	Method
1	1. Age; 2. Injury during the past 12 months	Pain (yes/no)		Enter
2			1. Gender; 2. Educational level; 3. Company size (employees); 4. Time in current job (months); 5. Breaks during working; 6. Exercise habit; 7. Professional training received 8. Total score of C-WSF	Enter
3			EOK EF SA IWL RTB WHB LEM	Enter

Step 1: Confounding variables involved only. Logistic regression was firstly conducted to assess whether the confounding variables, age and injury involved significantly predicted whether or not a Chinese chef would have WMS. When these two predictor variables were considered together, they did significantly predict this outcome (χ^2= 34.98, *df*=8, *N*=310, p<0.001). Table 41 presents the OR and 95% CI for this prediction model without other variables being considered.

Table 41

Results of Logistic Regression Analysis with Confounding Variables

Variable	*b*	*SE*	Wald	*P*	OR	95% CI
Age	0.054	.012	20.345	.000	1.056	1.031-1.081
Injury involved	1.620	.550	8.681	.003	5.052	1.720-14.837

Note: confounding Variable(s) entered on step 1: age, injury involved.

The first column, labeled *b*, lists the logit coefficients of the predictor variables. These unstandardized logistic regression coefficients correspond to the *b* coefficients in an ordinary least squares (OLS) regression (Garson, 2001). These parameter estimates describe the steepness and direction of the logistic regression curve (Wright, 1995). Unlike OLS regression, however, a logistic regression calculates changes in the log odds of the dependent variable. The Wald statistic listed in the third column tests the significance of the logit coefficient associated with a given independent variable. This corresponds to the significance testing of *b* coefficients in an OLS regression (Garson, 2001). The column labeled OR is an estimate of the increase in the likelihood of returning to work associated with an increase in the predictor variable of one unit, when the other independent variables in the model are controlled (Wright, 1995). The OR is always 0 or greater, and it is 1 when membership in the case and control group is equally likely. Moreover, the odds are proportional; a variable with an OR of 2 has double the effect of one with an OR of 1.

Step 2: Demographic data and C-WSF. The hierarchical logistic regression model was further used to control for confounding variables (age and injury during the past 12 months). In this model, . The combination of age and injury significantly predicted the same outcome ($\chi^2 =$ 29.97, *df*=8, *N*=310, p<0.001). However, when the eight predictor variables were also involved, this model added to the predictive power of age and injury. In particular, the pseudo-R^2 (from 0.160 to 0.282) and percentage correct (from 73.3% to 75.7%) were higher than when only age and injury were entered, and were the same as found when all variables were entered simultaneously.

Table 42

Results of Hierarchical Logistic Regression Analysis with Seven Predictor Variables Entered (Adjusted for Age and Injury)

Variable	*b*	*SE*	Wald	*P*	OR	95% CI
Age	.035	.020	3.037	.081	1.036	0.996-1.078
Injured involved	1.518	.576	6.947	.008	4.563	1.476-14.107
Gender	.804	.498	2.607	.106	2.235	0.842-5.934
Education level	.374	.190	3.847	.050	1.453	1.000-2.110
Company Size	.045	.073	.376	.540	1.046	0.906-1.207
Time in Current Job	.004	.002	6.665	.010	1.004	1.001-1.008
Job Nature	-.156	.312	.249	.618	.856	0.464-1.579
Breaks	.049	.134	.135	.714	1.050	0.421-1.931
Exercise Habit	-.345	.451	.586	.444	.708	0.808-1.365
Professional Training	.040	.013	10.005	.002	1.041	0.293-1.713
C-WSF	-6.359	1.500	17.974	.000	.002	1.015-1.067

Note: Independent variable(s) entered on step 2: gender, education level, company size, time in current job, Job nature, Breaks, Exercise habit, and professional training, C-WSF.

Step 3: Seven Predictor Variables from WBAS. In this model, the seven variables significantly predicted whether or not a Chinese chef had WMS (χ^2=30.64, *df*=7, *N*=310, p<0.001). When the seven predictor variables were involved, this model significantly added to their predictive power. In particular, the pseudo R^2 (from 0.282 to 0.395) and percentage correct (from 75.7% to 80.1%) were higher than if the above ten variables alone had been entered.

Comparing the results from Step 1, 2, and 3 showed that EF, SA, and RTB were the strongest predictors of who would be in the control and who in the case groups, after adjusting for the confounding variables.

Table 43

Results of Hierarchical Logistic Regression Analysis with Seven Predictor Variables Entered (EOK, EF, SA, IWL, RTB, WHB, LEM)

Variable	*b*	*SE*	Wald	*P*	OR	95% CI
Age	.011	.022	.261	.609	1.011	.969-1.056
Injury	1.745	.613	8.112	.004	5.726	1.723-19.026
Gender	.992	.513	3.744	.053	2.696	.987-7.364
Education	.219	.208	1.105	.293	1.245	.828-1.872
Company size	.027	.050	.299	.584	1.028	.932-1.132
Time in job	.004	.002	5.078	.024	1.004	1.001-1.008
Job nature	-.063	.332	.037	.848	.939	.489-1.799
Breaks	.136	.146	.871	.351	1.146	.861-1.527
Exercise habit	-.476	.492	.935	.334	.621	.237-1.630
Professional training	.027	.018	2.111	.146	1.027	.991-1.065
C-WSF	-.039	.030	1.672	.196	.962	.907-1.020
EOK	-.106	.052	4.226	.040	.899	.812-.995
EF	.375	.109	11.890	.001	1.456	1.176-1.802
SA	-.059	.063	.870	.351	.943	.832-1.067
IWL	.242	.085	8.047	.005	1.273	1.078-1.505
RTB	-.053	.044	1.479	.224	.948	.871-1.033
WHB	.045	.057	.641	.423	1.046	.937-1.169
LEM	.011	.022	.261	.609	1.011	.969-1.056

Goodness of fit tests were then used to determine which of the models derived from the three block trials best described the WMS reported by participants. The Hosmer-Lemeshow goodness of fit test was adopted (Hosmer & Lemeshow, 1989). A small Hosmer-Lemeshow χ^2 value and high probability (>0.10) test statistics indicate a reasonable fit between the predicted model and the observed data (Terry et al., 2003). In other words, insignificant results suggest a good model fit whereas significant results suggest a poor fit (Munro, 2001).

Table 44 summarizes the results of the Hosmer-Lemeshow goodness of fit test on the three models. The best appeared to be Model 3, which had a χ^2 of 3.54 (p=0.89). This model only included the predictors EF, SA, and RTB. The percentage correct predictions of the participants' WMS were 73.3% for Model 1, 75.7% for Model 2, and 80.1% for Model 3.

In logistic regression analysis, the dependent variable is binary (0: control without musculoskeletal discomfort or pain; 1: case with musculoskeletal discomfort or pain). This did not include parameters of the strength of the discomfort or pain including duration, frequency, and intensity. To further examine the predictive strength of EF, SA, and RTB for participants' symptoms, multiple linear regression was adopted. CSSS was set as the dependent variable and the seven predictors (EOK, EF, SA, IWL, RTB, WHB, and LEM) as independent variables to predict it. The results were consistent with the findings from the logistic regression which found that EF (Beta=-0.243, t=-2.649, p=0.009), SA (Beta=0.227, t=3.825, p=0.000), and RTB (Beta=0.268, t=3.251, p=0.001) were the strongest predictors of CSSS.

Table 44 *Results of the Hosmer-Lemeshow Goodness of Fit Test on the Logistic Regression Model*

Model*	χ^2	p value	Correct prediction percentage	Adj R^2	Adj R^{2a}	Adj R^{2b}
1	6.70	.57	73.3%	0.160	-	-
2	18.45	.02	75.7%	-	0.282	-
3	4.97	.76	80.1%	-	-	0.395

Model represents the models generated from Step 1, 2, and 3. [a] Adjusted for age and injury. [b] Adjusted for age, injury, education level, company size, time in current job, job nature, breaks, exercise habit, professional training, and C-WSF

Discussion

This chapter has reported on the development and testing of the 51-item self-report WBAS. The results have shown that the WBAS is reliable and valid for use with Chinese chefs in the catering industry. In the qualitative study reported in the previous chapter, the core theme of "fast, efficient, and good" helped to explain the mechanism of formation of WBA in the workplace. The characteristics of WBA as unconscious, uncontrollable, efficient, and fast suggest that it is a higher cognitive and learning process. The case-control study has shown that EF, SA, and RTB were the strongest predictors of WMS. They were statistically tested and the results demonstrated that they played an important role in the formation of WBA and further contribute to the development of WMS.

Role of the Environment

Learning, reinforcement, and modification are the three steps in the formation of WBA. Environmental factors include the physical workplace, safety guidelines, and the actions of supervisors and coworkers. In such complicated circumstances, the last of these factors seems to be the most direct and important (Hauer et al., 2014). Making the transition from an unskilled to a skilled worker can be daunting for someone who enters the workplace with the aim of achieving the outcome "fast, efficient, and good" (Pereira, 2008). The supervisor therefore has an important responsibility for encouraging the worker's daily practices. For instance, if the supervisor's work methods or practices focus only on being fast and good, without considering any safety behaviors or placing much store on OSH knowledge, his or her style will present a negative role model for workers (Berggren & Severinsson, 2006). Gradually, the worker may learn from this model and develop his or her own risky safety behaviors. Therefore, during this process of learning and developing WBA, there is an important need to improve supervisors' ability, particularly in relation to work methods or practices affected by OSH, to support workers in taking the necessary action. This can be done by means of enhancing their OSH knowledge and competence (Koolhaas et al., 2010).

On the other hand, when people are learning in the working environment, how they perceive the importance of safety behavior, drawing on the example of supervisors or coworkers, is also crucial. Perceived group norms as specified in the TPB are one of the best predictors of employee participation (Mohr, VanDeusen, Lukas, & Meterko, 2008). Establishing strong norms and values may therefore influence employee participation and change in the workplace.

Awareness of Safety

The findings of this study indicate that participants with lower safety awareness were 1.4 times more likely to suffer from WMS than those with higher awareness. Safety awareness has been reported as a significant risk factor in WMSD. Whysall, Haslam, and Haslam (2006) use a stage of change approach, combining 24 multi-component occupational interventions geared to reducing WMSD. These interventions were significantly more effective in promoting safety awareness and desired behavioral change among workers. Raising awareness of risks, risk severity, and susceptibility through providing graphic information, details of the probability and significance of illness/injury, and case studies of sufferers was one of the core components of the occupational interventions. It was particularly effective in the precontemplation stage (that is, where the worker sees no need to change as WMSD is not considered a significant risk). Moreover, skill training with participation, feedback, and assistance with tools/equipment was also stressed in the action stage. Such intervention programs suggest that changes in safety-related behaviors are cognitive and learned processes which need to be repeated. Once the safety behavior has been formed and is becoming automatic, significant reduction in WMS can be achieved.

Training has been identified as an important component of prevention strategies. Training is a way of sharing knowledge to enhance work skills and raise safety awareness. These two critical purposes must be embedded in any intervention program seeking to implement prevention strategies in the workplace (Bradshaw et al., 2011; Entzel, Albers & Welch, 2007; Robertson & O'Neill, 2003). Skills training can not only increase participants' knowledge but also promote their self-efficacy through the experience of mastery (Bandura, 1977; Bandura, 1986; Bandura, 1994). This is why some workers do not consider behavioral change; they believe that their tasks can be completed on the basis of their mastery of skills experience, whether or not they understand the associated risk.

Beliefs about Risk

The findings of this study have also shown that risk-taking behaviors in the workplace are often motivated by the following factors; importance of working for a living, influence of supervisor and/or coworkers, and belief in fate. Firstly, in Hong Kong culture, having a job is very important. These workers were heavily reliant on their jobs to support their families. As they worked for around 10 hours a day, they tended to use rapid but incorrect methods to complete their tasks in the hope of being able to leave early, or at least on time. Some had found that they could not do so if they strictly followed OSH guidelines and used the correct postures. This outcome expectation strongly encouraged them to take risks in the workplace (Bandura, 1986). Secondly, employees may feel compelled to follow the norms in the workplace, as developed by their supervisor and coworkers, instead of observing OSH guidelines or safe work practices. They may feel out of place or weird because correct postures do not match the standards of their workplace culture. Thirdly, based on their reported perceptions of the degree of exposure to the risk factors, many participants in this study believed that they had developed WMS as a result of fate or bad luck. They framed risk-taking behaviors as either inevitable or just part of the job (Hunter & Silverstein, 2014). It may therefore be suggested that if a worker lacks awareness of his or her potential for developing WMS, views WMS as normal, or blames him- or herself for the onset of symptoms (Hunter & Silverstein, 2014), the higher the probability that he or she may take risks at work. Consequently, there may be a higher probability of such a worker suffering from WMS or WMSD.

It has also been suggested that risk-taking behaviors are motivated by sensation-seeking and individual personality traits, particularly in terms of sexual behavior (Cross, Cyrenne & Brown, 2013) and driving (Nordfjærn & Rundmo, 2013; Yang et al., 2013; Bachoo, Bhagwanjee & Govender, 2013). However, there is little research on the relationship between these factors and the development of WMS.

Screening Accuracy of the WBAS

Based on the qualitative study, which was used to develop the item pool, followed by a series of psychometric tests including item analysis, factor analysis, and reliability testing, the final WBAS consists of 51 items along seven subscales (EOK, EF, SA, IWL, RTB, WHB, and LEM). The ROC analysis reported a sensitivity of 0.880, specificity of 0.371, and AUC of 0.650. According to Fan, Upadhye, and Worster (2006), an AUC value of 0.5 indicates no discriminative value (that is, 50% sensitive and 50% specific). In general, ROC curves with AUC of 0.75 are not clinically useful and an AUC of 0.97 has a very high clinical value. However, an area of at least 0.70 indicates acceptable discrimination (Hosmer & Lemeshow, 2000). This result is almost exactly consistent with the findings of the validation study using the C-WSF which identified an AUC of 0.711 (Cheng et al., 2014). The WBAS is acceptable as a screening scale for WMS, but is not suitable for clinical use.

Conclusion and Limitations

Study 4 supports the findings of the qualitative work and identifies three strong predictors of WMS (SA, EF, and RTB) by controlling for a series of confounding variables. If workers have little awareness of safety in terms of undesirable WBA, have learned the job in an unsafe working environment (both physical and social), and strongly believe in taking risks at work, they are more likely to form poor working habits and have more chance of developing WMS than other workers. The WBAS has demonstrated acceptable screening accuracy between the case and control groups, and a strong correlation with the C-WSF.

However, the study does have some limitations. Firstly, the participants came from five labor unions and six Chinese restaurants with a response rate ranging from 52-82%, which may have introduced selection bias. Secondly, self-reported data has the inherent potential limitation of recall bias, whether or not the informant had WMS. The true effect of this on the risk estimates cannot be reliably estimated (Vrezas et al., 2010). Finally, based on the possible selection and recall bias, the generalizability of these findings to other industries or populations may be limited.

Chapter VII - General Discussion

In the four studies reported here, the 51-item self-report WBAS has been developed and tested for reliability and validity based on a cross-sectional survey, an onsite ergonomic field study, and qualitative and case-control studies. The WBAS was developed for use as a direct measure of safe or risky work behaviors which are assumed to contribute to the development of WMS. It demonstrates high internal reliability and acceptable screening accuracy in differentiating between workers with or without WMS in the case-control study.

Study 1 shows that chefs in Chinese restaurants have the highest prevalence of WMS among workers in the catering industry in Hong Kong (prevalence rate of 70%). Moreover, they report higher pain intensity compared with those who worked in floor roles and other sectors, particularly at the shoulder. Frequency of movement also has a strong relationship with WMS, which is consistent with previous studies. Study 2 is a case presentation of an onsite ergonomic assessment carried out to identify the risk factors for WMS in chefs working at a medium-sized Chinese restaurant. It shows that prolonged standing and awkward lifting posture with fast and repetitive upper limb movements are the most undesirable work postures or practices, and can be considered as the main risk factors for WMS. Such postures or practices are quite common in the catering industry. However, the chefs in this study preferred to use them rather than a correct posture (such as using a torso rather than a leg lift, even when the workers knew and understood how to perform manual handling tasks correctly). This might be because such behaviors lead to desirable outcomes or consequences (such as completing the job on time or being praised by supervisors or coworkers), which are positively reinforced (rewarded), and then become automatic over a long period. In the short term, they overlook the consequences (pain or discomfort) of using incorrect postures, particularly when compared with these so-called desirable outcomes. Workers may not experience any discomfort, pain, or injury at the time of the movement even if they are using incorrect posture. This might positively reinforce such behavior. Equally, they may actually suffer discomfort but have become used to it (Vink & Kompier, 1997) and consider it as the inevitable price of working.

The qualitative study (Study 3) identified similar findings. The concept of WBA is derived from the core theme expressed by participants of "fast, efficient, and good." It is therefore defined as a form of work habitual behavior. It is also a goal-directed cognitive and learning process because it is acquired and presented with little conscious though, and is uncontrollable, efficient, and fast. The study constructs the four steps of the formation of WBA; learning, reinforcement, formation, and modification. As a whole, the construct seems to combine the elements captured from behaviorism, constructivism, and socioculturalism.

Maintaining consistent compliance with safety behaviors requires frequent positive reinforcement (Cole, 2002). This might come from supervisors and coworkers' appraisal and the rewards from getting the job done on time, or the reduction of discomfort after using correct postures. However, behavioral changes are also presented as a form of information processing. Mental processing is required to develop a plan to guide direct action toward desired goals and to reach those goals by overcoming barriers (Bower & Morrow, 1990). This is why little conscious thought (attitudes, beliefs, or perceptions) and little information processing (such as decision making, learning from the consequences of incorrect posture) are captured in the structure of WBA.

In Study 4, a measurement tool to assess WMS among chefs in Chinese restaurants was developed and tested and shown to demonstrate high test-retest reliability and internal consistency. It also correlated strongly and significantly with the C-WSF, another measure of the development of WMS which focuses on the cognitions, behaviors, and physiological reactivity that cooccur and constitute an individual work pattern (Feuerstein, 1996). The C-WSF is especially applicable to clerks working in an office environment. It may be less appropriate in catering contexts because of the different mental and physical workload. In this study, the WBAS has discriminated effectively between workers with or without WMS.

The results of the four studies taken together suggest that the WBAS is a reliable and valid instrument for use in the catering industry. It measures work habits by dividing them into a number of features; effectiveness of OSH knowledge, environmental factors, safety awareness, importance of working for a living, risk-taking beliefs, learning from experience of WMS, and work habitual behavior. Undoubtedly, this provides a more complete and full account of work habits and their development compared to other existing instruments like SRHI, or the C-WSF.

Although the factor analysis identified a four-factor structure for the WBAS, consistent with the findings of the qualitative study, these factors only explained 38.441% of the cumulative variance. This may be because the factor loadings were based on the original 94 items with no deletions. However, this finding is consistent with some of validation study of questionnaire or scale (Panthee, Shimazu & Kawakami, 2014). Any factor analysis may generate factors that are essentially incapable of interpretation within the conceptual framework of the research (Portney & Watkins, 2009). Such subjectivity is often the basis of serious criticism.

At the item level, more than 13 items related to the influence of supervisors and coworkers. Three dealt with effectiveness of OSH knowledge, 5 with environmental factors, 4 with work habitual behavior, and 1 with learning from experience of WMS. The influence of supervisors and coworkers extends throughout almost the entire structure of the WBAS. This suggests that these sources play a significant role in the development and formation of WBA. The SCT (Bandura, 1996) also supports this proposal. In the workplace, the focus of learning is observing others. The social environment, and individual characteristics and behavior, interact with and influence one another. In the circumstances, safety knowledge, perceived self-efficacy, outcome expectations, and goal formation are shared and may form a culture in the workplace, just as social norms develop in any other environment. For instance, if every worker in a kitchen uses incorrect posture to lift and carry objects (waist bending, without using trolley), because they see it as the fastest way to achieve the goal and they believe they have the ability to do it (self-efficacy), a new worker may feel odd if he/she uses leg lifting and a trolley to carry objects (difference from norms). If this is repeated, the acts become automatic responses when facing similar situations.

This study has also shown that attitudes, beliefs, awareness, and decision making are part of the conceptual framework of WBA and are important predictors of WMS. Here, decision making is not a result of analytical information processing and deliberate planning; it is formed by unconscious or autonomous decision-making processes. All these processes might be part of workers' habitual behaviors that have been precisely selected and reinforced by the desirable or undesirable consequences (Cole, 2002). Commonly, workers are not consciously aware of the habits (automatic responses) that govern their behaviors, and have no intention of changing them. They may do so at some point based on their own or others' experience of WMS, which may raise their awareness of the need to adopt safety behaviors.

To effectively change a targeted and habitual behavior using an injury prevention strategy is not an easy task, particularly when the habits are strong. Individuals are less likely to absorb new information and may also evaluate counter-habitual behavioral information negatively (Verplanken & Wood, 2006). Therefore, when the habitual behaviors are weak (new, untried, and unlearned), changing attitudes and intentions may guide future behaviors (Nilsen et al., 2008). However, when behaviors are strong habits, changing these is a better predictor than attitudes or intentions (Triandis, 1977).

Some limitations of the study must be acknowledged. The disadvantage of self-administered or -reported measures is that participants may try to be consistent where this is not appropriate, or to provide "correct" or socially acceptable answers. Multiple-choice items are used to try to reduce this risk compared to single-choice items. However, the majority of items in the WBAS concern workplace safety behavior (such as whether or not the person follows OSH guidelines), supervisor and coworkers' behavior (such as "I think that my supervisors do not pay attention to OSH"), the workplace environment (such as "My workplace provides safety operation guidelines"), and so on. All these items may be sensitive to such biases. Using more implicit or operative measures (Fazio & Olson, 2003) might tackle this problem. Such measures, however, cannot always be used for practical reasons (Verplanken & Orbell, 2003).

The measurement of work habits has long been an underdeveloped issue. Therefore, the WBAS may have a role in screening as part of the development and evaluation of injury prevention strategies to provide baseline information about work habits. Also, the development of practical measures such as the WBAS may contribute to the discussion of behavioral change and simulate the further development of theory and research on WBA.

Chapter VIII: Conclusions

This study is the first attempt to explain the mechanism of WBA in the workplace and develop a scientifically validated measurement scale in the context of the Hong Kong catering industry. The participants in this study were all Chinese chefs working in Chinese restaurants. At the time of the study, they were in work and some had existing WMS.

The main findings of this study are that the WBAS is a reliable and valid instrument to measure habitual behaviors at work with respect to the development of WMS. The scale also captures a number of other features, namely the effectiveness of OSH knowledge, environmental factors, safety awareness, importance of working for a living, risk-taking beliefs, learning from experience of WMS, and work habitual behavior. Such features provide a more complete account of work habits and their development. By controlling for the confounding variables, the hierarchical logistic regression showed that environmental factors, safety awareness, and risk-taking beliefs were the strongest contributors towards the development of WMS when the case group was compared to the control. This highlights the problems in OSH education and the context (the physical environment and the influence of supervisors and coworkers) within which safety authorities have to try to deliver the message effectively to workers in order to eliminate undesirable or unwanted behaviors in the workplace. Therefore, it is proposed that if habitual behaviors are weak, an injury prevention strategy might focus on changing attitudes and intentions to guide future behaviors, but where they have become strong habits, changing these is a better predictor than attitude or intention. This may help explain why workers with strong work habits are less likely to act on new safety information, and evaluate counterhabitual behavioral information negatively.

The results of this study provide further evidence for the importance of supervisors in influencing the development of WMS among catering workers. The supervisor is considered a role model in the workplace and therefore plays an important role in the process of learning and changing safety behaviors. This finding also sheds light on the notion that OSH education in the workplace is closely related to the organizational safety culture. Changing organizational safety behaviors may drive changes in individual safety behaviors and encourage learning.

The findings inform the need for change to existing injury prevention strategies, and the design and delivery of specific work-related injury prevention programs. The prediction model and scale developed here are useful for OSH practitioners to incorporate in their daily work when trying to predict individual workers' risk of developing WMS. However, it is also important to note that since the study was conducted in the catering industry context, and in the kitchen environment specifically, the accuracy and consistency of the predictions and use of the scale in other industries cannot be guaranteed and the results should be interpreted with caution.

It has now been more than 10 years since the Hong Kong government launched the OSH ordinances in 1998. The results of this study will contribute to the future development of OSH for workers in Hong Kong. They provide evidence that enhancing the learning of desirable work habits and breaking up undesirable yet strong habits should be the main thrust of any successful WMS prevention strategy for catering workers.

Suggestions for future studies looking at the prevention of WMS and the enhancement of OSH programs in the workplace are proposed as follows:

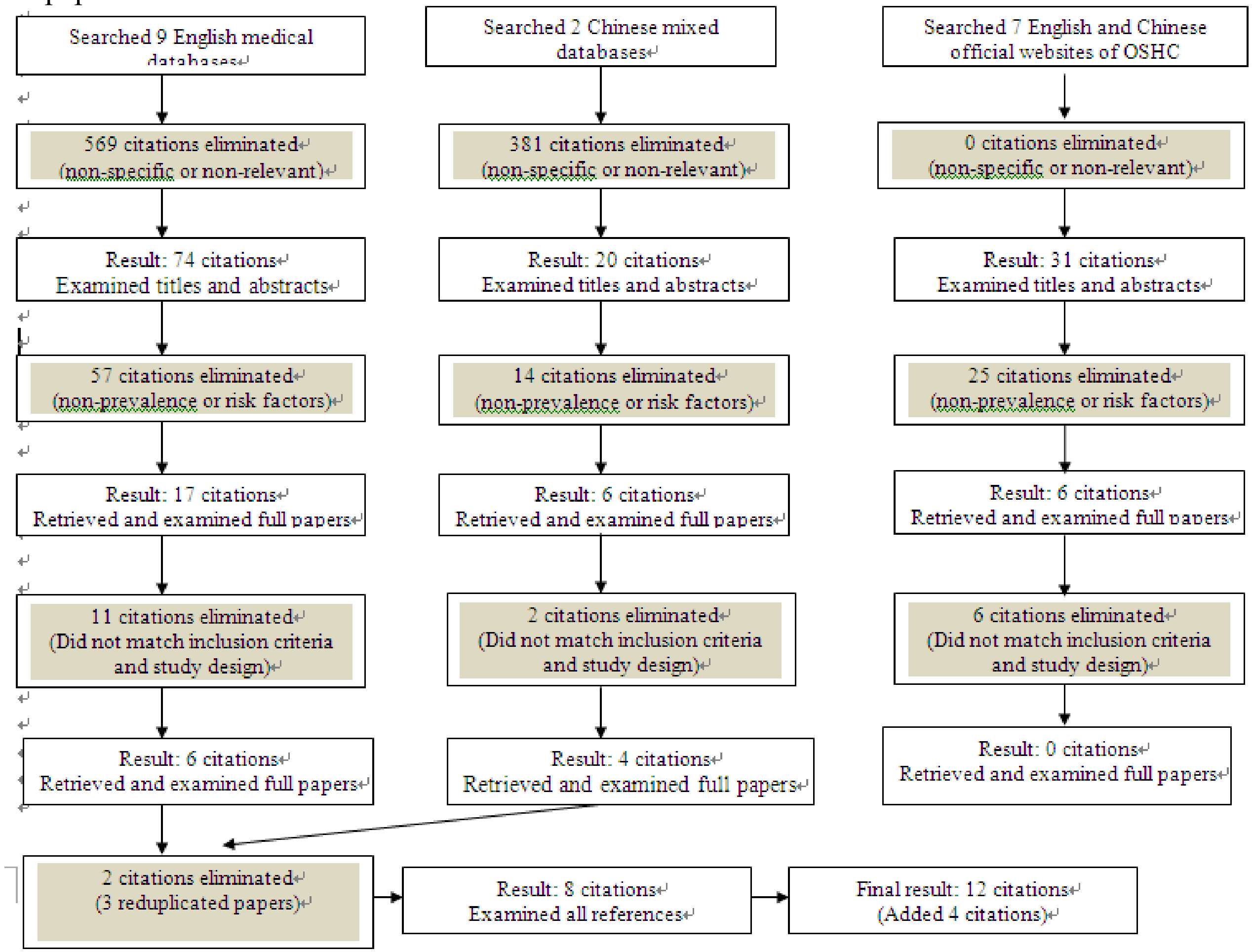
1. The current version of the WBAS has 51 items. There is a need to systematically reduce this number to shorten the time required to complete the survey, particularly for use in industries which require fast and repetitive movements at work. The development of such a short form version should be considered. However, the context and wordings are based on the catering industry environment, so care should be taken when using the scale in other industries.

2. As mentioned above, if habitual behaviors are weak, an injury prevention strategy might focus on changing attitudes and intentions to guide future behaviors, but where they have become strong habits, changing these is a better predictor than attitude or intention. Future work should attempt to quantify the strength of work habitual behaviors or work habits and develop different stages as a result. Injury prevention strategies could then be based on the stage of the relevant work habits in order to provide tailormade and stage-matched interventions to enhance safety attitudes and intentions. This may help to achieve the ultimate goal of changing undesirable work habitual behaviors.

Eventually, the author hopes that these findings, and the development of the WBAS, will contribute to the enhancement of knowledge in the field of workplace OSH and the occupational rehabilitation of WMS and WMSD. It is also hoped that this work can help to explain the phenomenon of behavioral change in the workplace in terms of the link between attitudes and behavior, and stimulate further development of theory and research on WBA.

APPENDICES

Appendix 1: Selection of papers for review



Appendix 2

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飲食業從業員工作特性及筋骨勞損可能性問卷調查

Survey of Musculoskeletal Symptoms for Catering Industry Workers

問卷編號 Questionnaire No.：__________

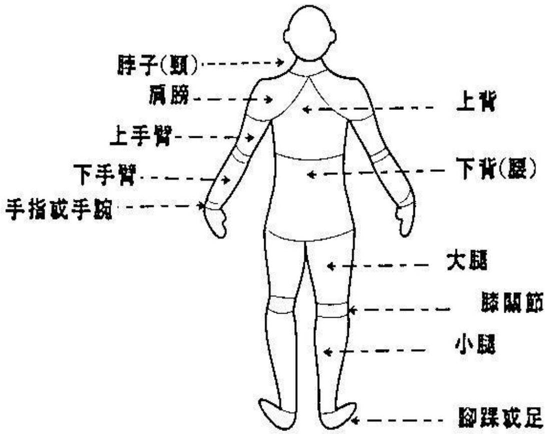
您好 Dear Sir / Madam：

首先感謝你閱讀及填寫此問卷調查表！本問卷主要目的是探討飲食業從業員的工作特性，以減少日後可能有之筋骨勞損問題(如腰酸、背痛等)。本問卷以不記名的方式進行，需時約 15 分鐘左右，所收集的資料僅僅供本課題研究使用，我們保證對你所有填寫的資料保密，請放心填寫。問卷內各題目並沒有對或錯的答案，最重要是能得到你的寶貴意見。再次感謝你參與本次研究！

Thank you very much for reading and filling in this questionnaire! The purpose is to identify the relationships between different activities in the workplace of catering industry workers and the development of various musculoskeletal symptoms (such as shoulder/back pain). The survey is anonymous and takes about 15 minutes to complete. All the information collected will be kept strictly confidential and for research use only. There are no "correct" or "incorrect" answers in the questionnaire. Your thoughts are valuable and most welcome.

如對本次研究有任何問題，請聯絡：香港理工大學康復治療科學系 徐艷文先生（電話：2766 6743）或 鄭樹基博士（電話：27665396）。

If you have any enquiries about the project, you can contact Mr Xu Yanwen (Tel: 2766 6743) or Dr Andy Cheng (Tel: 27665396) for more information.



身體圖：可參照圖中所示位置，填寫第 16 及 25 題
Body map: reference for item 16 and 25

填寫日期： 2010 年 ______月 ______日
Date of survey: 2010 _______month ______day

1. 性別：☐男 ☐女　　年齡：______　　身高：_____公分　　體重：_____公斤
   Sex: ☐Male ☐Female　　Age：______　　Height：_____cm　　Weight：_____kg
2. 教育程度：☐小六或以下　☐中一至中三 ☐中四至中五 ☐中六至中七 ☐文憑/副學士/大專 ☐大學學位或以上
   Education level: ☐primary school or below　☐F1-F3 ☐F4-F5 ☐F6-F7 ☐diploma or equivalent ☐Degree or above
3. 請在表中"√"出相應的選項 Please tick"√"the appropriate boxes below

工作單位性質 Work type	工作所在區域 Location	職務名稱 Job Title	工作內容〈可選擇多於一項〉Job content	工作單位雇員大約人數 Number of employees
☐ 酒店內之中餐廳 Chinese Restaurant in Hotel	☐ 香港島 Hong Kong Island	☐ 資深廚師 Senior Chef〈主廚、副主廚等〉	☐ 搬運物品 Moving objects ☐ 清洗食材 Ingredient cleaning	☐ Less than 20 people ☐ 20 – 49 people

□ 酒店內之西餐廳 Western Restaurant in Hotel □ 港式茶餐廳 Hong Kong Style tea restaurant □ 快餐店 Fast food restaurant □ 粵式酒樓菜館 Cantonese Restaurant □ 京川滬式酒樓菜館 Jin, Cun, or Shanghai restaurant □ 其他中菜的中式酒樓菜館 Other style Chinese Restaurant □ 西式餐廳〈法式、意式等〉Western Restaurant (French, Italian, and so on) □ 日本料理〈鐵板燒〉Japanese Food □ 酒吧、咖啡廳 Bar, coffee house □ 其他(請註明)：_________ Other	□ 九龍 Kowloon □ 新界及離島 New Territory	□ 一般廚師 Chef □ 點心廚師 *Dim sum* Chef □ 燒味廚師 BBQ Chef □ 助廚或廚工 Kitchen assistant □ 洗碗工 Dishwasher □ 樓面經理 Floor manager □ 樓面領班 Floor foreman □ 樓面服務員 Waiter/waitress □ 清潔人員〈餐務〉Cleaner □ 收銀員 Cashier □ 其他(請註明)：_______ Other	□ 切割食材（砧板）Ingredient chopping □ 烹飪製備菜餚（爐頭）Cooking □ 清潔洗滌鍋碗盤 Plate cleaning □ 現場檢視器具設備 Onsite equipment monitoring □ 供餐服務，如點菜/上菜/撤盤 Catering service □ 清理打掃樓面範圍 Floor cleaning □ 清理打掃廚房範圍 Kitchen cleaning □ 收銀/結賬 Cashier □ 魚池操作與清潔 Fishpond cleaning □ 水吧服務 Water bar service □ 其他(請註明)：___________ Other	□ 50 – 99 people □ 100 – 199 people □ 200 – 299 people □ More than 300 people

4. 工作空間：通道闊度約為：____公分 Work space: passage width: __feet

5. 工作平臺高度：大約高度：____公分 Working platform: height:___feet

6. 您從事目前的工作至今已有多久？_____年_____月， 您平常做事習慣用那一隻手？ □左手 □右手

How many years and months have you been in your present type of work? ___year___month, Are you right- or left-handed? ☐Left hand ☐ Right hand

7. 您平均一日的工作時數為_____小時，平均一星期工作_____天， 平均一個月休息_____天
   On average, how many hours a day do you work? ___Hours; how many days a week do you work?___day; how many days a month do you rest?
8. 你的上班時間？ ☐日班 ☐通宵班 ☐輪班
   Your working time? ☐day shift ☐overnight shift ☐ shift working
9. 你是否全職擔任這份工作？ ☐否 ☐是
   Full-time job or not? ☐No ☐Yes
10. 您的工作時間內是否有休息時間？ ☐沒有 ☐有
    在休息時間時會進行什麼活動? (請註明):

Do you have any rest breaks during the working day? ☐No ☐Yes

What kind of activities will you do during rest break?：

11. 你有吸煙的習慣嗎？
    Do you smoke? ☐No ☐Yes
12. 您經常運動〈例如慢跑、爬山等約 20-30 分鐘〉嗎？
    ☐ 沒有做運動的習慣 ☐ 很少，一個月頂多一次 ☐ 偶而，一個月約有 1-3 次 ☐ 經常，一個月至少 4 次以上
    How often do you do exercises (such as jogging, climbing, and so on, for 20-30 minutes)?
    ☐ No exercise habit ☐ Seldom, once a month ☐ Occasionally, 1-3 times a month ☐ Frequently, more than 4 times a month

13. 您工作時常使用的動作：（請在下表中"√"出相應選項）Please tick "√" the appropriate boxes below to describe the body movements involved in your work activities.

動作項目 Body movement	很少 Seldom	有時 Occasionally	時常 Often	很多 Much	非常多 Very often	動作時的姿勢〈可選擇多於一項〉Posture
手腕持續旋轉（好似抓鍋剷炒菜						☐站姿 Standing ☐坐姿 Sitting ☐半蹲姿 Half-

動作）Wrist twisting (like cooking with slices)						squatting □蹲姿 squatting □跪姿 kneeling
手腕出力彎曲（好似砧板動作）Wrist bending (like using gym equipment or chopping with knife)						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
手腕持續用力 （例如燒烤豬隻）Prolonged wrist exertion (sustained holding of utensil)						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
用拇指與其他四指拿捏搬運物品（好似搬枱動作）Grasping and pinching objects with thumb and other fingers (like lifting a table)						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
用手指反覆製作物品 Repeated finger movements						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
超越肩部由高處拿取重物 Getting heavy objects from or above shoulder level						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
側身由後方取拿其他物品 Twisting back to take objects from behind						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
彎腰從地面抬取重物 Lifting heavy objects from the floor with waist bending						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
彎腰伸手向前拿取物品 Forward reaching with waist bending						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling

雙手持物向前推 Pushing forward with hands holding objects						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
震動，例如操作攪拌器 Vibration, such as operating the mixer						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling
其他: Other						□站姿 Standing □坐姿 Sitting □半蹲姿 Half-squatting □蹲姿 squatting □跪姿 kneeling

14. 工作中進行重復動作時的速度：□快速 □中等速度 □慢速
    Speed of repeated movement during work: □high □medium □low
15. 在最近的 12 個月內，您身體有沒有疼痛或任何不舒服的感覺出現？請在下表中“√”出相應選項。
    注意：如果下表中你的身體各部位都沒有疼痛或不舒服的症狀，也請你在“沒有”一欄下面□中“√”出，之後問卷結束。如果你的身體部位有疼痛或不舒服的症狀，請繼續完成餘下問題。
    Have you experienced discomfort such as ache or numbness any time during past 12 months? Please tick ”√” appropriate boxes below if you have.
    Note: If you do not have any discomfort, please tick “√ “ the box under No” then you have finished the survey.

疼痛或不舒服的部位與程度	沒有	有 Yes	不舒服的感覺 Feeling of discomfort	不舒服的程度 Intensity of sensation	症狀出現的時間 Time of Occurrence	症狀出現的頻率 Frequency of sensation

Body part of discomfort	NO		酸痛 Soreness	觸痛 Tenderness	刺痛 Stabbing pain	麻痹 Numbness	0=No discomfort；10= very severe discomfort The larger the number, the more severe the discomfort	1. 早上，上班前 Morning, before work 2. 上班時間內 During working 3. 晚上，下班以後 Night, after work	1. 幾乎天天都有 Every day 2. 每星期約有 2-3 次 2-3 times a week 3. 每個月約有 2-3 次 2-3 times a month 4. 很少，不記得 Seldom, do not remember
脖子(頸)Neck							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
肩膀 Shoulder							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
上手臂 Upper arm							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
肘關節 Elbow							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
下手臂 Forearm							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
手指或手腕 Finger or wrist							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
上背 Upper back							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
下背(腰)Lowerback							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
大腿 Thigh							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
膝關節 Knee							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4

小腿 Leg							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4
腳踝或足 Ankle							0 1 2 3 4 5 6 7 8 9 10	□1 □2 □3	□1 □2 □3 □4

16. 這些不舒服的症狀斷斷續續已有多久時間？_____年_____月_____星期___日
17. How long have you experienced this discomfort ? _____years_____months_____weeks___days

18. 在最近的 12 個月內，您有否因為這些不舒服的症狀而減少了以下活動呢？
    日常家務？□有 □否， 餘暇身體運動？□有 □否， 工作活動？□有 □否
    During the past 12 months, have you ever been limited in performing the following activities because of the discomfort?
    Household activities ? □Yes □No， Sports activities ? □Yes □No， Work activities? □Yes □No

19. 在最近的 12 個月內，您總共有多長時間因為這些不舒服的症狀而影響呢？
    □ 0 天 □ 1-7 天 □ 8-30 天 □ 超過 30 天
    During the past 12 months, what was the total length of time during which you were affected by this discomfort?
    □ 0 day □ 1-7 days □ 8-30 days □ more than 30 days

20. 這些不舒服的症狀對您的影響為？ □不影響生活與工作能力 □稍微降低生活與工作能力 □明顯降低生活與工作能力 □嚴重影響生活與工作能力 □完全無法生活與工作
    To what degree has this discomfort affected your daily life and ability to work? □不影響生活與工作能力 Not affected □稍微降低生活與工作能力 Slightly affected □明顯降低生活與工作能力 Obviously affected □嚴重影響生活與工作能力 Seriously affected □完全無法生活與工作 intolerable - cannot go on with life and work activity
21. 您曾因此而請假休養嗎？□沒有 □有， 大約請過__次假
    Have you ever asked for sick leave because of this discomfort? □No □Yes，if Yes how many times: ___time(s)
22. 你認爲這些不舒服的症狀是由甚麽情況引起的呢？(請註明)：

What do you think is the cause of this discomfort?

23. 如這些不舒服的症狀是與你當前的工作有關，你覺得主要原因是？（可選擇多項）：
☐工作時間長短 ☐站立時間長短 ☐搬運物件的重量 ☐工作間設計 ☐個人裝備，如鞋 ☐其他:（請註明：＿＿＿＿＿＿）
If this discomfort is related to your work activity, which of the following is/are the main cause? (you can select more than one)?
☐Length of working hours ☐Prolonged standing ☐Weight of objects ☐Workplace design ☐Personal equipment, such as shoes ☐Other（＿＿＿＿＿＿）

24. 您有否曾經因為這些不舒服的症狀而轉工或改變工作任務？ ☐是 ☐否
Have you ever had to change your jobs or duties because of this discomfort? ☐Yes ☐No

25. 在最近的 12 個月內，您是否因爲這些不舒服而尋求治療？☐否 ☐是，如選擇“是”，請在下表中“√”出曾經接受的治療**〈可選擇多於一項〉**
During the past 12 months, have you ever sought treatment because of this discomfort? ☐No ☐Yes, if you select Yes please specify which treatment you have consulted (you can select more than one);

疼痛或不舒服的部位 Body part	未予理會 Ignore	自行處理，冷熱敷或藥敷 Self management (handling it yourself, use of heat or cold pad	看中醫吃藥，做按摩推拿/針灸/拔火罐 Chinese medicine (massage/acupuncture/cupping jar)	看西醫吃藥，做物理治療 Western medicine (medication or physiotherapy	動手術 Surgery	住院 Admit to hospital	其他 Other
脖子(頸)Neck							
肩膀 Shoulder							
上手臂 Upper arm							
肘關節 Elbow							
下手臂 Forearm							

手指或手腕 Finger or wrist							
上背 Upper back							
下背(腰)Lower back							
大腿 Thigh							
膝關節 Knee							
小腿 Leg							
腳踝或足 Ankle							

------問卷結束，再次感謝您的參與！
End of questionnaire, thank you very much for your participation------

Appendix 3

Content Validity Ratings for the revised questionnaire in Study 1

Link between Job Characteristics and WMS (5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

	E 1*	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
1. 工作空間 work space	5	5	3	5	3	1	4	5	0.86
2. 通道大小 passage width	5	5	4	5	3	1	3	5	0.86
3. 工作平臺高度 work platform	5	4	3	5	3	4	4	4	0.86
4. 每天工作時數 working hours per day	3	5	4	5	3	5	5	5	1.00
5. 上班時間（日班，通曉班，輪班）working time (day shift, overnight shift, shift working)	2	1	4	3	1	1	4	1	0.43
6. 是否全職擔任這份工作 full-time job or not	5	1	3	3	1	3	3	3	0.71
7. 工作時身體姿勢 working posture	3	5	4	5	3	5	5	5	1.00
8. 在休息時間會否進行伸展運動 do stretching exercises during rest break	4	3	3	3	3	5	3	3	1.00
9. 工作中進行重復動作時的速度 Speed of repeated movement during working	4	4	3	4	3	3	5	4	1.00
10. 震動，例如操作攪拌器 vibration	5	3	2	2	3	5	3	3	0.71
11. 手腕持續旋轉（好似抓鍋剷炒菜動作）Wrist twisting (like cooking with slices)	5	3	4	5	3	5	5	5	1.00
12. 手腕出力彎曲（好似砧板動作）Wrist bending (like using gym equipment or chopping with knife)	5	3	3	5	3	5	5	5	1.00
13. 手腕持續用力，例如燒烤豬隻 Prolonged wrist exertion (sustained holding of utensil)	4	3	4	5	3	5	5	5	1.00
14. 用拇指與其他四指拿捏搬運物品（好似搬枱動作）	5	5	4	4	3	4	3	4	1.00

Grasping and pinching objects with thumb and other fingers (like lifting a table)									
15. 用手指反覆製作物品 Repeated finger movements	5	1	3	5	3	3	3	3	0.86
16. 超越肩部由高處拿取重物 Getting heavy objects from or above shoulder level	5	5	3	5	3	5	4	5	1.00
17. 側身由後方取拿其他物品 Twisting back to take objects from behind	4	4	4	5	3	5	3	4	1.00
18. 彎腰從地面抬取重物 Lifting heavy objects from floor with waist bending	4	5	3	5	3	5	4	5	1.00
19. 彎腰伸手向前拿取物品 Forward reaching with waist bending	3	5	3	5	3	5	3	3	1.00
20. 雙手持物向前推 Pushing forward with hands holding objects	3	5	3	5	3	5	3	3	1.00
21. 不適合的鞋 poorly fitting shoes	4	5	3	5	3	3	5	5	1.00

*E represents an expert panel member

Link between Body parts and WMS
(5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

Body part	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
1. 脖子(頸) neck	5	4	5	5	5	5	5	5	1.00
2. 肩膀 shoulder	5	4	5	5	5	5	5	5	1.00
3. 上手臂 upper arm	5	4	5	5	5	5	4	5	1.00
4. 肘關節 elbow	5	5	5	5	5	5	5	5	1.00
5. 下手臂 lower arm	5	5	5	5	5	5	5	5	1.00
6. 手指或手腕 finger or wrist	5	5	5	5	5	5	5	5	1.00
7. 上背 upper back	5	3	3	4	5	5	4	5	1.00
8. 下背(腰) lower back	5	5	5	5	5	5	5	5	1.00

9. 大腿 thigh	5	4	5	5	3	5	5	5	1.00
10. 膝關節 knee	5	4	5	5	5	5	5	5	1.00
11. 小腿 leg	5	5	5	5	4	5	5	5	1.00
12. 腳踝或足 ankle	5	5	5	5	4	5	4	5	1.00

Link between Pain Intensity and WMS
(5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
不舒服的程度（0-10） Degree of discomfort	5	5	5	5	5	4	5	5	1.00

Link between Pain Duration and Frequency and WMS
(5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
1. 症狀出現的時間 onset of symptoms	5	5	5	5	5	5	4	5	1.00
2. 症狀出現的頻率 frequency of symptoms	5	5	5	5	5	5	5	5	1.00
3. 這些不舒服的症狀斷斷續續已有多久時間？ Duration of symptoms	5	5	5	5	5	5	4	5	1.00

Link between Functional Impact at Home/Work and WMS
(5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
1. 這些不舒服的症狀是否與你當前工作有關 the symptoms are caused by the job	4	5	5	5	5	4	5	5	1.00
2. 您有否曾經因爲這些不舒	5	5	5	5	5	5	5	5	1.00

服的症狀而轉工或改變工作任務？Have you changed your job or duties because of this discomfort?									
3. 在最近的 12 個月內，您有否因為這些不舒服的症狀而減少了活動？I am limited in performing the following activities because of the discomfort	5	4	5	5	4	5	5	5	1.00
4. 在最近的 12 個月內，您總共有多長時間因為這些不舒服的症狀而影響您從事日常工作（在家或不在家 The duration of daily activities has been affected by this discomfort	5	5	5	4	5	5	4	5	1.00
5. 這些不舒服的症狀對您的工作影響為 The impact of symptoms on your job	5	5	5	5	3	5	5	5	1.00
6. 您曾因此而請假休養嗎？Have you asked for sick leave because of this discomfort?	5	5	5	5	5	5	4	5	1.00

7. 您有否因爲這些不舒服的症狀而被診斷爲工傷或職業病？Have you been diagnosed with an occupational disease?	4	3	5	4	4	5	3	4	1.00

Link between Pain Management and WMS
(5-point Likert-type scale from 1=strongly disagree to 5=strongly agree)

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
1. 未予理會 ignore	4	5	5	5	5	5	5	5	1.00
2. 自行處理，冷熱敷或藥敷 self management	5	5	5	5	5	5	5	5	1.00
3. 看中醫吃藥，做按摩推拿/針灸/拔火罐 Chinese traditional medicine	5	5	5	5	5	5	4	5	1.00
4. 看西醫吃藥，做物理治療 Western medicine and physiotherapy	5	5	5	5	5	4	5	5	1.00
5. 動手術 surgery	5	5	5	5	5	4	1	5	0.86
6. 住院 inpatient stay	5	5	5	5	5	4	1	5	0.86
7. 您的工作時間內是否有安排休息時間？rest arranged during working hours	4	5	5	5	5	5	5	5	1.00
8. 在休息時間時會否進行伸展運動?	4	5	5	5	5	5	5	5	1.00

stretching exercises during break									
9. 您經常運動〈例如慢跑、爬山等約 20-30 分鐘〉嗎？ exercise	4	5	5	5	4	5	5	5	1.00

Representativeness of WMS-related Items

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
受影响的身体部位 body part	4	5	5	5	5	4	5	5	1.00
疼痛程度 pain intensity	4	4	5	4	5	5	5	5	1.00
疼痛频率及持续时间 pain frequency and duration	4	5	5	4	5	5	4	5	1.00
疼痛对工作和日常生活活动的影响及损失 the influence of pain on work and daily activities	4	4	5	4	5	5	4	4	1.00
缓解疼痛的措施及策略 the strategy for pain relief	4	4	4	5	5	4	3	4	1.00
總體代表性 overall representativeness	4	5	5	5	5	4	3	5	1.00

Representativeness of Work Characteristics

	E 1	E 2	E 3	E 4	E 5	E 6	E 7	Mode	CVI
總體代表性 Overall representativeness	4	5	5	4	3	4	4	4	1.00

Appendix 4

香港理工大學 康復治療科學系

邀請函

首先非常感謝貴機構在過去一年對本研究計划的大力支持與幫助！在你們的大力支持下，我們已經完成了對香港飲食業從業員筋骨勞損流行病學的研究及現場人體工效學的研究。我們發現中餐廚師的筋骨勞損流行率最高。基於研究的需要，我們需要繼續作下一步的研究，具體內容如下：

研究題目: 香港中餐廚師肌肉骨骼系統疾患（筋骨勞損）与工作方式關係的研究

研究成員: 徐艷文先生，鄭樹基博士

研究內容及目的

本研究旨在了解中餐廚師（包括炒菜、點心及燒味廚師）工作方式或工作取向的形成過程及其影響因素，探討不同的工作方式導致肌肉骨骼系統疾患發生之間的相互關係，從而建立工作場所職業安全与健康的預防介入模式。為達到此目的，我們會採用個人訪談及問卷調查的方式進行研究，邀請坊間不同工作年資的中餐廚師及專業人士進行意見交流，一起探討工作方式的形成過程及其相關影響因素。

進行方式

第一階段主要採取個人訪談的方式進行，主要邀請廚師學徒、入職 1 至 2 年的廚師及入職 3 年以上或更長時間的廚師進行研究，面談時間約 1.5 小時。訪談過程輕鬆及無任何限製。為了保證資料及意見的完整性及今後資料分析的需要，訪談過程備有錄音設備。但是，請注意，所有關於在訪談過程中發表的任何意見，沒有是非對錯之分；而且，所有意見僅僅作為學術研究使用，我們保證對所獲得的意見保密。第二階段採取問卷調查的方式進行。參加者主要填寫約長 0.5 小時的問卷。為了補償參與者的來回車資及時間，每位參與者將獲得額外 200 港元的研究補償。

本着共同推動香港飲食業職業安全與健康的目的，希望貴機構能夠繼續大力支持及配合是次研究計划，尤其在實驗對象招募方面。稍後我們將會有科研人員打電話與貴機構聯絡，謝謝！

如你對本次研究計划有任何疑問，可致電 2766 6743 或電郵
0890 @ 向研究員徐艷文先生或致電給我（電話：2766 5396）
查詢本研究計划，再次感謝你對本研究計劃的大力支持與配合！

鄭樹基 博士

Appendix 5

香港理工大學 康復治療科學系

<u>研究項目：探討飲食業從業員工作方式成因及影響因素的研究</u>

參與研究同意書

本人 ________________同意參加香港理工大學康復治療科學系鄭樹基博士負責研究、徐艷文先生負責執行的研究項目。研究題目為：探討飲食業從業員工作取向成因及影響因素的研究。本研究旨在了解中餐廚師（包括炒菜、點心及燒味廚師）工作方式或工作取向的形成過程及其影響因素，探討不同的工作方式導致肌肉骨骼系統疾患發生之間的相互關係，從而建立工作場所職業安全与健康的預防介入模式。為達到此目的，我們會採用個人訪談及問卷調查的方式進行研究，邀請坊間不同工作年資的中餐廚師及專業人士進行意見交流，一起探討工作方式的形成過程及其相關影響因素。

我理解此研究所獲得的資料僅可用於未來的研究及學術交流。我亦明白我有權保護自己的私隱，我的名字及個人資料將不會被披露，而本人也有權知道自己的資料及這些資料的用途。

研究人員已對此研究計划的目的及過程進行解釋。我理解這項研究不涉及或存在任何風險。我是自願參與該項研究計划。

我理解我有權在研究過程中提出問題，并在任何時候決定退出研究而不會受到任何不正常的待遇或被追究責任。

參加者姓名：______________________________

參加者簽名：______________________________

研究人員姓名：______________________________

研究人員簽名：______________________________

日期：　　　　______________________________

Appendix 6

計划面談時提出的問題
Questions to Guide Interview

面談開始時開放式的問題 (Initial Stage Questions)

1. 根據勞工處資料顯示，飲食業發生的工傷事故數字最多，當中，也包含了很多筋骨勞損的個案。請告訴我飲食業怎麼會發生這些事情？
According to the Labor Department data, the number of occupational injuries in the catering industry is rather high. Of them, there are a lot of WMS. Could you please tell me why this happens in the catering industry?

2. 你自己有沒有筋骨勞損的問題？比如某關節疼痛、麻痺或不適，甚至影響到你不能完成某項工作。如有的話，什麼時候第一次出現？
Do you have any WMS problems? For instance, joint pain, numbness, or discomfort that may even stop you completing some work tasks. If yes, when did this happen?

3. 假如/真的出現這樣的事情，你是怎麼想的？你覺得這事情怎麼會出現在你身上？有沒有任何人影響到你的行動？請告訴我她/他/他們如何影響到你。
If you have developed WMS, what do you think this has happened to you? Does anyone influence your work behavior? If yes, please let me know how they influence your work behavior.

4.你能否描述一下那些情況/工作任務會導致到你工作時疲勞、麻痺、疼痛或不舒服？
Could you describe the situations or tasks which result in fatigue, numbness, pain, or discomfort?

5. 你認為什麼因素導致這種情況的發生？
What factors do you think cause such a situation?

6. 這種筋骨勞損的症狀發生后，你之後會怎麼應付或處理？
After the WMS happened, how did you cope or deal with this problem?

面談中段問題 (Middle Stage Questions)

1、根據你的工作經驗，當你看到或聽到職安局或勞工署介紹飲食業職業安全和健康，預防筋骨勞損或肌肉骨骼不適發生的措施時（如避免彎腰搬抬重物，可利用下肢力量保持腰部正直的姿勢搬抬重物，或儘量使用工具、與同事一起合力搬抬的方法；或工作當中適當作小息），你覺得這些措施可不可行或有沒有用？為什麼有用？
In your experience, when you read or hear about prevention strategies (such as manual handling operation methods) from the Labor Department or OSHC, do you think such knowledge is useful for you or not? Why?

2、在你工作過程中，你會不會用這些措施，為什麼用？為什麼不用？
During your working processes, will you apply this prevention strategy to real work tasks? And why/why not?

3、告訴我你對於學習這種職業安全與健康的想法。
Please tell me what you think about learning OSH knowledge.

4、我們常常說，習慣了的東西很難去改。我們每個人都有自己一套的做嘢方法或做嘢習慣或工作的取向。你覺得，這種工作習慣或取向是如何一步一步形成的？
We often say that it is difficult to make a change when a habit is formed. We all have our own way of working or working habits. Could you please let me know how this way of working or work habit forms, according to your experiences?

5、這種工作取向的形成大概經歷了多長的時間？
How long does this formation of a way of working or work habit take?

6、有沒有誰牽涉在這種形成的過程中呢？如有，請指出。你覺得，誰的影響對你最大？
Who do you think is involved in this formation process? Who influences you too much?

7、總的來說，你覺得有什麼因素會影響到你這種做嘢的方法或方式呢？
To conclude, what factors affect your way of working or work habit formation?

<u>面談結尾問題 (End Stage of Questions)</u>

1、你還有沒有其它一些想法（關於飲食業職安健或工作取向）在你之前所談論的內容中沒有提及到呢？
Do you have any other thoughts about OSH or work habits which you have not already mentioned?

2、你還有沒有其它一些問題想問我的嗎？
Do you have any questions you want to ask me?

Appendix 7

Fragmentation of Data and Conceptual Labels from example Case M (last case)

Data	Conceptual label
這可能與一開始進行學徒訓練階段有關。他跟的師傅，如果他做事態度 (code:13,1,3)馬虎，求求其其，那你就會受到他的影響而養成不好的習慣(code: 13,1,4)。有些人斬野希望插在砧板上，但是有些人説不能插在砧板上，要放在砧板上，而且刀鋒是向裏面的。因爲插在那裏很危險。那些守門需要學，跟師傅學技能外，還需要學守門，做事企理。我學的那個師傅很好，很細微的東西都注意到 (code: 13,1,6)。	做事態度 （working attitude） 受到師傅影響而養成不好的習慣（bad habit was formed by the influence of master） 注意到細微的東西(aware of the small things)
那你決得他有那些好的地方呢？ 比如那張刀，不能插在砧板上，以免刀掉下來受傷。地面儘量不要有水積，一來不好看，二來容易跌倒受傷。要拿水沖沖，還要那些鹽散在地面上。以免跌倒。如果師傅不講，你就不會知道(code: 131,10,)。有時候不單是自己跌倒，比如燒味部，因爲有其他部門的同事可能進來，可能會導致他人受傷。	師傅不説就不知道一些預防的措施 （know little about prevention strategy without master’ s teaching）
我 17 歲半就開始入這一行工作，主要是因爲我姑媽家里人叫我去做。那時候因爲讀書成績不好，去拿個文憑又沒有什麽意思，又不想浪費時間，所以，開始在快餐店做樓面。後來 18 歲後（未夠 18 歲不能入酒樓做野，因爲勞保），之後就入酒樓工作。我這幾年都轉了 7、8 間酒樓。因爲覺得別的酒樓好，或是因爲人事問題，或是公司要你走。	
在這 7、8 間其實都是做同一樣工作，都在燒味部。一開始從學徒開始做起 (code: 13,1,17)，主要是做下欄野，一路做，一路上。到你都學會了，燒又得，斬由得，主要看你能不能應付 （code: 13,1,18）。轉工主要是根據師兄弟之間，説那裏有酒樓請人，就過去了。	從學徒開始做起（start working as a trainee） 訓練中能不能學會及應付（learning and coping during training）
現在我從事切野工作。雖然燒野不屬於我的工作範圍，但是如果同事需要幫忙，就過去幫忙。我之前在這家酒樓工作，後來轉到其他酒樓工作。但是，這家酒樓師傅叫我回來，説人手不夠，所以我又回來了。	
師傅對我都挺好的。師傅開始時會叫你先搞衛生，抹野，執野等等。或煲飯或裝飯。我開始在快餐店做時裝飯裝了半年。來到這家酒樓後才開始有機會碰一下刀。剛開始斬野給自己的同事吃。半年的時間都在做下欄野，之後才開始做燒味。我覺得我都知道挺多 OSH 的知識，主要是師傅教的 (code: 13,1,25)。有些好的師傅除了叫你一下燒味的方法之外，還會叫你一些做人的野。因爲酒樓太多員工，需要處理好人際關係。安不安全的都會講給你知。比如那煲泡雞水，她都會説儘量兩個人一起抬。如果一個人抬，他會罵你。第一，如果同事受傷就不好了。第二因爲有工傷，上面寫字樓責罵下來就不好了。所以這些東西可以避免的。每個大佬都會跟你這麽説。因爲他要負責這個場，有事發生他要交代的。 如果有人工傷，但是老闆會追究，大佬就不好交代了。那煲水非常重，如果你夠力還好，不夠力的話就容易扭傷腰骨了。	師傅教會我很多 OSH 知識 （I learned much OSH knowledge from my master）
但是，很多人都説，很難找拍檔一起做的。 這要看大家拍檔之間配不配合 (code: 13,2,1)。如果拍檔真的	拍檔之間的配合(cooperation with coworkers)

很多耶做，而且，那煲水也不是這麼急搬下來的，那就先放在那裏先。沒有那麼忙的時候，才叫他一起搬。這也不浪費他很多時間。但是，平時要執生，如果不好意思叫他搬，如果很旺或爐頭需要用，就要很有禮貌叫同事幫忙。 每一個人都有自己的守門，已經是習慣了怎麼樣做，如果之前你跟的那個師傅好，你的守門就好。同事之間互相幫忙，主要看大家的性格。因為有些同事，如果你說他，他會說：你為什麼要說我啊？所以要知道他的為人。 那除了師傅或同事外，你的守門還有什麼因素會影響到呢？沒有了。 都有關係的。因為每一個場的範圍都不同，如果範圍淺窄的，總之你需要執生。儘量就住。 老闆對我守門沒有什麼影響。因為他不會直接和我說，他會通過大佬反映。	
守門的形成可能與性格有一點聯係 (code: 13,2,13)。因為有些人做事不夠穩定，比如，大家都是做同一樣野，有人比較緊張，比如大佬在旁邊看住，就比較容易出錯。因為有些人不會處理這些東西。這要看個人能不能控制(code: 13,2,15)得住。 可能有這樣得一個情況，比如有兩個人，有一個會及時清理積水及油積，但是另一個會說，反正收工前都要做的，不如收工前再做吧，也不用那麼辛苦。他們之間可能態度就很不同了。又比如開燒爐蓋，如果不注意的話，就會搶火。這些都是師傅教我的。我曾經看過這個例子。	守門的形成可能與性格有一點關係 (weak relationship between formation of habit and personality) 工作時行為的控制 （behavioral control）
我覺得我的安全意識都是很好的(code: 13,2,20.1)。因為已經形成了習慣，所以就不需要老是提醒(code: 13,2,20.2)自己。平時都是這樣做的。如果你有良好的習慣，這些都不是很容易改變的。 因為每個人跟的師傅不同，所以我覺得我的同事的守門有不同。如果一開始師傅一直沒有提點你，你一些壞習慣就會慢慢形成，比如掛那個砧板的油積。師傅都是叫你學他的那套。如果有些學徒認真學，師傅會教他工作外的東西。	自我感覺很好的安全意識(self-perceived safety awareness) 形成了好的習慣就不用經常提醒自己 （you do not often remind yourself of the safety issue if a good habit is formed）
其實，守門的東西，活學活用。如果你見到人家有更好的東西，你就去學羅。從你開始進入工作開始，你就需要去學(code:13,2,25)。	從開始工作就需要去學守門的東西(start to learn safety from the beginning of working)
我自己本身如果工作量大，我會覺得手腕等部位比較緊，但不是痛，也不是勞損那種。我不會去理他。手是你自己的，你自己知道自己的事，當我覺得連續工作到手不能再斬的時候，我就會停下來休息 (code: 13,2,29)一下。再斬。如果繼續下去，就容易勞損。比如，我會去吃煙、或上洗手間。	很累了就需要停下來休息一下（take a short break if fatigued）
如果精神不集中，至多會慢一點，不會斬到手，因為你會縮回來。我的師傅不允許我戴鋼絲手套工作。我沒有聽過鋼絲手套。因為你要知道自己的能力去到那裏 (code: 13,3,)。不能勉強自己去快點做完工作。工多就自然會熟練。慢慢你就會越來越快。有些人會決定自己斬得這麼快，會炫耀，或講笑。	知道自己的能力水平(understand own capability)

Appendix 8

香港理工大學 康復治療科學系

飲食業從業員工作行爲習慣研究

您好：

首先感謝你閱讀及填寫此問卷調查表！本問卷主要目的是探討飲食業從業人員與職業安全健康相關的工作行爲及習慣，從而幫助研究人員制定科學可行的預防策略，以減少日後可能有之筋骨勞損問題(如腰酸、背痛等)。

本問卷以不記名的方式進行，共包括三部分內容，第一部分是一般的人口統計學資料，第二部分是有關筋骨勞損的資料，第三部分是工作行爲習慣量表。需時約 30-45 分鐘左右，請耐心填寫完畢。所收集的資料僅僅供本課題研究使用，我們保證對你所有填寫的資料保密，請放心填寫。問卷內各題目並沒有對或錯的答案，最重要是能得到你的寶貴意見。

如對本次研究有任何問題，請聯絡：香港理工大學康復治療科學系 徐艷文 先生（電話：2766 6743）或 鄭樹基博士（電話：27665396）。

再次感謝你參與本次研究及對香港飲食業職業安全與健康工作的支持與配合！

第一部分：一般人口統計學及工作資料

26. 性別： □男 □女 年齡：______歲

27. 教育程度：□小六或以下 □中一至中三 □中四至中五
□中六至中七 □文憑/副學士/大專 □大學學位或以上

28. 您從事目前的工作至今已有多久？_____年_____月

29. 工作單位僱員人數大約：□少於 20 人 □20-49 人 □50-99 人 □多於 100 人

30. 您平均一日的工作時數為_____小時，平均一星期工作_____天， 平均一個月休息_____天

31. 您擔任這份工作是： □全職 □兼職

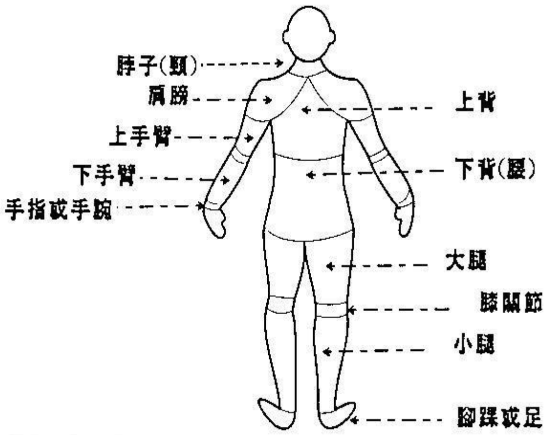
32. 您的工作時間內是否有安排休息時間？
□沒有
□有，一日平均休息_____次，一次平均休息_____分鐘
在休息時間時會否進行伸展運動? □沒有 □有

33. 您經常運動〈例如慢跑、爬山等約 20-30 分鐘〉嗎？
□ 沒有做運動的習慣 □ 很少，一個月頂多一次
□ 偶而，一個月約有 1-3 次 □ 經常，一個月至少 4 次以上

34. 您是否參加過職業訓練局或廚藝學院的專業培訓？
□沒有
□有，培訓時長為_____月____日，接受培訓時間是：□入行前參加 □工作後參加

35. 在過去的 1 年內，你曾否試過因為工作原因而發生意外或受傷？
□否 □是，共請假多少天？ ________天

第二部分：筋骨勞損資料



請參照上圖完成下列選項：

36. 您身體某個部位有沒有因爲工作的原因而出現疼痛或任何不舒服的感覺？

☐沒有（*如選擇沒有，第 12、13、14 條題目可忽略不做*）

☐有，如有，請在下列部位中選出（可多選）：

☐脖子(頸) ☐肩膀 ☐上手臂 ☐肘關節 ☐下手臂 ☐手指或手腕

☐上背 ☐下背(腰) ☐大腿 ☐膝關節 ☐小腿 ☐腳踝或足

37. 您這種情況（疼痛或不舒服）已經持續了多長時間：

☐少於 1 小時 ☐1 小時至 1 天 ☐ 1 天至 1 個星期 ☐1 星期至 2 星期

☐2 星期至 4 星期 ☐ 1 個月至 3 個月 ☐多於三個月

38. 在過去的一年裏，多長時間出現一次這種情況（疼痛或不舒服）？

☐幾乎沒有（每 6 個月） ☐很少（每 2－3 個月） ☐有時（每月 1 次）

☐經常（每星期 1 次） ☐常常（每天）

39. 總體上說，這種情況（疼痛或不舒服）的嚴重程度是：

☐沒有疼痛 ☐輕度疼痛 ☐中度疼痛 ☐非常疼痛 ☐極度疼痛

第三部分：工作行爲習慣簡易量表

下列選項是對工作行爲及習慣的描述，請根據您本人在工作中的體驗，選出最適合的選項，在相應的方框內打“√”，完成下列調查。

	非常不同意	不同意	不肯定	同意	非常同意
1. 工作場所的佈局和設計適合我工作	[ ]	[ ]	[ ]	[ ]	[ ]
2. 儘管晉升需要一系列的過程，但是我相信晉升主要取決於個人能力，所以我積極努力地工作	[ ]	[ ]	[ ]	[ ]	[ ]
3. 因爲我知道學東西快就可以很快獲得晉升的機會，所以我積極努力地工作	[ ]	[ ]	[ ]	[ ]	[ ]
4. 我積極努力工作，希望得到上司的賞識，從而獲得晉升的機會	[ ]	[ ]	[ ]	[ ]	[ ]
5. 工作時我很注重安全意識	[ ]	[ ]	[ ]	[ ]	[ ]
6. 工作中，當我覺得身體不舒服或疼痛時，我會想辦法改善工作方法	[ ]	[ ]	[ ]	[ ]	[ ]
7. 我的上司會幫助同事一起改善工作方法	[ ]	[ ]	[ ]	[ ]	[ ]
8. 我會向同事學習，從而幫助自己改善工作方法	[ ]	[ ]	[ ]	[ ]	[ ]
9. 我的工作場所提供了安全操作指引	[ ]	[ ]	[ ]	[ ]	[ ]
10. 我會按照安全操作指引來工作	[ ]	[ ]	[ ]	[ ]	[ ]
11. 因爲我覺得自己的身體可以應付，所以我一點都不擔心獨自搬抬重物會受傷	[ ]	[ ]	[ ]	[ ]	[ ]
12. 很多人在工作期間休息時都會吸煙或賭錢，而我卻會選擇做一些伸展運動	[ ]	[ ]	[ ]	[ ]	[ ]
13. 我會留意上司或同事的工作方法	[ ]	[ ]	[ ]	[ ]	[ ]
14. 看見同事因爲工作姿勢不對而被人罵，我學會了怎樣做	[ ]	[ ]	[ ]	[ ]	[ ]
15. 因爲我的工作節奏很快，所以我根本沒有時間休息或做伸展運動	[ ]	[ ]	[ ]	[ ]	[ ]

16. 我覺得自己的生活方式很健康	[ ]	[ ]	[ ]	[ ]	[ ]
17. 同事的肩膀腫起來了仍繼續正常工作，所以我認爲筋骨勞損其實很小事	[ ]	[ ]	[ ]	[ ]	[ ]
18. 工作中，由於人手不足的問題導致我的精神變得很緊張，經常出錯	[ ]	[ ]	[ ]	[ ]	[ ]
19. 我不是很接受職安健預防筋骨勞損的方法，因爲我一直都習慣了自己的一套方法	[ ]	[ ]	[ ]	[ ]	[ ]
20. 我有自己的工作習慣和方法，我認爲其他方法都是多餘的	[ ]	[ ]	[ ]	[ ]	[ ]
21. 我知道雖然每個人都很怕筋骨勞損，但是爲了生活只能繼續做	[ ]	[ ]	[ ]	[ ]	[ ]
22. 如果我工作期間休息一下，其他同事就會有意見	[ ]	[ ]	[ ]	[ ]	[ ]
23. 我認爲老闆不喜歡同事在工作期間做運動	[ ]	[ ]	[ ]	[ ]	[ ]
24. 如果我知道不正確的工作姿勢會導致受傷或有嚴重後遺症，我就會去改	[ ]	[ ]	[ ]	[ ]	[ ]
25. 我認爲工作上動作快非常重要，因爲動作慢就會被同事/上司說	[ ]	[ ]	[ ]	[ ]	[ ]
26. 我工作的環境非常不適合我工作	[ ]	[ ]	[ ]	[ ]	[ ]
27. 儘管工作辛苦，但爲了賺更多錢，將來退休沒有那麼辛苦，即使痛也要繼續工作	[ ]	[ ]	[ ]	[ ]	[ ]
28. 儘管工作辛苦，但爲了家庭，即使痛也要繼續工作	[ ]	[ ]	[ ]	[ ]	[ ]
29. 即使我用不正確的姿勢搬東西，受傷也不會這麼巧發生在我身上	[ ]	[ ]	[ ]	[ ]	[ ]
30. 如果我用手推車搬東西就會覺得自己很沒有用，因爲其他同事都沒有用手推車來搬東西	[ ]	[ ]	[ ]	[ ]	[ ]
31. 因爲更快完成工作可以獲得上司稱讚，所以我會用危險的工作習慣和方法	[ ]	[ ]	[ ]	[ ]	[ ]
32. 爲了生活，即使工作很辛苦我都可以應付	[ ]	[ ]	[ ]	[ ]	[ ]
33. 因爲同事患病，我知道了筋骨勞損的嚴重	[ ]	[ ]	[ ]	[ ]	[ ]

性，所以工作中我會按正確的方法和姿勢來做					
34. 搬重物時我會儘量分開多次來搬，因爲我知道搬過重的重物非常容易受傷	[ ]	[ ]	[ ]	[ ]	[ ]
35. 因爲我的工作經驗豐富，所以我的安全意識十分強	[ ]	[ ]	[ ]	[ ]	[ ]
36. 我認爲筋骨勞損的問題是自己一輩子的事情，很嚴重	[ ]	[ ]	[ ]	[ ]	[ ]
37. 工作中很多的人力提舉動作，我認爲自己都能夠做到，很簡單	[ ]	[ ]	[ ]	[ ]	[ ]
38. 我認爲工作中按照職安健步驟來做會浪費我好多時間	[ ]	[ ]	[ ]	[ ]	[ ]
39. 我認爲工作要講步驟，每個步驟你都要去研究，以防受傷	[ ]	[ ]	[ ]	[ ]	[ ]
40. 我非常關注工作上有關的安全守則	[ ]	[ ]	[ ]	[ ]	[ ]
41. 我認爲我的同事/上司缺乏安全意識	[ ]	[ ]	[ ]	[ ]	[ ]
42. 我非常熟悉自己的工作要求	[ ]	[ ]	[ ]	[ ]	[ ]
43. 工作時間長讓我覺得很疲勞，尤其在工作後半段時間	[ ]	[ ]	[ ]	[ ]	[ ]
44. 工作中我常常要求自己儘快做完工作，準時收工	[ ]	[ ]	[ ]	[ ]	[ ]
45. 因爲上司要求快和準時收工，所以我不會按照職安健的方法來做	[ ]	[ ]	[ ]	[ ]	[ ]
46. 我認爲按照職安健的方法來做就會導致生產力受到影響	[ ]	[ ]	[ ]	[ ]	[ ]
47.由於上司或老闆給了我很多無形的壓力，促使我形成不正確的工作習慣和方法	[ ]	[ ]	[ ]	[ ]	[ ]
48. 我認爲某個工作姿勢適合或方便，我就會用那個工作姿勢，不管符不符合職安健的要求	[ ]	[ ]	[ ]	[ ]	[ ]
49. 我認爲自己做慣的這個動作或姿勢才能完成這項工作，相反正確的姿勢我就做不完	[ ]	[ ]	[ ]	[ ]	[ ]
50.工作中我清楚知道這樣做會受傷，但是我	[ ]	[ ]	[ ]	[ ]	[ ]

仍然會去做，因為我不會百分百受傷					
51. 為了完成工作任務，即使有受傷的危險也要去做	[ ]	[ ]	[ ]	[ ]	[ ]
52. 我知道正確的工作行為習慣，但是，實際操作過程中卻很難做到	[ ]	[ ]	[ ]	[ ]	[ ]
53. 職安健所講的預防筋骨勞損的方法基本上沒有用，因為老闆不允許我這樣做	[ ]	[ ]	[ ]	[ ]	[ ]
54. 職安健所講的預防筋骨勞損的方法基本無用，工作中的事情只能靠自己隨機應變處理	[ ]	[ ]	[ ]	[ ]	[ ]
55. 我剛開始工作時已經有很好的安全意識	[ ]	[ ]	[ ]	[ ]	[ ]
56. 我明白到安全意識終身受用，因為它會幫助我產生一種慣性行為，從而預防受傷	[ ]	[ ]	[ ]	[ ]	[ ]
57. 我明白到付出更大的努力才能比別人積累更多的經驗，從而更好地預防受傷	[ ]	[ ]	[ ]	[ ]	[ ]
58. 因為我對工作有興趣，所以整天安排自己工作	[ ]	[ ]	[ ]	[ ]	[ ]
59. 我的工作需要長時間操作，這讓我感到很疲勞	[ ]	[ ]	[ ]	[ ]	[ ]
60. 因為經歷了錯誤的工作行為習慣所帶來的痛苦，所以我學會了如何檢點自己的工作方法	[ ]	[ ]	[ ]	[ ]	[ ]
61. 由於明白到在長時間工作下不可以持續發力，所以我會把工作控制在自己的能力範圍內進行	[ ]	[ ]	[ ]	[ ]	[ ]
62. 我有自己的一套方法來預防筋骨勞損	[ ]	[ ]	[ ]	[ ]	[ ]
63. 我覺得職安健的知識很有用，但是，工作太忙了，根本沒有辦法按照該方法來做	[ ]	[ ]	[ ]	[ ]	[ ]
64. 我和同事的關係很好	[ ]	[ ]	[ ]	[ ]	[ ]
65. 我事事親力親為，儘量不給同事添麻煩，所以提舉重物時都不喜歡叫別人幫忙，自己一個人完成	[ ]	[ ]	[ ]	[ ]	[ ]
66. 平時我都是按照自己的工作習慣和方法來	[ ]	[ ]	[ ]	[ ]	[ ]

做的，結果什麼事情都沒有發生，即使受傷也是時運低造成的					
67. 工作時一分鐘就是一分鐘，非常緊張	[ ]	[ ]	[ ]	[ ]	[ ]
68. 長時間工作讓我感到精神壓力很大	[ ]	[ ]	[ ]	[ ]	[ ]
69. 因爲要生活，所以再苦再累也要做好這份工作	[ ]	[ ]	[ ]	[ ]	[ ]
70. 工作時因爲工作緊張，所以我經常沒有按照正確的姿勢工作	[ ]	[ ]	[ ]	[ ]	[ ]
71. 我認爲即使有筋骨勞損，應該休息一下就好了	[ ]	[ ]	[ ]	[ ]	[ ]
72. 儘管我知道什麼是正確的姿勢，但是因爲工作急促就沒有考慮姿勢是否正確了	[ ]	[ ]	[ ]	[ ]	[ ]
73. 我一直都有運動的習慣	[ ]	[ ]	[ ]	[ ]	[ ]
74. 因爲在工作中我一直都沒有留意有關姿勢的問題，所以就形成了一個危險的工作習慣	[ ]	[ ]	[ ]	[ ]	[ ]
75. 工作中的體力勞動不能代替運動	[ ]	[ ]	[ ]	[ ]	[ ]
76. 對我來說，筋骨勞損是小問題	[ ]	[ ]	[ ]	[ ]	[ ]
77. 對我來說，錢不是最重要的，身體才是最重要	[ ]	[ ]	[ ]	[ ]	[ ]
78. 我沒有筋骨勞損的問題，我不需要留意職安健的資訊	[ ]	[ ]	[ ]	[ ]	[ ]
79. 我覺得我的上司不重視職安健	[ ]	[ ]	[ ]	[ ]	[ ]
80. 我覺得流血的受傷才嚴重，筋骨勞損其實不嚴重	[ ]	[ ]	[ ]	[ ]	[ ]
81. 老闆對我的工作要求特別嚴格，讓我感到壓力很大	[ ]	[ ]	[ ]	[ ]	[ ]
82. 我的老闆寧願補錢也不願意我休息，因爲我的工作很重要	[ ]	[ ]	[ ]	[ ]	[ ]
83. 對於搬抬重物，我認爲叫同事幫忙很浪費時間	[ ]	[ ]	[ ]	[ ]	[ ]
84. 我的工作程式很複雜，需要很多的準備功	[ ]	[ ]	[ ]	[ ]	[ ]

夫，所以我很注意每個工作步驟					
85. 我會自己研究工作方法來預防受傷	[ ]	[ ]	[ ]	[ ]	[ ]
86. 因爲我要求自己的工作效率要快和產品品質要高，如果我心急就很容易出錯，所以我需要控制好自己的情緒	[ ]	[ ]	[ ]	[ ]	[ ]
87. 我很長時間都沒有休息了	[ ]	[ ]	[ ]	[ ]	[ ]
88. 因爲工作環境不允許，所以我認爲根本上不可能按照職安健的方法來預防筋骨勞損	[ ]	[ ]	[ ]	[ ]	[ ]
89. 我很留意自己的工作行爲習慣，因爲我是家庭的經濟支柱	[ ]	[ ]	[ ]	[ ]	[ ]
90. 工作上我會爲自己編排一套自己需要的工作姿勢及動作	[ ]	[ ]	[ ]	[ ]	[ ]
91. 我經常分析和研究工作方法，慢慢就形成了一個適合我自己的工作行爲習慣	[ ]	[ ]	[ ]	[ ]	[ ]
92. 假如受傷了，我會問自己爲什麼這麼大意，然後思考有什麼更好的方法可以預防出錯	[ ]	[ ]	[ ]	[ ]	[ ]
93. 工作上我會思考和研究，所以老闆很放心我的工作	[ ]	[ ]	[ ]	[ ]	[ ]
94. 我覺得用正確的姿勢工作很麻煩，很浪費時間	[ ]	[ ]	[ ]	[ ]	[ ]
95. 我覺得用正確的姿勢工作很不自然	[ ]	[ ]	[ ]	[ ]	[ ]
96. 我知道自己工作的姿勢不對，但是沒有辦法去改變	[ ]	[ ]	[ ]	[ ]	[ ]
97. 我不想放假休息，這樣我就可以獲得更多的收入	[ ]	[ ]	[ ]	[ ]	[ ]
98. 儘管我知道因爲工作環境的原因導致自己的工作方法或習慣不對，但是也只能慢慢去適應	[ ]	[ ]	[ ]	[ ]	[ ]
99. 雖然我知道一個人去搬抬過重的重物不對，但是我沒有其他更好的辦法	[ ]	[ ]	[ ]	[ ]	[ ]
100. 雖然我知道職安健關於如何預防筋骨勞損	[ ]	[ ]	[ ]	[ ]	[ ]

的知識，但是實際上用不上					
101. 在工作上我認為最重要是速度快，不管姿勢是否正確	[ ]	[ ]	[ ]	[ ]	[ ]
102. 因為在工作上每個人都想表現自己，所以不僅產品品質要高而且生產速度要快	[ ]	[ ]	[ ]	[ ]	[ ]
103. 我認為工作速度慢就會被上司或同事罵	[ ]	[ ]	[ ]	[ ]	[ ]
104. 因為我知道筋骨勞損的嚴重性，導致我對它有恐懼感，所以在工作中學會了如何保護自己	[ ]	[ ]	[ ]	[ ]	[ ]
105. 我會在疼痛、不舒適的情況下繼續工作，這樣才不會影響我的工作品質	[ ]	[ ]	[ ]	[ ]	[ ]
106. 在工作時，我的雙手和雙臂會感到疲勞	[ ]	[ ]	[ ]	[ ]	[ ]
107. 在工作間工作時，我會感到疼痛	[ ]	[ ]	[ ]	[ ]	[ ]
108. 因為我對自己的手/臂/肩/頸痛毫無辦法，所以只能忍痛繼續工作	[ ]	[ ]	[ ]	[ ]	[ ]
109. 我實在沒有辦法消除或緩解自己手/臂/肩/頸部所出現的各種症狀	[ ]	[ ]	[ ]	[ ]	[ ]
110. 我的手指/手腕/雙手/雙臂（其中一處或多處）會做一些急促、猛烈、快速、突然的動作	[ ]	[ ]	[ ]	[ ]	[ ]
111. 我不能中途停工，因為這樣做會讓其他工友對我有意見	[ ]	[ ]	[ ]	[ ]	[ ]
112. 我不能中途停工，因為這樣做會讓老闆失望或增加他的負擔。	[ ]	[ ]	[ ]	[ ]	[ ]
113. 我不能中途停工，因為這樣做會讓同事失望或增加他們的負擔	[ ]	[ ]	[ ]	[ ]	[ ]
114. 我不能中途停工，因為這樣做會影響我的評估、晉升，和/或讓我丟掉工作	[ ]	[ ]	[ ]	[ ]	[ ]
115. 如果我關心自己的健康而放下工作，放鬆一下或做做運動，我的同事/老闆會對我有意見	[ ]	[ ]	[ ]	[ ]	[ ]
116. 儘管我在工作中付出了很大努力，但我還	[ ]	[ ]	[ ]	[ ]	[ ]

是真的不知道我的工作是否得到應有的認可					
117. 如果你沒完成自己的工作，老闆不會讓你好過	[ ]	[ ]	[ ]	[ ]	[ ]
118. 如果我向主管反映（一些）問題，比如某某同事沒有努力做好自己的本職工作，這根本起不了什麼作用，所以不如自己做多點	[ ]	[ ]	[ ]	[ ]	[ ]
119. 上司或其他人對工作品質的要求與我不同，這一點讓我感到很沮喪	[ ]	[ ]	[ ]	[ ]	[ ]
120. 我的工作有太多的最後期限，所以總也幹不完	[ ]	[ ]	[ ]	[ ]	[ ]
121. 儘管我會有條理地安排自己的工作，以便能夠在最後期限前完成工作，但情況在不斷變化，自己還是得更加努力地工作，以便按時完成	[ ]	[ ]	[ ]	[ ]	[ ]
122. 我的工作時間表很難控制	[ ]	[ ]	[ ]	[ ]	[ ]
123. 我在自己的工作間工作時會感到壓力	[ ]	[ ]	[ ]	[ ]	[ ]
124. 工作中我會督促自己，確立高於上司和其他人的預期目標	[ ]	[ ]	[ ]	[ ]	[ ]
125. 我的同事沒有做好自己的份內工作，我就得承擔更多的工作	[ ]	[ ]	[ ]	[ ]	[ ]
126. 別人會告訴我應該放慢節奏，工作不要那麼拼命	[ ]	[ ]	[ ]	[ ]	[ ]
127. 在日常工作期間，我會中途停下來休息，做做伸展運動	[ ]	[ ]	[ ]	[ ]	[ ]
128. 在工作間工作時，我會不時停下來休息	[ ]	[ ]	[ ]	[ ]	[ ]

<u>選出所有您僅在高工作要求/高工作量期間</u>才有所體驗的<u>各種行爲/情緒/症狀</u>。（請注意：沒有體驗到的<u>行爲/情緒/症狀</u>，就不需選擇）

129. 憤怒 [ ]

130. 失控 [ ]

131. 無法專注于/集中精力工作 [ ]

132. 無精打采/筋疲力盡 [ ]

133. 不能承受 [ ]

134. 脾氣暴躁/易怒 [ ]

135. 雙腳冰涼 [ ]

136. 雙手冰涼 [ ]

------問卷結束，再次感謝您的參與！------

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