

A Community-Based Pilot Study Exploring Work-Related Musculoskeletal Disorders (WMSD) Perception Among Recently Relocated Syrian Refugees in Canada

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Refugees, a vulnerable population, usually end up in precarious work situations, which are very common in small businesses (SBs). SBs, where 69.7% of the total private labor force is employed, often hire unskilled workers and immigrants to perform manual labor and have few resources for musculoskeletal disorder (MSD) or occupational health and safety (OHS) prevention. A research group at the University of Waterloo has responded to this concern and developed a simple message about proper techniques for manual material handling (MMH) that was found to be a useful preventative approach to convey ergonomics knowledge and potentially lower the burden of MSDs among workers in SBs.

This study followed up on research on the simple educational message “Leave objects off the floor” conducted by Binh Ngo in 1995. In his before-after study of the intervention, participants were asked to rate 44 videos of typical lifting tasks, from 0-10, on how likely they believed the task they just saw could eventually lead to a low back injury or low back pain (LBP). Based on the positive outcomes in Ngo’s study, it was hypothesized that this simple educational message could lead to positive outcomes among newly resettled Syrian workers to improve their knowledge of identifying LBP risk factors. Syrian refugees who had been relocated in Ontario, Canada for less than six years were recruited with the help of staff at settlement agencies in Hamilton, Kitchener, and Waterloo. An explanatory sequential mixed-method approach was utilized to understand refugee workers’ knowledge before and after the simple educational message. A total of 92 participants rated the 44 video clips before and after the simple educational message and 15 participated in semi-structured interviews.

Statistical analysis of the lifting task rating data illustrated that the study participants were able to correctly identify LBP-associated risks, including the risk factors of vertical height, horizontal distance, weight, twisting, coupling, and repetitive movements with the exception for lifting and lowering. These findings were evident both before and after receiving the simple educational message. A primary hypothesis was that participants would rate more

lifting tasks which included the risk factor of vertical height as riskier after they were exposed to the educational message (vertical height is the focus of the message). This hypothesis was supported as for the vertical lifting tasks the increase in mean risk ratings in post-tests ranged from 13 to 35%.

Analysis of the interview data helped explain specific findings from the ratings of lifting tasks that were unusual or unexpected. For example, for ratings for the task of lifting off the floor using the squat lifting technique were lower than expected and participants explained that they had heard in the past that squatting while lifting was the preferred approach. Similarly, participants ranked lowering objects as less risky than lifting based on their own perceptions when in fact the scientific evidence does not support differences in risk. An important message from the study is that simple messages can be effective but will be less effective if past experience/knowledge of participants is discordant.

The interviews provided rich information regarding factors contributing to MSD development in refugee workers. Findings suggest that due to the usual gradual onset of symptoms in the early stages, alongside the general lack of knowledge, MSDs are not considered a serious health concern. Many accept its development as a natural part of the work experience, and thus inevitable. Participants described how institutional and personal barriers played a role in their exposure to MSD risk factors in Canadian workplaces and their reluctance to report hazardous conditions even if they experienced musculoskeletal pain. Many participants reported to be lax about protecting themselves from work-related hazards when faced with the demands of their jobs and other factors that discouraged safe work practices. These influential considerations included environmental factors, e.g., managers' attitudes which focused more on customer service or productivity, MSDs being seen as less important than injuries and accident prevention, small businesses being in a survival mode with no resources for MSD prevention, participants' own economic transition and their need to keep their job, as well as different levels of discrimination embedded in workplace structures.

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List of Abbreviations

MSD	Musculoskeletal disorders
SBs	Small businesses
LBP	Lower back pain
H&S	Health and Safety
OHS	Occupational health and safety
MMH	Manual material handling
IRCC	Immigration, Refugees, and Citizenship Canada
KTE	Knowledge Transfer and Exchange
VH	Vertical Height

Chapter 1: Introduction and Overview

Between November 2015 and 30 April, 2017, 44,919 Syrians were resettled in Canada (Canada. Citizen and Immigration Canada, 2019), increasing the number of newly arrived residents who are mostly only qualified for lower-skill employment positions (Endicott, 2017; Sienkiewicz, Mauceri, Howell, & Bibeau, 2013). Consequently, there is an increase in the potential risk of these individuals developing musculoskeletal disorders (MSD) (MacEachen et al., 2010). MSD, particularly lower back pain (LBP), are one of the most common workplace injuries and significantly influence the number and costs of workplace compensation claims and long-lasting work absences. One contributor to such injuries is the vulnerability of individuals, including the Syrian refugees (Bäärnhielm, Edlund, Ioannou, & Dahlin, 2014). They experience the work environment differently than native Canadians and immigrant classes that have entered Canada by choice. Factors such as a lack of health & safety (H&S) knowledge, different cultural and belief systems, language barriers (Colic-Peisker & Tilbury, 2007), financial constraints, and fear of asking questions due to the fear of job loss likely influence their behaviors to occupational health and safety (OHS) and MSD risks.

This vulnerable population usually ends up in precarious work situations (temporary, contract, short term), which are very common in small businesses (SBs). SBs, where 69.7% of the total private labor force are employed (Ngo, Yazdani, Carlan, & Wells, 2017), often hire unskilled workers and immigrants to perform manual labor and had few resources for MSD or OHS prevention. A research group at the University of Waterloo has responded to this concern and found that a simple message about proper techniques for manual material handling (MMH) can be a useful preventative approach for conveying MSD information and potentially lowering its burden in SBs (Yazdani et al., 2018). The simple education message has been found to improve the identification of MSD hazards and improve risk awareness, which are important in changing worker behaviors (Ngo et al., 2017).

Lifting significantly contributes to LB injuries, and is riskier the closer the objects being lifted are to the ground, due to the higher level of spinal compression and shear (Waters, Anderson, & Garg, 1994). Lifting repetitively from a lower height, over time, increases the trunk flexion

posture that leads to LB injuries such as disc herniation (Callaghan & McGill, 2001). The contextual message mentioned above only emphasizes minimizing the vertical distance, which is the main among seven risk factors (e.g., loads, twisting, lifting vs. lowering, coupling, and repetitive tasks). The conclusion from the scoping review accomplished that as lifting height getting far from to the waist, expecting a higher risk and as a consequence developing LBP (Ngo et al., 2017). So, the message concerned distance from the waist a main lifting risk factor has tried to convey the same concepts.

The purpose of this study was to examine and explore the MSD/LBP risk knowledge among recently relocated Syrian refugees in Canada, before and after presenting them with a simple educational message about safe lifting to see the efficacy of knowledge transfer through this approach. The research objectives were to:

1. Determine which lifting risk factors Syrian refugees identify to be hazardous.
2. Determine whether a simple educational message is effective in changing refugees' recognition of hazards.
3. Investigate if the participants find the message dissemination heuristically clear, simple, and understandable.
4. Investigate if participants find the message practical and effective in the context of their work and workplace based on their typical workdays, environmental factors (e.g., social support), and personal factors (e.g., self-efficacy and knowledge).

This thesis utilized a mixed-method methodological design, and the tools (a survey and intervention; simple educational message) were adapted from a study developed by Ngo, 2015. Following Ngo (2015), a survey was adapted to a Syrian refugee population to assess their understanding of MSD/LBP risks prior to and after a simple educational message, to measure if knowledge transferred conceptually (Squires, Estabrooks, Newburn-Cook, & Gierl, 2011). Participants were asked to watch ten-second videos of lifting/lowering objects and rate the perceived risk of low back (LB) injury (on an 11-point Likert scale) (see Appendix E). Potential participants for this study were randomly selected from those engaged with settlement agencies in the Kitchener-Waterloo and Hamilton areas in Ontario, Canada.

Results have informed us about which tasks participants perceived as hazardous in terms of LBP development. Risk perception was examined by considering participants' demographic

differences such as age, gender, and level of education/previous work experience. An open-ended semi-structured questionnaire was administered and thematically analyzed. Thematic analysis through inductive and deductive coding from the qualitative part of the study assisted us in understanding their perspectives and other social constructs.

Policymakers and H&S professionals can utilize this knowledge to provide proper interventions and guidance to workplaces to reduce MSD risks in this vulnerable population. Thus, this research has the potential to improve the health of this population newly integrated into Canadian society and its labor force, and as a result, help decrease the financial burden of MSD on individuals, employers, and the workers' compensation system. The findings can also be used to update labor market policies in terms of educating incoming refugees on MSD and safe handling practices in physically demanding occupations.

This study addressed the intersections of refugees, OHS, and the transfer of MSD knowledge based on heuristic concepts within the current labor market in Canada. An understanding of this situation is vital as the Canadian government promises and expects to see an ongoing trend of refugee acceptance.

Chapter 2: Literature Review

This chapter reviews the literature related to the topics of refugees; their employment and the importance of OHS; work-related musculoskeletal disorders (MSD) and low back pain (LBP) risk factors; hazard awareness and conceptual knowledge transfer; and the impacts of psychosocial factors on risk-associated behaviors.

The chapter begins with a discussion of how refugees differ from other immigrant classes (Segal & Mayadas, 2005). Refugees who are forced to leave their countries, often by conflict, are driven to act in a hurry, with little preparation. Following this, Syrian refugees' occupational integration and the high likelihood of their working in physically demanding occupations are addressed. Merging the topics of the refugee, working in physically demanding occupations in precarious positions, usually in SBs, and health sheds light on refugee workers and their risk of MSD development.

In terms of MSD prevention, knowledge is a primary factor (van der Beek et al., 2017). Thus, a tool developed by researchers at the University of Waterloo as an effective method for transferring safety and MSD knowledge is introduced as a recommended simple approach. A brief discussion provides information on the simple message development. A survey designed by Ngo (2015), aiming to measure the efficacy of the simple message approach, is also utilized in this thesis.

Many refugees, due to their experience of forced relocation, are at a higher risk than their Canadian-born counterparts of developing poor health in the workplace, often due to faulty perception of risks associated with tasks, and from being remiss in protecting themselves.

Lastly, identifying risks and hazards related to work-related MSD development overlies all sections of the literature review. Knowledge is the key to identifying MSD hazards (van der Beek et al., 2017); however, other factors can influence the practice of safety knowledge transmission in workplace settings and are discussed in detail. Differences in social conditions, changes in the delivery of health care, and the perception of health among refugees are influential factors that should be taken into consideration by host countries, in our case Canada (Gushulak, Pottie, Roberts, Torres, & DesMeules, 2011). The review concludes with a synthesis of key topics that suggests that refugees in their occupational transitions hold positions that make

them prone to developing MSD.

2.1 Refugees

Refugees are officially immigrants; however, they differ markedly from other immigrants in their psychosocial, physical, and financial profiles (Segal & Mayadas, 2005). For most immigrants, for example within the economic and family reunification category, choosing to leave their homelands is a positive experience, carefully planned, and prepared for in advance (Segal and Mayadas 2005). In contrast, refugees who are forced to leave, often by conflict, are driven to act in a hurry, with little preparation (Olsen, El-Bialy, Mckelvie, Rauman, & Brunger, 2016).

2.1.1 Immigrant Classes and Their Financial Stances

Today, one of every five Canadian workers was born outside of Canada and is classed as an immigrant who has settled here permanently by choice or force (Guruge & Butt, 2015; Kosny et al., 2012). Immigrants are distributed under three main categories, detailed next (Canadian Council for Refugees, 1951):

The first category, economic immigrants, are skilled and experienced individuals who are required in Canadian workplaces (Bullock & Bannigan, 2011). This category has several subsections. Applicants may be based in the business field, be provincial and territorial nominations, or have live-in caregiver status, Canadian experience, and in-demand skills, and other areas. Six factors – language, education, experience, age, a pre-arranged job in Canada, and adaptability – are assessed under a point system that determines selection based on a minimum of 67 out of a possible 100 points (Guruge & Butt, 2015). Economic immigrants assume the cost related to their immigration, and they may have been promised a job on arrival (Kosny et al., 2012).

The second category, family class or reunification immigrants, are those common-law and family member individuals who are sponsored under a government program by their family members who are Canadian citizens or permanent residents (Bullock & Bannigan, 2011). These immigrants must either work or be supported by their sponsor when they enter Canada; these immigrants are exempted from acquiring any language credential or skill requirements (Citizenship and Immigration Canada 2006), making it more likely for them to enter low wage

employment due to the lack of Canadian workplace experience and insufficient language proficiency (Kosny et al., 2012). This group may seem similar to refugee participants regarding their experiences of challenges in the workplace.

The third category is refugees who have had to leave their own country to avoid persecution or other dangers and hope to find safety in a host country (Kosny et al., 2012). Canada recognizes two main classes of refugees: resettled refugees and asylum seekers. Resettled refugees have been sponsored by the government of Canada or by a private group before their arrival (Bullock & Bannigan, 2011). These individuals might have been waiting in emergency refugee camps until they were fortunate enough to be selected to live in Canada or other countries. People in this category are granted permanent residency before arriving in Canada, similar to other immigrant classes. These individuals get financial support from the government or their private sponsors for six months to a year of resettlement (Citizenship and Immigration Canada 2006). However, those who are receiving support from private sponsors often feel more pressure to be self-sufficient since they do not want to be a burden to those who sponsored them (Lenard, 2016; Olsen et al., 2016).

The other class of refugees is asylum seekers, who make their way out of their country and flee from their situation (Olsen et al., 2016). They apply for asylum when either in the country or at a border office and must go through the in-land refugee determination system (Government of Canada, 2016). As they wait for their case to be decided, potential refugees can live in a community if they have valid documentation, but if their documents are inadequate, the government may detain them until they are rejected or approved as refugees (Government of Canada, 2016). Those whose claims are declined can apply to have the decision examined via a judicial review (Government of Canada, 2016).

2.2 Refugee Trajectory and Rationale for Focus on Syrian Refugees

In 2015, the Government of Canada promised an exceptional commitment to sponsor more than 40,000 Syrian resettlement refugees in Canada (Hanley et al., 2018). Although this commitment of the Canadian government had much national and international publicity, this was not the first time that Canada has made such a large humanitarian and resettlement promise (Alburez-Gutierrez & Segura, 2018). Most refugees coming through the government-assisted stream and

by private sponsorship and the blended visa-referral program were guaranteed financial supports. So, when the support ends, economic transitions become crucial.

Throughout history, millions of people have been relocated against their will. In the last decades, the problem of forcible displacement seems to have become worse, and according to the UNHCR (2017 a), intentional relocation of people and refugees have been dramatically increased by 74%, from 37.5 million in 2005 to 65.3 million resettled individuals in 2015 and only 21% of these 65.3 million individuals have been permanently relocated in a safe country (Alburez-Gutierrez & Segura, 2018; Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, & Riziki, 2017).

Immigrants in Canada face health challenges and typically their health declines over time. Canadian research on health transitions among migrants shows that, over time, refugees (OR 2.31), low-income immigrants (OR 1.5, 95% CI 1.3-1.7) and immigrants from low and middle-income countries (OR 2.3, 95% CI 1.6-3.3) have an increased risk of transitioning to poorer health as compared to residents who were born in Canada (Brian D. Gushulak, Pottie, Roberts, Torres, & DesMeules, 2011). More detailed research is recommended to better understand what leads to this downward trajectory in health status.

The literature suggests a variety of factors associated with this health deprivation. Focusing on refugees, poverty, and socially downward positioning are common, and these factors can further inflame adverse health outcomes caused by experiencing trauma and torture (Codell, Hill, Woltz, & Gore, 2011). Secondly, immigrants, especially refugees, experience the stresses and pressures of relocations, and these are associated with depression and psychosocial illnesses (B. D. Gushulak et al., 2011). Limited ability to communicate in either English or French has also been suggested to have an association with poor health (OR 2, 95% CI 1.5-2.7) (B. D. Gushulak et al., 2011). Ability to communicate in Canada's official languages also influences their transitioning to poor health and may result in this population's low level of health knowledge. Undoubtedly, their inability to explain their needs for health support also impact their competency to pursue H&S in their non-work life as well as within their work environments. Finally, their economic deprivation and limited ability to integrate with the dominant society, which are common in refugees and immigrant populations, can exacerbate adverse health conditions (B. D. Gushulak et al., 2011).

In a longitudinal cohort study of recent immigrants to Canada, Smith et al. (2009) found that poor proficiency in speaking English among refugee applicants led them to a greater probability of employment in physically demanding occupations two to four years after their relocation (P. M. Smith, Chen, & Mustard, 2009), which is associated with a higher probability of developing unhealthy behaviors. Prevention of workplace injuries among particular groups of new immigrants with poorer English skills requires great attention, especially for those in physically demanding occupations (P. M. Smith et al., 2009), as this is a population at the highest risk of developing MSD (MacEachen et al., 2010).

The newly resettled Syrians illustrate the largest humanitarian resettlement in Canada since 1980. In 2016, they made up 71% of the nation's total refugee intake (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, & Riziki, 2017); very few intakes were from other countries (i.e., Eritrea, Iraq, the Congo, Afghanistan). Syrian refugees made up 11.2% of all newcomers to Canada in 2016, and the largest number resettled in Ontario (IRCC, 2016). This exceptional and exciting Syrian refugee intake, and the expected future refugee intake due to humanitarian action (Diaz et al., 2017; Ruspini, 2009), highlight the need for exploratory studies to ease this population's integration and adaptation, both social and economic. They should be studied to understand their perceptions and risks accurately in order to proactively provide adaptive interventions.

2.2.1 A Population at High Risk of Workplace Injuries and Illnesses

Refugees are a structurally vulnerable population who are differently exposed to a variety of potential adverse health conditions. Social exclusion, downward social mobility, under-employment in physically demanding occupations are conditions that impacts their general health and well-being (P. M. Smith et al., 2009; Syed, 2016). More than half of the recently relocated Syrian population are eligible to enter Canada's labor market (18-59 age) (Society & Houle, 2019). Based on Canadian census data, Syrian refugees are younger than refugees who are entering from other countries, and the median range for their age is 18 (Society & Houle, 2019).

Although Canada usually is praised for its well-established immigration policies and welcoming attitudes towards immigrants, many immigrants and refugees still experience downward

occupational transitions due to labor market barriers and discrimination. They usually enter into a career which is referred to as 3D work: Dangerous, Dirty and Damned or Difficult, often labor-intensive and irrelevant to their previous skills, experience, and work culture (Syed, 2016).

While scholars point out many factors such as discrimination which is imbedded in Canadian institutions, and the policies and labor market structures that can adversely influence refugees in their migration route (Syed, 2016), very few studies explicitly examine how all these features may act together to impact refugees' mental or physical health. A high probability of employment in physically demanding occupations plus the aforementioned negative factors put refugees at a higher risk of developing MSDs as well as work injuries (Lewchuk & Laflèche, 2014; Syed, 2016).

2.3 MSD

Musculoskeletal disorders (MSD) is the general term for a range of conditions that can affect the muscles, bones, and joints (Campbell, 2017). Musculoskeletal pain is common in the neck and back, and pain consequent to physical trauma injuries that usually results from exposure to hazards at work, injury from playing sports, or in the course of military service (Campbell, 2017).

Workers' exposure to different factors, including the physical, ergonomic, and psychosocial features of work-related interaction were identified that contribute to MSD development (Luan et al., 2018). Workers who have excessive exposure to repetition, awkward postures, and heavy lifting are at the highest risk of developing MSD (Luan et al., 2018). MSD as a work-related disease, based on World Health Organization (WHO) interpretation, is said to be a "new epidemic."

The most significant increase of disabilities caused by MSDs in the past decade has occurred in low-income and middle-income countries, Africa, Asia, and the Middle East (Hartvigsen et al., 2018), where most refugees have come from. The high rate of occupational injuries in middle income and low-income countries may have resulted from challenges within health and social systems that are poorly developed and the lack of updating worker protection practices with the best available evidence (Hartvigsen et al., 2018).

Evidence illustrates that even though immigrants and refugees are living in developed countries,

in comparison to their native counterparts they are exposed to greater occupational risks and hazards and suffer the consequences. The high prevalence of injuries among this population may be linked to previous injuries (Kosny et al., 2012), informal employment, and limited job modification, which are known features of low-income counties (Hartvigsen et al., 2018). Factors that impact this population in the host country (Canada) result from lack of knowledge due to improper social support, education and language deficiency, and a poor job modification system (Kosny et al., 2012).

2.3.1 Loss of Income and Disability Due to MSD

In Ontario, over a third of all lost-time injuries result from work-related musculoskeletal disorder (MSD) claims (Baron, 2006; Yazdani et al., 2017, 2018). MSD are the most common types of workplace injuries in Canada, and account for almost 400,000 injuries every year (WSIB, 2014). MSDs can cause direct and indirect financial costs for both employees and employers (Yazdani et al., 2018). The estimated total direct costs nationally are about \$ 72 million in claims paid by the employer sponsored workers' compensation system in 2017, and the outcome was 462,000 lost days (WSIB, 2018). Modifications to equipment, administration fees, training and lost time are just some of the indirect costs of an MSDs case over time, and can be up to five times the direct costs (WSIB, 2018).

Effects to injured workers are considerable, including loss of income, disability, pain and suffering, as well as mental pressure due to unemployment and its effects on the family (Hartvigsen et al., 2018). Preventable WMSDs also have an impact on the whole of Canadian society due to the burden they put on both the compensation system and on public health care. Statistical reports from Ontario's Workplace Safety and Insurance Board (WSIB) note a worsening problem, as the lost time injury rate has increased by nine percent comparing 2016 to 2015.

In February 2007, the Ontario MSDs prevention guideline was announced, and employers are necessitated by law to take every consideration in protecting employees from hazards of developing MSD injuries (WSIB, 2014). These guidelines were updated by the Center of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD) in 2018 to cover different requirements and concerns of different size corporations particularly small

companies. The slogan “work shouldn’t hurt” is the key message of the guideline to encourage workers, managers, and all workplace stakeholders to take action to prevent MSDs.

WMSDs account for 47% of all injuries “sprains and strains”, 43% of all lost-time claim costs, and about half of all lost-time days. In four years, between 2003 and 2007, Ontario employers spent more than \$1 billion in direct and indirect costs related to 187,000 MSD claims approved by Ontario’s worker’s compensation system that resulted in time lost from work (WSIB, 2013). In 2002, the Commission de la Sante et la Securite du Travail (CSST) reported the cost of work related injuries to be about 1.24 billion dollars and that 40% of the costs were from WMSDs (Stock, Fernandes, Delisle, & Vézina, 2005). For instance, a survey conducted by the Quebec Social and Health Survey illustrated that 25% of workers in the province suffer from serious WMSD (Côté et al., 2014). The exact proportion of WMSD of all MSDs was not clear, but the costs associated with compensation for lost workdays related to these disorders was very high (Stock et al., 2005).

2.3.2 Lower Back Injuries and Risk Factors

The cost of back injuries to employers is tremendous and is the leading cause of Workers Compensation Benefit (WCB) claims among the three commonest high-impact claims for benefit payments -- lower-back, shoulder, and fractures (WSIB, 2018). These types of claims represent about 24 % of all benefits paid, and due to the nature of these injuries, recovering from them on average requires three to six months (WSIB, 2018). More than half of the claims, 14% among 24 % of high-impact claims types are related to LB injuries (WSIB, 2018).

In physically demanding occupations, several work-related risk factors have been identified that potentially increase risk of developing LBP (Garg et al., 2014). These risk factors are comprised of trunk flexion, MMH, average to high spinal loads, and vibration (Yazdani et al., 2018). Lessening any exposure to these risk factors at work as a prevention approach for primary, secondary, and tertiary (return to work) resolution are suggested (Griffith et al., 2012; Yazdani et al., 2018). However, it is challenging to identify hazards particularly related to each specific workplace and provide guidance for eliminating or lowering exposures (Yazdani et al., 2018). Prevention of LBP has proved challenging, and the large number of studies including epidemiological, biomechanical, and anatomical research have demonstrated that the highest rate

of developing LBP is associated with exposure to MMH.

The link between demand at work, exposure to repetitive physical tasks, and the anatomical considerations that lead to developing LBP have been well established through biomechanical, epidemiological, and anatomical research (Yazdani et al., 2018). For example, jobs with the highest rate of lost time due to LB injuries involve tasks that necessitate prolonged standing, awkward posture, improper lifting and lowering, which illustrates the link to physical loading (M. A. Adams, Mannion, & Dolan, 1999). Studies investigating posture and force, particularly loading on the spine during a flexed posture, on the prevalence of LB injuries illustrate odds ratios of 1.1-2.0 and 1.4-2.1 respectively (Sterud, Johannessen, & Tynes, 2014). Furthermore, five percent of working time requiring lifting tasks with 60° of flexion, and 30° of trunk rotation for more than 10% of the working time in one day had relative risk values of 1.5 and 1.3 (Griffith et al., 2012).

Epidemiological studies have illustrated other risk factors, including sex, age, BMI and trunk length, that also have an impact on the risk of developing LBP. The incident rate of LBP increases when individuals are in their third decade of life, and this prevalence tends to increase until 65 years of age (MacEachen et al., 2010). The incident rate of developing LBP is higher in females than males and among individuals with a higher BMI due to increased spinal loading (E. Smith et al., 2014). The amount of muscle activity can increase due to the moment arm of the L4/L5 vertebrae in individuals with longer backs and torsos, which further loads the spine and increases the risk of LBP (E. Smith et al., 2014). Epidemiological and biomechanical evidence supports multitude physical risk factors either related to physical aspects of the individuals or of the work tasks that could lead to LBP (Hoogendoorn et al., 2000). Overall, Vertical Height (VH) of lifting (below knee) has been identified as a major risk factor for LB injuries and pain, based on a review by Ngo, Yazdani, Carlan, and Wells (2017). Lifting from the floor is thought to be substantially worse than lifting from waist or elbow height considering biomechanical and anatomical aspects (Yazdani et al., 2018).

2.4 Workplace Participation of New Immigrants and Refugees

A high number of recent refugees and immigrants who have been in Canada less than 10 years (May, 2019) end up working in lower-skilled and physically engaging jobs (Hartvigsen et al.,

2018). Usually, the positions that these refugees secure include working in food services, taxi/truck driving, cleaning and services, agriculture, and construction, which are all considered physically demanding occupations with very high risk of MSD claims (Kazour et al., 2017). The positions that newly resettled refugees secure are often precarious, usually in SBs or they are selected from temporary work agencies as inexpensive labor. Usually, temporary work agencies and SBs have the highest rate of part-time and temporary employment relationships with their workers (May, 2019).

Agency work arrangements provide a non-standard system of supplying labor and have been increasing in the past decades (Cunningham, Sinclair, & Schulte, 2014). Employees are hired by these agencies and assigned to work at the premises of another employer (Howard, 2017). The common feature of these non-standard work arrangements is that there is no expectation of permanence no matter how well workers perform (Howard, 2017). This type of employment comes with the loss of standard arrangements for workers' access to legal protection and social benefits (Friedman, 2014). The agencies are labor suppliers, usually viewed as in a co-employment or joint employment relationship (Howard, 2017), and they send their hires to other companies for time-limited work assignments (Cappelli & Keller, 2013). Usually the host company argues that since there is no employment relationship with an agency worker, they are not legally responsible for protecting the H&S of that employee; however, in an agency arrangement, in fact, both employers legally share the responsibilities (Howard, 2017). These workers, mainly refugees and foreigners, do their assigned tasks often without seeking guidance or medical attention if they injured.

Other features of these non-standard work arrangements related to OHS can include workers worrying about job loss as a consequence of unsafe-work refusal, and workers' compensation policy and practices that limit benefits to workers (May, 2019). There is also the likelihood that these circumstances may lead to the under-reporting of workplace accidents and incidences. When it comes to insurance proceeds, many reports illustrate ongoing gaps between officially recommended safety regardless of the prevalence of OHS policies and the routine use of "safe work" messaging, and partnerships and the reality of workplace practices (Howard, 2017).

2.5 Small Businesses and the Importance of Safety Engagement

Following Canadian census data, researchers found that most immigrants and refugees make the first move in their career paths working in physically demanding occupations and precarious positions (May, 2019) (Stock et al., 2005). Precarious positions are often characterized by low-income, part-time and temporary employment, and recent research from Statistics Canada underlines that SBs have higher rates of part-time and temporary employees (May, 2019). These positions usually require some form of MMH such as handling heavy loads, or tasks that expose them to repetitive movements, forceful exertion, vibration, and maintaining awkward positions. These exposures increase workers' physical-injury risk and risk of developing MSDs (P. M. Smith et al., 2009).

Businesses are required to manage their H&S and create healthy workplaces to be in compliance with legislation, regulations, and codes of practice. However, the differences between small and large corporation management systems influence their H&S activities. Regulating acts based on existence codes is the case for large corporations with a high number of employees and resources. Financially, they can contribute to policy development and convince researchers to focus on H&S concerns in their businesses. Ultimately their support and interest in H&S result in fewer hazards and injuries at large corporations than in SBs, which usually exist in their own financially precarious state – survival mode. This fact supports existing evidence that individuals working in small to medium size enterprises more frequently experience hazards and suffer more work related-injuries than those working in a large one (Legg, Olsen, Laird, & Hasle, 2015). However, this situation is even worse when it comes to businesses with less than 20 employees and micro size businesses. Most literature supports that the physical environment of workplaces in SBs is hazardous, but without including the effect of psychosocial work environment (Faist, Arbeitspapiere, Papers, Editor, & No, 2013; Kazour et al., 2017).

Having more than 20 employees requires any enterprise to have a joint H&S committee, while companies with five or more employees need only have a designated H&S representative (Yazdani et al., 2018). SBs' operation and management are considerably different to that of large ones, and providing effective injury prevention requires special attention (Yazdani et al., 2018). These businesses usually have challenges in identifying and controlling hazards, particularly hazards regarding MSD which are often not as obvious as other workplace risks. Moreover, high

rates of MSD claims were found from those workers with lower education, not belonging to a workplace union, and employed in manufacturing or occupations with requirements for MMH (Morse, Dillon, & Warren, 2000).

The greater exposure to risks and hazards at SBs results from several circumstances that do not allow or encourage owners to create, maintain, and manage a safe and healthy workplace (Legg et al., 2015). For example, SB workplaces are usually less well set up than those of big corporations regarding the workplace layout, with less engineering controls to reduce exposures to physical as well as chemical hazards (Hasle & Limborg, 2006). Moreover, they have been found to have less safety engagement than larger businesses. For example, corporations with more than 100 employees were 100 times more likely to participate in safety activities than firms with less than 20 employees (Legg et al., 2015). One reason for less engagement in safety activities by SBs is that most corporations have their own OHS department and their own safety committees, while the requirement of safety committees is waived for corporations with less than 20 employees in most jurisdictions worldwide (Breen, Bergin-seers, & Sims, 2002; Cunningham et al., 2014; Holizki, Nelson, & McDonald, 2006).

One of the aspects of running SBs is that safety management and practices are covered under general management operations, generally with the owner managing both the business and H&S. Moreover, spoken rather than written communication is the most usual means of spreading safety information. As well, there is a tendency to rely more on personal contact and communicating (MacEachen et al., 2010). However, this reliance by the supplier of H&S guidance is problematic because there is often no documentation whereby workers can educate themselves about procedures and information is forgotten over time. Furthermore, managers tend to place the responsibility for occupational H&S and injury prevention on the workers, and their insufficient knowledge leads to long-term health problems (Yazdani & Wells, 2018). Above all, owners of SBs often work long hours running their businesses, and when it comes to H&S management, they perceive it as a non-core task (Yazdani & Wells, 2018). Ignoring the importance of OHS in SBs, however, can give rise to poor safety management and training skills, lack of resources, poor relationships with regulatory agencies, the high cost of using OHS consultations, and difficulties in implementing and understanding good safety practices, all of which affect workplace safety (Hasle, Bojesen, Jensen, & Bramming, 2012).

Factors influencing H&S in SBs include the cumulative effects of fatigue (the dominant precursor to MSDs), improper control of hazards and risks (due safety decisions being made based on individuals' risk assessments rather than evidence), and both workers and employers having an economic-survival mindset (Hasle et al., 2012).

2.5.1 Importance of MSD Knowledge and Awareness

SBs have been identified to have limited time, knowledge, and resources to improve their H&S activities, particularly in the area of MMH (MacEachen et al., 2010) due to the complexity of ergonomics knowledge (Yazdani et al., 2018). In SBs, there are often few resources for MSD prevention, and business owners' lack of knowledge and awareness has been identified as one the main reasons (Yazdani, Sawicki, Schwenck, & Wells, 2019).

Yazdani et al. also noted that SBs do not take H&S, particularly ergonomics knowledge, seriously, unless it is addressing serious traumatic issues, so running through only a few suggestions with them is ineffective. Therefore, the literature suggests that it is unlikely that MSDs prevention activities will be welcomed or appreciated in SBs. Additionally, due to the small number of OHS and ergonomist professionals allotted to the very large number of SBs, basic ergonomics knowledge can only be inadequately transferred to their work environments, if at all. Thus, a knowledge gap is a major issue even when particular MSD knowledge is supposed to be transferred to these businesses. For example, practitioners recruited by SB owners may only emphasize proper lifting (stoop vs. squat lifting) (Yazdani et al., 2018), whereas Straker (2003, pp 83) believes that a more-comprehensive workplace-design approach is needed, not just isolated training in proper lifting. Additionally, many studies debate the effectiveness of the squat technique, due to a variety of factors that make its efficacy complicated and uncertain.

A study of health literacy illustrated that immigrants of low socioeconomic status and poor education were the most likely to have the least knowledge of health (Derose, Escarce, & Lurie, 2007). Individuals lacking the right tools, knowledge or improper H&S administrative management were more prone to risks while participating in hazardous activities, necessitating the requirement of being closely monitored and supervised by their health administration.

Immigrants and refugees may lack OHS knowledge when they relocate to another country due to the lack of previous experience, illiteracy, and not being accustomed to health rules and

regulations. It is expected that Syrian refugees who are sponsored by the government (GSP) are among those at the highest risk of having a lack of OHS knowledge and high risk of MSD development among other refugees and immigrant classes. Individuals with previous injuries, women, complete families, and the young individuals who have stayed for a long time in camps are a high priority for entrance into the GSP (Immigration Refugees and Citizenship Canada, 2016). They usually are unschooled, unemployed, or injured due to their past conditions, bring urgency to the need to train them adequately during their first years of economic transition (IRCC, 2016).

2.6 Hazard Identification

Reducing the burden of WMSD primarily requires the ability to identify hazards (Yazdani et al., 2018), that is, a possible source of danger that has the potential of harming vulnerable targets (Song, Kanthasamy, Anantharam, Sun, & Kanthasamy, 2010). Actually, the terms risk and hazard are usually used interchangeably, but in terms of risk assessment they are two very distinct terms. A hazard is an agent that can cause damage, and risk is the probability that exposure to the hazard will lead to a negative consequence (Song et al., 2010). In this study, the focus is on the presence of hazardous situations (MSD hazards), and any physical conditions such as poor posture, repetitive motion, vibration, etc. that may lead to a risk of injury to musculoskeletal systems, e.g., muscle, ligaments of the lower back, the nerves of hands (Song et al., 2010).

Ideally, in places where safety is a priority, hazards were identified and then considered and tasks prioritized and carried out to avoid the most-severe impacts. Finally, specialists will work on developing and implementing interventions to control the hazards (Yazdani et al., 2018). Based upon a review by Ngo, Yazdani, Carlan, and Wells (2017), lifting an object from the ground (vertical distance from the floor; below the knee) was identified as a main risk factor for LBP. Based upon the review conducted by Ngo et al. (2017), and Hoozemans et al. (2008), lifting from the floor even without any weights in the hands generates high loads on the LB. This finding contrasts with the common belief about weight and lifting. Objects up to 15 kg add only very little stress to the back, and the effect is similar to lifting loads of no weight at all (e.g., a piece of paper).

2.6.1 MSD Knowledge Transfer and Exchange (KTE)

It has been anecdotally determined that MSD is thought to be a complex topic and that communication about MSD prevention is considered challenging (B. P. T. Ngo et al., 2017). Risk assessment tools such as the Snook Tables (Snook & Ciriello, 1991) and the National Institute of Occupational Safety and Health (NIOSH) lifting equation commonly used by OHS specialists are considered the primary useful tools for practitioners of MSD prevention who deal with SBs (B. P. T. Ngo et al., 2017). A possible explanation for focusing on only these two tools is the absence of simple educational tools, ideally ones able to increase hazard awareness and are suitable for SBs (B. P. T. Ngo et al., 2017). To address this absence, a research group at the University of Waterloo, in collaboration with three H&S associations in Ontario, developed a knowledge dissemination tool which was simple to use and based on a heuristics process. A study by Ngo, (2015) confirmed the usefulness of this tool in disseminating a simple hazards identification message “Store it off the floor” to prevent and control LBP development in small and micro businesses.

Many scientific studies support the idea that the VH in lifting affects LB loading and injury development, particularly for those in MMH positions (Ngo et al., 2017). However, it is very evident that knowledge transition between science and practice is slow or lacking (Van Eerd, 2019). This situation is certainly true in relation to the importance of lifting height and its adverse effects on LBP being transmitted to those to whom it can make a difference and who are exposed to hazardous situations.

A variety of occupational H&S interventions have been applied to workplaces, many not be based on the best available evidence (Van Eerd, 2019). Scientific research on H&S is advancing, and every day studies produce further information and updates that could influence the progress of programs and interventions. Similarly, Van Ered (2019) identified the need to better investigate the area of knowledge transfer regarding its efficacy in making differences in worker H&S. Knowledge Transfer and Exchange (KTE) (Kagan, Simmons-Mackie, Gibson, Conklin, & Elman, 2010), according to the CIHR definition, is an approach concerned with ‘a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians.’ It can be considered a process of exchanging knowledge to make research information available and accessible for use in training, and an

iterative process that takes place between researchers and end users. As noted in the CIHR definition, any attempt at the process of transferring knowledge is considered KTE. And it is important to disseminate science that has been thoroughly evaluated by researchers through an exhaustive literature review on the topic.

Considering the KTE approach, as discussed earlier, a systematic review found that VH is the main risk factor for LBP, and a simple written message was developed targeting this point. As this thesis builds on a study by Ngo, (2015) it worth briefly reviewing that study and why its authors initially found the topic worth exploring, plus an overview of their main findings.

2.7 Overview of Ngo's (2015) study

Research groups at the University of Waterloo have found that small and micro businesses confront many H&S challenges, particularly in controlling MSD hazards and on top of that LBP, as it is a challenging topic. Therefore, a method which was inexpensive in terms of time and budget was deemed to be helpful. They aimed to develop an intervention in order to transfer knowledge so as to provide the ability to identify and control hazards, one suitable for both workers and employers. A simple educational message was developed and its efficacy was explored in a cross-sectional study design. Findings supported the efficacy of the approach in promoting workers' utilization of conceptual knowledge.

Another work, conducted by Yazdani et al. (2018), through an attempt to understand how success in conceptual knowledge utilization could be applicable in terms of its instrumental aspects, used a graphical poster handout in a toolbox talk. Knowledge dissemination via the recent attempt were evaluated in a qualitative semi structured exploration in 40 SBs with a single follow up time point. It was found that 37% of participants (among 40 participants) were aware of the transferred concept from their previous work setting, and the rest of the participants, 63%, declared that their perception about lifting changed when they got the knowledge about the main LB risk factor "store it off the floor". It is worth noting that the only focus was to assess the success of knowledge transfer, and the intervention's simplistic concepts and participants were not monitored to assess effectiveness.

2.7.1 Development Procedure of Tools (A Survey and a Simple Message)

Lifting has a significant effect on LB injuries, having greater impacts the closer the objects being lifted are to the ground as it produces a higher level of spinal compression and shear (Waters 1994). Lifting repetitively from a lower height, over time, increases the trunk flexion posture that leads to LB injuries such as disc herniation (Callaghan & McGill, 2001).

The contextual message used in Ngo's study emphasized only vertical distance, ignoring the six remaining LBP risk factors, such as weight, twisting, lifting vs. lowering, and coupling, which were included in the survey. Loads and vertical distance are considered the critical factors for spinal loads during a lift, and all questions in the survey covered these two main factors and other factors randomly distributed. The conclusion from thorough discussion and associated information from a literature review was that as lifting originates closer to the ground, higher risk is incurred, and as a consequence, the risk of developing LBP rises (B. Ngo, 2015). Thus, the message concerned VH as a main lifting risk factor and was worded as, "The closer your hands are to the ground when you are lifting an object, the more likely you will hurt your back. Even when lifting light objects, you can hurt your back. There is no best way to lift things from the ground, so to stop that problem altogether: 'store it off the floor!'"

The written educational message outlined the main relevant LBP risk factor. The message guided participants in how engaging in risky behavior--"lifting things from the ground" impacts body posture and causes more pressure on the LB regardless of the weight of the object. Further, it explained the importance of limiting the exposure to this main risk factor and encouraged them to stop lifting from the floor (B. Ngo, 2015).

The survey developed by researchers at the University of Waterloo (B. Ngo, 2015) was comprised of 44 video clips, plus Likert-scale questions about lifting components related to everyday work-related tasks—including the key risk factors for LBP. This survey tested individuals regarding their knowledge about identifying LBP hazards before and after providing them with information in a simple textual message. The video clips followed the details based on the NIOSH lifting equation and were used to evaluate participants' ability to identify the hazards of work-related MMH tasks.

The NIOSH lifting equation, which is a common tool MSD use to calculate the risk of MMH

tasks, has identified seven inputs for risk of LBP (Yazdani et al., 2018). The NIOSH equations has a significant impact on lifting index values (LIs) and illustrates the associated risks. Three vertical components: vertical origin, destination, and distance are the vertical lifting height factors, and risk has been found to increase when the lifting and lowering distance gets above or below the range of waist height (Elfeituri & Taboun, 2002). The solution for reducing LBP risk is to decrease the vertical reach distance for any lifts (Elfeituri & Taboun, 2002), and the simple message in this study carries the same concept.

2.7.2 Utilizing a Heuristic Concept Transferring Knowledge

The Centre of Research Expertise for the Prevention of MSDs (CRE-MSD), a research group at the University of Waterloo, had found that a simple message about proper techniques for MMH can be a useful prevention approach (Yazdani et al., 2018). The aim is to provide an approach that is easy to access and cheap (Yazdani et al., 2018).

In knowledge utilization, a heuristic technique can be an approach that acts as a dominant path in transferring knowledge when the emphasis is on conceptual use (also called “enlightenment” or “indirect” use), effort to use, and instrumental use of knowledge. This technique is primarily used when we want to pass on a piece of information for changing or framing or planning steps regarding a particular issue, and so produce better results or outcomes (structural problem solving) (Yazdani et al., 2018). Knowledge utilization can occur conceptually, instrumentally, or strategically (Kramer et al., 2013). Knowledge conceptually can create enlightenment where the learned information influences individuals’ understanding of an issue, which is the main concern in this study (Kramer et al., 2013). Knowledge transfer can be seen if workers use the newly gained knowledge or it changes their attitude on the subject of interest for the better or causes them to make appropriate changes as needed (Kramer et al., 2013). Further explanation of the heuristic concept is provided in the methods section.

Chapter 3: Study Rationale and Objectives

3.1 Study Rationale

Among immigrants, refugees are most likely to end up in precarious labor for the first five to ten years after resettlement (Friesen & Sherrell, 2018). They experience high levels of stress arising from their relocation and adaptation to their new society, and from the high probability of ending up with lower-quality careers regardless of their previous professional background. These circumstances make them more prone to unhealthy behaviors. Moreover, the precarious work environments are associated with additional problems such as low income, limited social interactions, adverse working conditions and limited control over the work (May, 2019). All these factors exacerbate both the risk of developing work-related MSD and their adverse consequences.

Research on refugees who end up in physically demanding jobs is limited in the Canadian setting, and usually researchers group refugees with other immigrant classes which may not be appropriate as they differ in many characteristics. Refugees often find work in SBs that have very limited resources for OHS prevention, further increasing the risk of refugees suffering from work-related MSD. This study builds on the work of Ngo (2015), who was able to develop methods to measure the ability of workers to identify risks for MSDs by rating videos showing workers performing typical lifting tasks. Ngo (2015) found that a simple message could be useful in helping workers identify high risk tasks likely to lead to LBP. This present study, which utilizes the methods developed by Ngo, has assessed Syrian refugees' hazard perception of work-related MSD/LBP. After the initial testing of the refugee participants' awareness and ability to identify risky lifting tasks, they were shown a short educational message, modified to be relevant to new Syrian refugees, which had been shown by Ngo to be effective. Afterwards, the participants were retested to determine if the simple educational tool had changed their ability to identify MSD hazards.

A brief informative message was used as a tool to find out if this message effectively changed Syrian refugees' understanding and awareness of LBP risk and hazards. In another study conducted by Ngo in 2015, this message, when tested in a Canadian workplace context, was

shown to be effective in changing risk awareness. This educational message was developed by researchers at the University of Waterloo to improve MSD awareness regarding a major risk factor for LBP. The goal was to determine if this population's understanding about the risk factor would alter upon exposure to a simple educational message relevant to much of their daily work.

It is known that previous work experience, culture, and other factors such as workplace transition and relocation pressures impact participants' perception of risks and hazards in practice, even if they are exposed to some safety education. In other words, assuming exposure to a message can provide sufficient knowledge for them to identify hazards, other factors may impact their uptake and application of that knowledge. So, interviews were conducted as part of the current study, with questions to gain in-depth information on personal and institutional factors that can impact individuals' hazard awareness while they are in the work context. First and foremost, the interview section explored whether knowledge was transferred through the written message, and if participants thoroughly understood it, whether their perception and knowledge were related and aligned, or not and if not, why not.

In SBs, there are often challenges regarding to injury prevention and compliance with H&S and regulations due to the time and budgets constraints and managers lack of knowledge. The research group at the University of Waterloo has found that the simple message about proper techniques for MMH can be a useful prevention approach (prompt, cheap, and straightforward). This study provides an opportunity to examine the effectiveness of the same concept of providing a simple message on LBP risk awareness among recently relocated Syrian refugees. Also, the study explored how participants' H&S awareness in the context of MSD could be influenced by the work environment and social interactions toward having better health outcomes.

The primary hypothesis of this study was that, post testing, participants will rate most lifting instances as riskier. After receiving their educational message, it was expected that participants' awareness of LBP hazards would have improved. Interviews were carried out to obtain general insights about how/why they perceive risk and hazards in a particular way and to determine how the message impacted each participant given their unique backgrounds and experiences.

The information collected can be used to assist this population in their journey of integration into Canadian society and workplaces. Under occupational H&S legislation, workers must be

informed of the risks that they face in the workplace, and they can refuse to do hazardous tasks. Thus, this research has explored whether they are able assess hazardous situations and how they deal with them in their everyday work environment. The findings from this study, although explanatory, provide policymakers with a general perspective of the challenges this population faces in the Canadian workforce in terms of MSD and more generally their H&S; they can use the findings from this study to develop and adapt guidelines to better protect this vulnerable population. This investigation gives voice to refugees to better express their work-related MSD understanding and its development, a perspective that is too often absent from the literature (Immigration Refugees and Citizenship Canada, 2016; Hoogemoorn 2000).

Research outcomes can be utilized as a foundation for more extensive projects of implementing MSD knowledge transfer tools for risk and hazard management in SBs and updating the MSD prevention guidelines in the future. Overall, this work will provide awareness of the employment risk and hazard potentials faced by this unique population and whether other psychosocial factors affect individuals in their behaviors associated to MSD development.

Exploring this new subpopulation in studies like this one can inform the development of preventative interventions that are more suitable for them, reducing the economic burden of injuries and improving their overall health and wellbeing. Findings can be used for developing a larger investigation to change labor market policies and management and to educate incoming refugees on safe handling practices relevant to the jobs they have in Canada.

3.2 Study Objectives

This study aims were to explore work-related musculoskeletal disorders (MSD)/Lower Back Pain (LBP) hazard perception among recently relocated Syrian refugees in Canada before and after presenting them with a simple message about safe lifting. To address the research aim, a mixed-methods approach, using both surveys and interviews, has been applied to address the following objectives:

1. Determine which lifting risk factors Syrian refugees aware of being to be hazardous.
2. Determine whether a simple educational message is effective in changing refugees' recognition of hazards.
3. Investigate if the target population finds the message clear and understandable.

4. Investigate whether participants find the message practical and effective in reality.
5. Explore participants' hazard awareness challenge based on their typical workdays regarding their environment; social support, personal factors, self-efficacy and knowledge.

Chapter 4: Methods

A mixed methods study using an explanatory sequential design was conducted (Creswell & Plano Clark, 2011) to explore the effectiveness of a simple educational message (an intervention) in increasing work-related MSD hazards awareness. A survey and simple message were adapted from a study conducted by Ngo, 2015 to help us in this investigation. A total of 92 Syrian refugees were surveyed, and 15 individuals were participants in follow-up interviews.

A quantitative cross-sectional (pre and post-test) study was combined with a qualitative semi-structured interview with participants who were selected based on a variety of work experience and level of education, age, and gender differences. To attain a systematic and comprehensive explanation of how participants' awareness of hazards had been influenced by the intervention, quantitative and qualitative data were integrated at both the collection and analysis stages (Pluye et al., 2013).

The quantitative data collection documented participants' perceived risk Likert ratings from a survey as well as their reflections on each question. Guided by quantitative data, we recorded and analyzed participants' explanations of their general MSD knowledge, any experience of MSD pain, the objectives of the search, the cognitive impact of the received intervention (e.g., participants were asked about the transferred knowledge and if they are able to provide an example or in their own words explain the message to the interviewer), and finally how compliance with MSD at their workplace is influenced by other factors. Quantitative and qualitative data were then merged to provide a narrative description.

4.1 Theoretical Model

A theoretical–analytical framework developed for the study was conducted on tenet of the heuristic concept (Tversky and Kahneman 1974). Employment of heuristic concept perspectives would aid in explaining how a simple and brief message has the capacity to impact workers' risk awareness and in what circumstance it has the most effectiveness.

Overall the aim was to determine under which circumstances could improve the efficacy of utilizing a simple educational message and thus increase MSD awareness. The intervention in this study was developed based on a heuristic concept (Yazdani et al., 2018).

4.1.1 A heuristic concept

Testing and verifying the effectiveness of a simple educational message based on a heuristic concept was the predefined objective for the quantitative part of this study (John W. Creswell, Ann Carroll Klassen, Clark, & Katherine Clegg Smith, 2011). The heuristic concept was developed in the 1970s and 80s by psychologists Amos Tversky and Daniel Kahneman. Human decision making and problem-solving operate within “bounded rationality.” Heuristic instruction relates to the situations where individuals look for solutions or judgments that are appropriate enough for their points but brief and optimized (Tversky & Kahneman, 1974). It is “fast and frugal” that has the capacity to largely correct and reduce cognitive bias when different factors are interacting. That interaction of different cognitive elements make decision making not straightforward, and in fact, finding the best choice is complicated (Gigerenzer, Todd, & Group, 1999). Thus, the simple message makes the decision making simpler.

Thus, in this study, first, a large number of Syrian refugee participants were surveyed (before and after intervention) to find out if the knowledge transferred conceptually. Quantitative surveys produced numerical data for measurement of the extent to which the message had effectively improved participants’ knowledge.

Henceforth, participants’ MSD knowledge improvement based on the results of the numeric evidence (obtained from the quantitative part of the study) and participants understanding from the utilized intervention (simple message) were both better explained and clarified when we moved to the qualitative part of the study. We also used our discussions with participants to explore other factors that emerged as they spoke, that might impact them and their assessment of hazardous situations when putting their knowledge into practice, and possible fallout from interactions with their work environments and social contexts.

4.2 Participants & Settings

4.2.1 Quantitative Data Participants & Settings

Participants for the survey consisted of 92 Syrian refugees were recruited verbally in the Hamilton, Kitchener, and Waterloo regions of Ontario. The participants were selected from the Syrian refugee influx and who have lived in Canada for less than six years. Efforts were made to

include a mixture of females/males, different educational backgrounds, and a variety of work experiences.

Demographic data (see **Table 4-1**) were collected at the beginning of the survey, and included personal information about participants’ characteristics; gender, age, education, years of work experience, length of time in Canada. This step was followed by inquiries about their general understanding of MSD/LBP.

All participants were informed about the purpose, aims, risks, and benefits of this study before they signed the consent form in order to join the study. Study participants received a feedback letter giving them information on the study and their role in the research as well as the researcher’s contact information. The study was appraised and received ethics clearance from the University’s Research Ethics committee.

Table 4-1: Demographic Survey Items. The items that were asked are listed below with example question or answers and rationale behind each item adapted from Ngo’s study (2015).

Item	Examples	Rationale
Sex	Female/Male	Examine sex differences
Positions/Education experience (before or after migration)	High school/Labor College Degree/Lead University degree	Related to MSD/OHS knowledge
Work experience (outside of Canada)	Yes No	Knowledge/skills in OHS and MSD awareness
Work experience (inside of Canada)	Yes No	Knowledge/skills in OHS and MSD awareness
Previous low back injuries	Yes No	Individuals with LBP can show reduced perceptions of physical capacity and more self-care (Jick, 2018).
Workplace size	<20 employees >20 and <50	Small businesses (companies with < 20 workers) have been shown to not have access to information about MSD. If it can be shown that the individual workers can learn to be aware of risk factors, it provides more incentive for transferring knowledge to small businesses (Ngo, 2015).

Snowball sampling was used to recruit Syrian refugee participants. All participants were pre-screened for the study for a number of characteristics as below:

- Syrian refugees that have entered Canada through government or private sponsoring (GAR and PSR programs) or blended visas
- Participants over 18 years of age so that informed consent could be obtained

Maximizing the variety of Syrian participants from different social networks and with varied

experience was done to ensure that we had a representative sample of this population. All participants had to be over 18 to be categorized as adults, considering the age of work eligibility and also due to ethical reasons related to the consent form. There was no limitation on marriage status – single, married, divorced, and common-law, or–with/without dependents such as children or other family members.

4.2.2 Qualitative Data Participants and Settings

Purposive sampling from the population of participants who had completed the quantitative survey was used in the recruiting of 15 respondents for in depth interviews (Creswell, 2013). Selection of participants ensured a maximal variation in age, work experience, and level of education or skills, as determined from their responses on the questionnaire.

One-on-one semi-structured, in-depth interviews were carried out when participants had completed the survey. Beforehand, participants were asked about their willingness to take part in a verbal interview, and they were provided with a \$20 Tim-Hortons gift card.

4.3 Procedure

4.3.1 Quantitative Participant Identification and Recruitment

We worked in collaboration with community partnerships – the Immigration Working Center (IWC), librarians in public libraries, YWCA Hamilton, ShamRose Refugee Support Centre, Reception House Waterloo, The Working Centre, and the Mennonite Coalition for Refugee Support to get assistance in recruiting potential study participants. All are not-for-profit organizations helping refugees with services such as language classes, housing, and job searching. The trusting relationships between the refugees and the community service providers assisted in approaching possible study participants. Staff in the collaborating organizations were introduced to the study aims and objectives, the study’s inclusions and exclusions, data collection protocols, and procedures. Community service providers agreed to contact participants and ask about their willingness to participate.

Through discussion with the staff in community organizations, we learned that there was a high probability that potential participants were not able to communicate in English. Thus, all printed materials for the survey were translated into Arabic languages; one person voluntarily would

assist with translation when administering the questionnaire and provided participants with further explanations if needed.

Our intention was to select Syrian refugee participants who had been living in Canada for less than six years and were actively looking for a job or already employed and probably received some sort of training. This cutoff at six years was deliberately chosen to align with the start of Syria's civil war, as proclaimed by the UN, because the literature indicates a range of 5-10 years for immigrants to adapt themselves in economic transitions. Overall, we needed participants whose knowledge, experience, and perception were tailored mostly based on where they had lived and their conditions after relocating to Canada.

Individuals were recruited one on one since as it was not logistically possible to recruit them in a group. Moreover, individual recruitment and completion of the study protocol one on one ensured that participants attentively responded to each question and were not influenced by other members of a group. The one-on-one approach also provided us the chance of recording notes on participants' comments related to the survey questions or if they had challenges understanding it. Answers were recorded in an answer sheet manually and later transferred into an Excel spreadsheet. Field notes were collected to capture initial impressions, comment on possible themes for analysis, and create questions or make findings that could advise us on interviews.

4.3.2 Qualitative Participant Identification and Recruitment

Interviews took place in various private-public locations that were suitable for both the researcher and the participant. Public places included meeting rooms in YMCAs/YWCAs, public libraries, and community centers. Interviews usually exceeded one hour. Interviews were audio-recorded and transcribed before analysis via NVIVO software.

The purposive sampling approach allowed us to identify participants with rich information about our area of interest and to question them to collect their in-depth insights. Such cases were identified based on the ongoing research through the survey part until it has been reached a point that required in-depth explanations and interviews to assist us. In this study, for example, information-rich cases may be those individuals who indicated no significant improvement or no improvement in their responses to the rating survey questions from the pre-test to the post-test, those who felt integrated into the Canadian work environment, and participants with injury

experience at workplaces.

4.4 Data Source and Instruments

4.4.1 Quantitative Data Source and Instruments

In this study, the survey/video method designed by Ngo (2015) was used to gather participants' risk perceptions for each lifting/lowering scenario. Each question was linked to a ten-second video clip focused on common physical engagements in the workplace. Each participant was asked to rate the same videos pre- and post-test on a 0 to 10 Likert scale, and they were asked to rate how likely the lifting instances were to eventually lead to LBP. **Figure 4-1** provides example in the three frames for one of the questions. More details about the survey can be found in next section.



Figure 4-1: Example of 3 frames collected from the twisting, floor-to-floor video. The pictures from left to right show the subject just lifting the object (Lift off phase), twisting during mid lift (Mid phase), and just before the subject places the object down on the floor (End phase).

The survey consisted of two groups of 44 questions, each question linked to ten-second videos of lifting instances (Ngo, 2015). The ten-second videos of lifting were captured from the posture in the frontal and sagittal planes, giving the audience enough visual information for posture analysis. Lifting as a large-scale work action can be properly captured by participants particularly when the lifting and lowering are happening in symmetrical postures (Ngo, 2015). Additional attention was paid when filming those tasks targeting twisting risk factor to ensure the motions were captured clearly. Further detail for survey development were provided in Appendix D.

In the designed survey, participant responses were measured initially in the pre-test to determine which MSD risk factors for LBP were perceived as risky by the target population. In the next step, participants received an educational message (intervention) explaining the importance of

reducing VH when lifting an object, as this is the main risk factor for LBP. Finally, the extent that participants' responses changed after the message was measured from the data collected post-test. The purpose of these steps was to analyze and understand the effectiveness of the simple educational message on proper lifting and to quantify how well participants were able to recognize tasks that hold hazardous LBP risk factors.

4.4.2 Qualitative Data Source and Instruments

Through a semi-structured interview, comprised of open-ended questions, we explored participants' general MSDs knowledge as well as the effectiveness and clearness of the simple educational message. Participants were advised on proper lifting to improve their ability in identifying MSDs/LBP hazards. Questions were aimed to obtain data in explaining some parts of quantitative results, as well as to demonstrate in further detail how they perceived the simple message. Finally, the exploratory part of the qualitative study shed light on participants' general thoughts about training.

From the beginning of the survey, it was the assumption that the intervention would be simple and clear. Thus, the qualitative complementary part of this study assisted in better understanding of participants' perspectives about message simplicity and whether the knowledge transition heuristically was effective or not.

It has been a common approach in this type of research to recruit participants until a theoretical saturation point is reached (Braun & Clarke, 2006). However, in this study, the aim was to classify different possibilities regarding H&S training approaches and their management from workers' points of views. The findings of this study and investigating the effectiveness of a simple tool can enlighten researchers in devising further research to identify proper H&S tools or approaches suitable for specific target populations.

Thus, participants with different experience were recruited for the interviews. They included a balance of females and males, those who had recently entered the work environment, participants with varied employment histories, different educational backgrounds, skilled/unskilled, young and middle-aged, and working in large, small or both sizes of business (e.g., experience in both small and large workplaces). The interview protocols (Appendix F) were established and several mock interviews tested their feasibility and the time requirement.

In terms of developing the interview questions, evidence suggests that behavior changing in the health domain is more effective when directed by relevant theory than under non-theoretical approaches (Dewar, Lubans, Plotnikoff, & Morgan, 2012), so a questionnaire was developed based on Bandore's Social Cognitive Theory and included the following scales of personal and institutional factors that are part of the social dynamics and are influential when participants receive training.

By considering qualitative interviews shortly after the survey, key information from participants' perceptions of work-related MSD hazards supplemented the quality of this section. Data collection would clarify for example; 1) which instance of lifting was perceived as most risky and why?; 2) assessing participants general knowledge, attitudes/perceptions about MSD; 3) participants opinions about the simplicity of the educational message; 4) and investigating synchronization of any received knowledge as training with their real practice at their workplace.

4.5 4.5 Data Analysis

4.5.1 4.5.1 Quantitative Data Analysis

The numbers and finding from the survey were utilized to analyze and test participants' ability to recognize LBP risk factors and to what extend this simple educational message was effective in improving their hazard awareness. SPSS software was utilized for the statistical analysis.

Shapiro-Wilk tests of normality illustrated that data were normally distributed. The statistical level of significance was considered to be $\alpha = 0.05$.

- Objective I: Lifting risk factors

To find out which risk factors of LBP were perceived as riskier than others, t-tests were used to compare mean scores for different risk factors.

- Objectives II: Message Efficacy (To what extent knowledge was transferred)

Scoring differently of the same questions in pretest and posttest could illustrate participants risk awareness whenever they detect increase of vertical height while objects were lifted.

- Objectives III: Correlations of demographic variables

To determine whether demographic factors were associated with participants' rankings,

demographic stratified, post-hoc regression Pearson Product Moment Correlations were calculated. To account for multiple comparisons, Bonferroni corrections were utilized.

Forty-Four lifting tasks were filmed organized by different factors. For instance, the lifting height combinations for VH were categorized into eight, from Calf-to-Waist (CW), Floor-to-Floor (FF), Floor-to-Shoulder (FS), Floor-to-Waist (FW), Knee-to-Waist (KW), Thigh-to-Waist (TW), Waist-to-Shoulder (WS), and Waist-to-Waist (WW). And three ranges for weight of objects were considered: light, medium, and heavy. The NIOSH Variables of risk for developing LBP were lifting/lowering, frequency, horizontal distance, Vertical Height (VH), asymmetry, stoop, coupling, and weight see Table 4-2.

Table 4-2: Lifting Videos. Forty-Four lifting tasks that were filmed organized by factor. Each cell represents one lifting trial unless otherwise specified. The lifting height combinations are from Calf-to-Waist (CW), Floor-to-Floor (FF), Floor-to-Shoulder (FS), Floor-to-Waist (FW), Knee-to-Waist (KW), Thigh-to-Waist (TW), Waist-to-Shoulder (WS), and Waist-to-Waist (WW).

Vertical Height (VH)	Lower	NIOSH Variables				Stoop	Weight	
	(Low)	Frequency (FREQ)	Horizontal Reach (HORI)	Asymmetry (ASY)	Coupling (CUP)	(STP)	Light (LIT)	Heavy (HEV)
F – W ABCDF	W-F ^B	F – W ^C	F – W ^C	F – W ^C	F – W ^D	F – W ^E	F – W ^E	F – W ^E
C – W ^{ABE}	W-C ^B						C – W ^E	C – W ^E
K – W ^{ABCD}	W-K ^B					K – W ^D	K – W ^E	K – W ^E
W – W ^{ACE}		W – W ^C	W – W ^C	W – W ^C	W – W ^C		W – W ^E	W – W ^E
F – F ^{ACE}		F – F ^C	F – F ^C	F – F ^C	F – F ^C		F – F ^E	F – F ^E
T – W ^A								
F – S ^A								
W – S ^A								

^A = t-test comparing average mean of lifting height combinations
^B = t-test comparing lifting vs. lowering
^C = t-test comparing NIOSH variables
^D = t-test comparing Stoop lift with default lifts
^E = t-test comparing default lifts with altered objects weights

Vertical Height (VH) were divided to eight in order to not clearly be identifiable by participants Table 4-3.

Table 4-3: Mean and Standard Deviation of Eight-VH Rated Based on Participants Risk Perception: Descriptive Statistics (Pre-test).

VH	F-W	C-W	K-W	W-W	F-F	T-W	F-S	W-S
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Lifting and Lowering were compared in Table 4-4 for three vertical heights (light, medium, and heavy).

Table 4-4: Results of t-test and Descriptive Statistics of risk perception for lifting and lowering objects comparing three different VH combinations.

Vertical Height (VH)			
Lift (defaults)	F-W	C-W	K-W
Lower	W-F	W-C	W-K

Table 4-5 shows NIOSH variables (e.g., frequency, horizontal reach, asymmetry, and coupling) risk perception were analyzed among three main VH categories.

Table 4-5: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception comparing NIOSH variables with default lifts for three different VH of (FW, CW, KW).

Vertical Height (VH)				
Default		F-W	W-W	F-F
NIOSH Variables	Frequency	F-W	W-W	F-F
	Horizontal Reach	F-W	W-W	F-F
	Asymmetry	F-W	W-W	F-F
	Coupling	F-W	W-W	F-F

Results of descriptive statistics comparing different vertical height with different method of lifting Table 4-6 and **Table 4-7**.

Table 4-6: Results of t-test and Descriptive Statistics of risk perception comparing squat and stoop lifting objects comparing three different Vertical height combinations.

Vertical Height (VH)		
Squat (Default)	F-W	K-W
Stoop	F-W	K-W

Table 4-7: Comparing default lifts with altered object weights in five different categories of VH.

Vertical Height						
Weight	Medium (Default)	F-W	C-W	K-W	W-W	F-F
	Light	F-W	C-W	K-W	W-W	F-F
	Heavy	F-W	C-W	K-W	W-W	F-F

4.5.2 Qualitative Data Analysis

A thematic analysis was considered to be the appropriate approach for analysis of the data. This method is theoretically flexible enough to answer different types of research questions within different frameworks, such as questions related to people’s experience and beliefs (Braun & Clarke, 2006).

In this study, survey analysis entailed the interviews documented on collecting data concerning MSD/LBP knowledge, exploring the efficacy of simple educational message, and their general perception about the received simple training. However, additional themes were intended to be

data-driven. Accordingly, an inductive approach to coding the data without preconceptions of the themes was employed following Braun and Clarke's direction (2006). Selected data from the qualitative component of the study would focus on addressing the research questions and more in-depth understanding of the survey results and understanding the participant's rationale.

In the early stages of analysis, an inductive approach was enhanced by not engaging with the literature. Therefore, interpretation of the themes guided the relevant literature review. The analysis proceeded to discern patterns in the data and developing an understanding of the broader meanings in an iterative and cyclical process (Singer & Hunter, 1999) and then examining them with respect to previous literature. The original content and thematic cluster(s) were compared again to ensure consistency and reflexivity that all the original material has been retained in the cluster (Dixon-Woods et al., 2006).

The aim of the complementary part is to give voice to the participants in the front line. The realistic approach of thematic analysis is essential in empowering this study in providing the audience with a report that represents participants' experience, meaning, and reality in their everyday work environment. After identifying any patterns from the dataset, thematic analysis not only assisted us in analyzing and reporting themes within the data but also provided further insight in interpreting different aspects of the research topic (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007). The transcribed qualitative data was stored and analyzed with NVIVO™ software package. This guide for conducting thematic analysis that was developed by Braun and Clarke, 2006 was used and the following steps were performed:

- Six of the interviews were coded (chunk by chunk) and analyzed at the beginning to find out about the emergent codes and expand the interviews based on clarifying any complications and if needed to recruit more participants.
- First set of interview transcript (six) was read by Dr. Elena Neiterman to thoroughly understand and get familiarize with the nature of the data to discuss the codes relevancy.
- The initial codes have been utilized as a template (King, Catherine Cassell, & G Symon, n.d.) to capture relevant responses to each topic to interpret the data. The initial codes were reviewed by two other researchers. The initial coding delineated participants' direct experience, thought and perspectives.
- The consistency of inter-codes was determined and discussed among researchers to make

sure of codes agreement.

- The initial codes that usually assorted based on the likelihood of themes were disposed within the identified themes.
- The identified themes were reviewed and finalized to avoid duplicate themes and identify missing ones.
- Researcher refined each theme and finalize the identified themes to use for final analysis and summarizing the findings of this study and establish the report.

Chapter 5: Results

Results can best be treated under four headings. Initially, the first heading covers descriptive characteristics of participants. Secondly, quantitative results from participants' LBP risk perception presented and results explained further from findings emerged in the qualitative data analysis. Thirdly, the effectiveness of the intervention investigated from the results of pre and post-test was reported and explained using both quantitative and qualitative data. Finally, participants' points of view regarding their hazard's awareness challenge based on typical workdays were described. Four headings would present results aiming to cover study objectives as below:

1. Determine which lifting risk factors Syrian refugees perceive to be hazardous.
2. Determine if MSD risk knowledge and perception differs by sociodemographic variables – gender, years of working experience/previous injuries.
3. Determine whether a simple (heuristic) educational message is effective in changing refugees' recognition of hazards.
4. Investigate if the participants find the message clear and understandable and effective.
5. Explore participants' hazard awareness challenge based on their typical workdays regarding their environment; social support, personal factors; self-efficacy and knowledge.

Quantitative data comparing pre- and post-test results examine whether the utilized intervention could increase participants' ability to identify potentially hazardous situations leading to LBP or not. Data from the qualitative part, which are organized based on major themes, also help us better understand the numeric results and explain participants' points of view regarding H&S training in general.

5.1 General Characteristics of Study Participants

The sample consists of 92 participants recruited through snowball sampling. The sample for the qualitative component was 15 participants who had participated in the survey and consisted of nine females and six males. The interviews were arranged at the end of the survey. Demographic

information of the sample is illustrated in Table 5-1 for the survey and Table 5-2 for the interview participants.

Table 5-1: Description of survey participants (snowball sampling)

Descriptor (Survey)	Number of participants = 92
Mean Age (SD)(Yrs.)	29.61 (9.0)
Female/Male	53/39
Work Experience (No/Yes) (Percentage)	32/57 (%34 / %66)
Length of Stay in Canada (Months) (SD)	25.15 (15.8)

Table 5-2: Description of interview participants (purposive sampling)

Descriptor (Interview)	Number of participants = 15
Mean Age	36.6
Female/Male	9/6
Work Experience (No/Yes) (Percentage)	All participants had more than a year of work experience
Level of Education	8 educated (equivalent to college & university)/7 under diploma
Length of Stay in Canada	X<6 yrs.

Table 5-3 illustrates interview participants demographic information including age, sex (male/female), their level of education and experience, years of living in Canada, working in large (L) or small businesses (S), either they were employed part-time (P) or full-time (F), and participants previous work experience in Syria and Canada.

Table 5-3: Interviewed participants' demographic information.

	pseudonym	F/M	Age	Edu/Skill	MSD pain	Living in Ca (yrs.)	Working in Large (L)/Small Bs (S)	Number of Job/Exp	Previous career (Syria)	Part-time/ Full-time
1	Hajar	F	27	Educated	Yes	3	L	3-Services	Teacher	PPP
2	Misha	F	28	Educated	Yes	5	S	3-Barber	Uni/Student	PPP
3	Bahar	F	23	Labor	Yes	2.5	S/L	3-Sale & services	Uni/Student	PPP
4	Azam	F	48	Educated	Yes	1	S	1-Librarian	Teacher	P
5	Mitte	F	50	Educated	Yes	5.5	S/L	4-Sale & services	Governmental job	PFP P
6	James	M	38	Labor	No	6	S/L	2-General labor	Labor (Construction)	F
7	Sapid	F	36	Educated	Yes	4	L	3-General Labor-Sail & Services-Accountant	College instructor	FPP
8	Alisha	M	37	Educated	No	4	S/L	3-Engineer	University instructor	FFF
9	Mavi	F	51	Educated	No	1	L	1-Sale & services	Librarian	P
10	Maher	M	25	Labor	Yes	2	S/L	2-Tile installer-	Labor	FF
11	Ali	M	34	College	No	1.5	L	1-Technician	Technician	F
12	Osman	M	32	College	Yes	1	L	1-Technician	Technician	F
13	Omar	M	28	College	No	1	L	1-Technician	Student	F
14	Sharifa	F	46	Labor	Yes	4	S/L	1-General labor	Homemade	P
15	Anna	F	52	Educated	Yes	6	S	3-Cleaning-Packager-PSW	Nurse	PPP

PPP: Three job experience all part-time (3 part-time jobs).

FPP: First job of the participant was full-time, second job part-time, and the third job was fulltime.

Small businesses: S

Large corporations: L

5.2 Risk Perception of Lifting Factors

Likert-type scale scores were taken as a pre-test to analyze and provide insight on Syrian refugees' risk perception of LBP before they viewed the simple educational message. Seven NIOSH factors of lifting conditions (task) with different height combinations were used when analyzing the data through t-tests mean comparison. The results of the survey analysis were described thoroughly with qualitative data whenever further clarification was needed.

5.2.1 Vertical Height (VH)

Significant effects on risk perception were found in relation to changes of the VH of lifting task ($P < .0001$, **Table 5-4**). It was found that lifts from calf-to-waist and knee-to-waist were perceived as risky with Likert score Mean of 5.48 (± 2.55) and 5.40 (± 2.16) respectively, and floor-to-waist stood in third place. The least-risky lift perceived among the eight VH categories was from waist-to-shoulder, with the Likert Mean range of 2.32 (± 1.75). In general, VH was perceived as a risk factor in either pre-testing or post-testing. Lifting objects from closer to the ground was mostly seen as riskier; however, the results from the post-test were more consistent regarding perceiving VH as a risk factor.

Table 5-4: Mean and Standard Deviation of Eight-Vertical Height Rated Based on Participants' Risk Perception: Descriptive Statistics (Pre-test).

Name of Vertical Height for Lifting	Number of Participants	M	SD	p-value
FF	92	4.65	1.888	<.0001
FW *	92	5.32	2.243	<.0001
FS	92	4.21	2.331	<.0001
CW *	92	5.48	2.558	<.0001
WS	92	3.02	1.757	<.0001
WW	92	3.37	2.293	<.0001
KW *	92	5.40	2.160	<.0001
TW	92	3.20	1.957	<.0001

Note: M=Mean. SD=Standard Deviation. The eight Vertical Height (VH) of lifting include: Floor to Floor (FF), Floor to Waist (FW), Floor to Shoulder (FS), Calf to Waist (CW), Waist to Shoulder (WS), Waist to Waist (WW), Knee to Waist (KW), and Thigh to Waist (TW). Likert scale of risk perception is 0 (Lifting Not Likely to hurt LBP) to 10 (Extremely Likely to hurt LBP).

*: The most risk perception average related to FW, CW, KW.

Figure 5-1 clearly illustrates that floor to waist, calf to waist and knee to waist are at the highest rank of risk perception. Waist to shoulder, waist to waist and tight to waist are at the lowest rank.

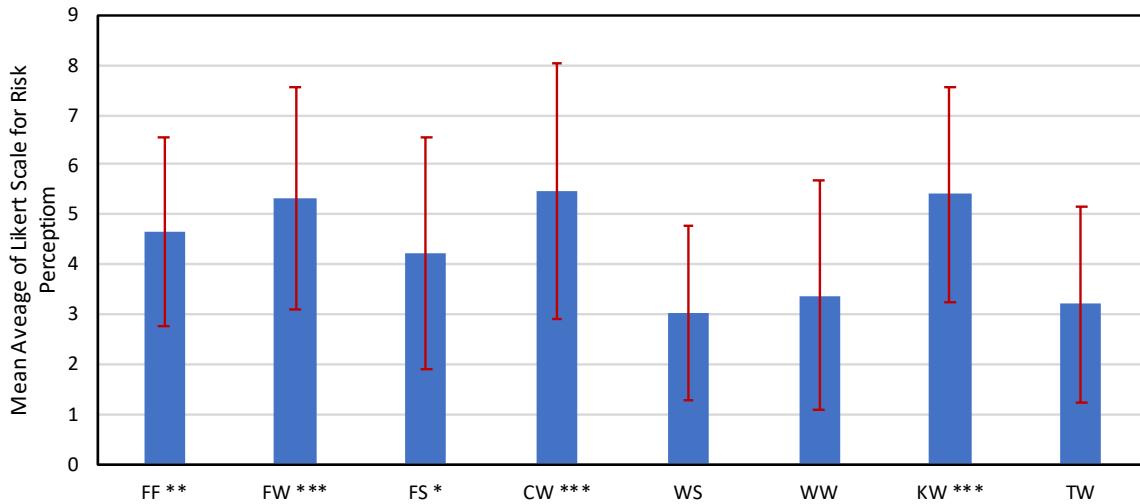


Figure 5-1: Comparison of mean scores for different combination of VH. Means and one standard deviation illustrated. Letters with the same illustration denote that those lifting tasks were not statistically different in participants' perceived risk.

During the interview data collection, some participants claimed that their work had been regulated based on the rules of not putting any objects on the floor but on the shelf. This concept was familiar and their reason was hygiene. However, one of the participants in the interview, Hajar¹, found it useless if it was supposed to be a support for her LB. Participants deemed that, when storing objects, they were aware there was no difference between lifting objects from the calf or the floor as prevention for LBP. Based on the interview results and field note, comparing lifting from calf and floor, participants perceived almost the same risk in lifting objects from either floor-to-waist or calf-to-waist. As Hajar indicated:

They told us to store objects on the shelf and not on the floor... it is the same concept. The problem is we put everything on the shelf but that shelf is only a bit higher than the floor... it is useless if they want to support LB, but is good for cleanliness.

Besides, it was claimed that it was not clear for some participants whether “store everything on the shelf” was a tip that targeted the food and hygiene or it aimed to protect them from LBP.

¹ Pseudonyms were used for all participants.

Sharifa excitedly stated that:

Oh, I heard it before. In bakery... I was thinking storing objects on the floor was for hygiene ... actually I am confused now; I cannot remember why they asked us to put stuff on the shelf [laughing].

Lifting from floor to floor stands in the fourth place of risk perception in the pre-test and the second place in the post-test with mean Likert score of 4.65 (± 1.88) and 6.11 (± 1.86) respectively. The interview revealed that participants' perception about lifting from floor to floor differed entirely based on their experience. Most of them did not consider lifting objects from floor to floor risky since the video recorded task was performed entirely in sitting posture (Figure 5-2). Participants perceived it as an easy task, particularly those with knee arthrosis. Azam who was a teacher in Syria mentioned that she preferred working in a sitting posture:

I feel it is not difficult to sit and do the job. I prefer it probably because I have knee pain and lifting objects from the floor and bending is too painful for me... and your body is doing less movement in sitting position, so it should be easier than bending and lifting objects.

On the other hand, those who had experience of working in sitting positions such as farmworkers, who experienced tomato and strawberry picking, or tile installing workers perceived floor-to-floor lifting one of the riskiest positions for LBP. All interviewed participants who worked in sitting posture had LBP experience after working for a while. For example, Maher, 26 years old, mentioned that:

When I was working in tile installation, I had a lot of pain in my lower back and one day I said oh my god what am I doing here? I'm going to hurt my body in this way. It was a really difficult and heavy job. I went to the doctor and he told me you are so young; why do you have this pain from now... so I know this position every day would hurt a lot.



(a)



(b)

Figure 5-2: the stance of lifting from floor to floor in the recorded videos, illustrating how workers perform the task while they are in a sitting positions either for a single lifting from floor to floor (a) or repetitive lifting from floor to floor (b).

5.2.2 Lifting vs. Lowering

Mean average of lifting and lowering in three different VH (lifting: FW, CW, KW), (lowering: WF, WC, WK) were compared through a simple t-test ($p < .0001$, Table 5-5). Surprisingly, lifting was perceived much riskier than lowering for the average of three VH lifts from calf, knee, and floor to waste. The mean average Likert score of lifting was 5.34 (± 1.84) while this score decreased dramatically for the mean average Likert score of lowering to half, 2.66 (± 1.35).

Table 5-5: Results of t-test; Descriptive Statistics illustrate the mean average results of risk perception for three different VH of lifting (FW, CW, KW)/lowering (WF, WC, WK) from the t-test.

Task	Mean	Sd	N	p-value
Average Lift	5.34	1.85	92	<.0001
Average Lowe	2.66	1.35	92	<.0001

The significant main effect on risk perception in the statistical analysis illustrated that participants perceived a lifting task much riskier than a matched lowering one ($p < .0001$, Table 5-6). The post hoc results demonstrate that lifting objects from the floor was perceived to be markedly riskier than lowering and has a significant main effect on risk perception ($p < .0001$, Table 5-6). Lifting from calf-to-waist was perceived the riskiest among all lifting/lowering tasks and is closely followed in its mean results by lifting originated from the knee ($p < .0001$, Table 5-6). For the purpose of comparing lifting and lowering of objects, all weight was picked medium. There is no significant effect within different VH lifting of objects from three different vertical distances (FW, CW, KW) according to the results from the multivariate test table of Wilks Lambada. Value shows 0.979 with associated significant effect on 0.393, which shows there are not any significant differences.

Table 5-6: Results of t-test and Descriptive Statistics of risk perception for lifting and lowering objects comparing three different vertical height combinations.

	Lifting			Lowering			P value in the t-test
	Mean	SD	t-test	Mean	SD		
FW	5.14*	2.28	<.0001	WF	1.50*	1.63	<.0001
CW	5.48	2.55	<.0001	WC	3.68	1.85	<.0001
KW	5.40	2.16	<.0001	WK	2.81	2.08	<.0001

P<.0001

This unexpected result was investigated through the interview data collection. Participants were

reasoning that they needed to invest more when they were lifting the objects due to overcoming gravity. Plus, they emphasized the initial force that they needed to apply when lifting the objects which made it a harder task, while this was not the case when lowering the objects. Alisha, one of the participants with high educational background, mentioned that:

When you are lifting the objects... you are doing that against the gravity and it is harder than putting your bag on the floor for example... I prefer to put objects on the floor rather than lifting them.

5.2.3 Asymmetry Lifts

There were significant interactions and major effects among lifts while comparing twist lifting to purely sagittal ones for different VH combinations (floor-to-floor, floor-to-waist, and waist-to-waist). First, the average between sagittal and twist lifting were compared. While there was a small interaction effect, twisting lifts were perceived to be riskier than their counterpart sagittal lifts. A simple paired t-test showed that the two samples differed slightly in their average mean for three different VHs (FF, FW, WW). The average mean for sagittal lifts was 4.39 (± 1.72) and the average for twisting lifts was 4.75 (± 1.52) ($p < .0001$, Figure 5-3, Table 5-7).

Table 5-7: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for sagittal lifting to twisted lifting combination of three different VH (FW, CW, KW).

Tasks	Mean	Sd	N	t-test
AveSag	4.39	1.72	92	<.0001
AveTwis	4.75	1.52	92	<.0001

P<.0001

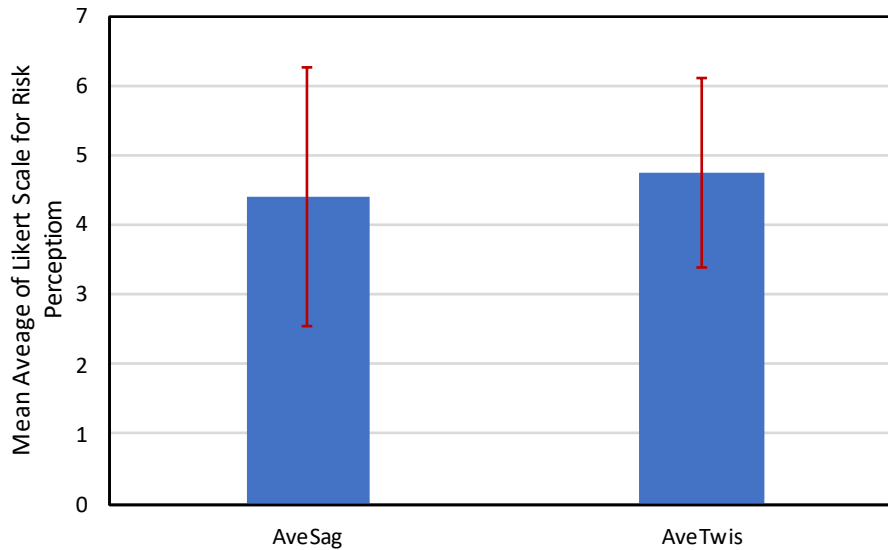


Figure 5-3: Comparison of mean scores for average of sagittal and average of twisting on Likert scale scores of risk perception. Scale ranges from 0 (Not risky at all) to 10 (Extremely risky). All differences are significant at $p < .001$.

Twisting lifts from floor-to-waist and floor-to-floor have been perceived riskier compared to their relative sagittal lifts. Interestingly, twisting waist-to-waist has been considered the least risky ($p < .0001$, Table 5-8).

Table 5-8: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for three different VH of sagittal lifting (FW, CW, KW) to twist lifting.

Sagittal	M	SD	P-value	Twisting	N	SD	P-value
FF	4.65	1.88	<.0001	FF	6.89	2.29	<.0001
FW	5.14	2.27	<.0001	FW	8.07	1.66	<.0001
WW	3.37	2.29	<.0001	WW	2.98	2.68	<.0001

$p < .0001$

Note: M=Mean. SD=Standard Deviation. Likert scale of risk perception 0 (Lifting Not Likely to hurt LBP), 10 (Extremely Likely to hurt LBP).

Participants with a low level of literacy or without work experience were closely monitored to see if they were successfully identifying the risk associated with twist lifting, as it was one of the hypotheses that participants might not be aware of this risk factor. Although the results from the numeric analysis only illustrated a slight difference between these two categories, twisting and asymmetry lift, about 80% of participants verbally asserted that twist lifting was dangerous when they were rating videos. These results came from the field notes since participants were recruited one-on-one and the interviewer recorded their scores. This risk factor was also not found to differ by sex. The result of waist to waist investigation illustrates that participants count on workers age in the video clip **Figure 5-6**.

5.2.4 Lift with and without Coupling (significant)

Lifting objects with a good coupling was perceived slightly less risky than poor coupling when average mean of three different height categories (floor-to-floor, floor-to-waist, and waist-to-waist) were compared in a t-test analysis ($p < .0001$). The mean average Likert score for a sample of lifts of good coupling of three different VH were 4.38 (± 1.72) while a sample of poor coupling lift was perceived only a bit riskier with mean average of 4.82 (± 1.75) ($p < .0001$).

Table 5-9: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for good-coupling lifting and poor-coupling lifting, combination of medium weight for three different VH (FW, CW, KW).

	Mean	Sd	N	p-value
AveGoodCoup	4.38	1.72	92	<.0001
AvePoorCoup	4.82	1.75	92	<.0001

Stratified different VH of lifting are illustrated in Table 5-10. Lifting originated from floor to floor with poor coupling has were perceived the riskiest task among all.

Table 5-10: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for good-coupling, poor-coupling by three different VH (FW, CW, KW)

GoodCo	M	Std.D	p-value	PoorCo	M	Std.D	p-value
FF	6.11	1.86	<.0001	FF	6.98	2.06	<.0001
FW	6.44	2.62	<.0001	FW	6.66	1.90	<.0001
WW	3.32	1.97	<.0001	WW	3.56	2.06	<.0001

There is a statistically significant mean difference in perceived risk for lifts with poor-coupling from floor-to-floor and floor-to-waist compared to lifts from the waist-to-waist height.

Unexpected results here illustrated that poor coupling was perceived as less risky as good ones. Through the interview inquiries, participants asserted that they did not notice the differences between video clips featuring good or poor coupling. Another explanation was about the characteristics of the objects. The shredded paper (a puffy object) was perceived as lightweight object as participants did not notice the weight of the objects illustrated on the top-right corner of the video clip. The object in this video clip was usually perceived a light item unless the interviewer mentioned the weight of the object when participants were rating the survey. **Figure 5-4** provides further illustration of the relevant details.

Height Combination
Floor to Floor



Floor to Waist



Waist to Waist

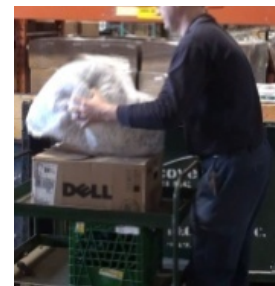
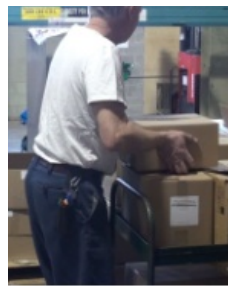


Figure 5-4: Participants usually rated the lower scale for the lifting when the object was the shredded paper.

5.2.5 Repetitive Lifts (Significant)

The mean average Likert score for a sample of repetitive liftings for a combination of three different VH (FF, FW, WW) was 5.37 (± 1.34) while a sample of liftings with a single lift was perceived less risky, lower Likert score mean, with an average of 4.52 (± 1.68) ($p < .0001$, Table 5-11). A simple paired t-test showed that the two samples were statistically different at a level of significance of $\alpha = 0.001$.

Table 5-11: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for repetitive liftings and single liftings, combination of medium weight for three different VH (FW, CW, KW)

Task	M	Sd	N	p-value
AveRep	5.37	1.34	92	<.0001
AveSing	4.52	1.68	92	<.0001

Randomizing the lifts based on different VH and medium weight provided a more detailed comparison ($p < .0001$, **Table 5-11**). For example, floor-to-floor in single task and floor-to-floor in repetitive task were matched based on the weight (medium) and where the task of lifting

originated (floor). Repetitive lifting task from floor-to-waist was perceived the riskiest with Likert average score of 5.40 (± 2.16) compared to other VH, and it was closely followed by single lifting task from floor-to-waist with a score of 5.14 (± 2.27) ($p < .0001$, **Table 5-12**). Lifting from floor-to-waist for both repetitive and single tasks was perceived risky considering VH effects on risk perception among participants. It is worth mentioning that participants were not yet trained with the simple educational message.

Table 5-12: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for repetitive lifting and single lifting tasks from three different VH (FW, CW, KW)

AveRep	M	Std.D	p-value	AveSing	M	Std.D	p-value
FF	3.61	2.31	<.0001	FF	4.65	1.88	<.0001
FW	5.40	2.16	<.0001	FW	5.14	2.27	<.0001
WW	4.36	2.30	<.0001	WW	3.67	2.25	<.0001

Surprisingly, floor-to-floor repetitive task of lifting was perceived the least risky with mean score 3.61 (± 2.61) compared to the matching task in single lifting with a score of 4.65 (± 1.88).

Reasons why participants unpredictably perceived floor-to-floor repetitive task as the least risky are better explained with their statements.

Most participants who had not experienced working in a sitting position, did not perceive the floor-to-floor repetitive tasks as risky Figure 5-5. Unexperienced participants asserted that sitting and working was comfortable compared to the single lift from floor-to-floor in which the worker stood up after finishing the job. They explained that the repetitive lifts from floor-to-floor were not perceived risky because in a sitting position it seemed that the worker did not lift objects and merely moved them, which is considered a relatively easy task compared to lifting an object from the floor. Women who had knee complications also found the lifting task in sitting posture an easier job. However, it seems that they did not have experience of working in a sitting position for an extended time except when they were doing their chores. As Azam mentioned:

I prefer sitting and working instead of standing or bending to do the task. I have knee pain; probably that is why. Generally, sitting and working on the floor is easier than walking or standing and bending.

On the other hand, other participants who had experience of working in a sitting position suggests that sitting on the floor and working was one of their most terrible work experiences that made them quit their job. Participants with mosaic installing and harvest picking (tomato and strawberry) experiences who usually worked in sitting posture strongly believed that lifting

objects from floor-to-floor could eventually lead to LBP. These participants rated video clips in which an object was lifted from floor-to-floor riskier than other participants who did not have that experience. Two of the participants in the interview asserted that they quit their job as a tile installer and harvester less than six months of employment. They ended up having LBP, and their physicians informed them that they could not continue in their career for a long time. When Maher was asked how he thought picking an object from the floor could eventually cause LBP, he replied that:

It actually will cause LBP. I am convinced with your explanation that we are hurting our body gradually. I was working in tile installation. I had lots of pain in my LB and one day I said oh my god, what I am doing here is going to hurt my body...it was a really difficult and heavy job...when I touched my body, I found my muscles stiff. First, I thought it was my bone and then realized it was my muscle. Now I got the reason from what you said.

Another possibility is that participants might not be focused on the repetitions of the task shown on the video clips, and focused on the lifting action only. Probably, the duration or repetition of the tasks were not that evident and noticeable for them. As Alisha claimed that:

I do not consider the repetition, honestly, I just think why the lifting could be more dangerous.

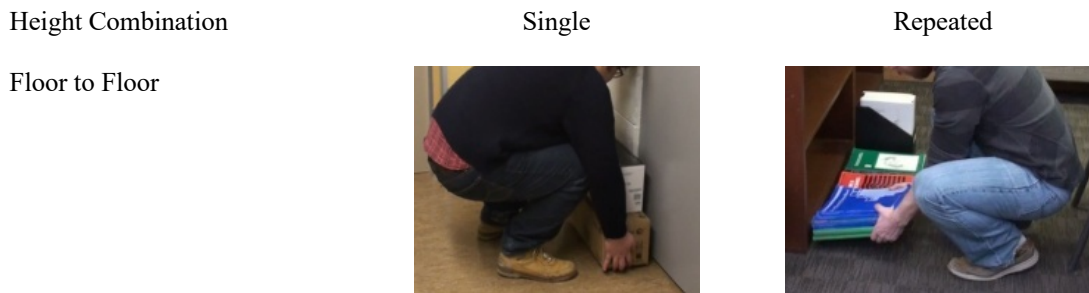


Figure 5-5: Most participants who had not experienced working in a sitting position, did not perceive the floor-to-floor repetitive tasks as risky. Participants rated video clips in which an object was lifted from floor-to-floor riskier than other participants who did not have that experience.

5.2.6 Lifts Requiring Horizontal Reach

Unexpectedly, a higher Likert scale rate average was seen in lifting in near distance compared to far distance (Horizontal Distance; HD); however, they were relatively close. The mean average Likert score for a sample of lifts with near distance grouping of three different VH (FF, FW, WW) was 4.48 (± 1.62) while a sample of lifts for far distance was perceived less risky with an

average 4.38 (± 1.51) ($p < .0001$, **Table 5-13**). A simple paired t-test showed that the two samples were statistically different at a level of significance of $\alpha = 0.01$.

Table 5-13: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for lifting tasks that do not need to reach horizontal distance and lifting tasks that need to walk and reach a distance, combination of medium weight for three different VH (FW, CW, KW).

Task	M	Sd	N	p-value
AveNearDistance	4.48	1.62	92	<.0001
AveFarDistance	4.38	1.51	92	<.0001

p<.0001

Floor to waist in both far and near distance requiring horizontal reach were rated higher with Likert mean 5.20 (± 2.63) and 5.14 (± 2.27) respectively ($p < .0001$, Table 5-14).

Table 5-14: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for lifting tasks that do not need to reach horizontal distance and lifting tasks that need to walk and reach a distance with three different VH (FW, CW, KW).

VHNear	Mean	Std.D	P-value	VHFar	Mean	Std.D	P-value
FF	4.65	1.88	<.0001	FF	3.08	2.07	<.0001
FW	5.14	2.27	<.0001	FW	5.20	2.63	<.0001
WW	3.37	2.25	<.0001	WW	2.33	2.22	<.0001

Surprisingly, liftings with horizontal distance (far) were perceived less risky than near ones. The designated distance in the video clip was intentionally chosen 2 feet/60 cm to be easily captured by the participants. However, it seems participants were not influenced by the extreme posture due to the increase in horizontal distance in the video clip and so did not perceive lifts with horizontal reach riskier.

Data from the interviews illustrated that participants have considered the age variable as a strong rationale in their rating. As a result, they allocated higher Likert score rate for near distance compared to far distance in waist-to-waist VH as you see in Figure 5-6.

Waist to Waist



a

b

Figure 5-6: Participants have considered the age variable as a strong rationale in their higher rating in waist to waist lifting comparing far and near distance of objects to their body.

(a) Objects near to body, (b) Objects far from the body

Floor-to-floor liftings for far and near distance also had an unexpected result. Participants in the interview claimed that lifting objects from the floor, standing up and leaving it on the floor again was considered more dangerous than lifting objects from the floor and leaving it on the floor while sitting on the ground, regardless of the extent arms were needed to be stretched as seen in the picture (b). Only participants with experience of working in a sitting position perceived it hazardous; otherwise, participants did not find it risky if they saw someone sitting and lifting objects, Figure 5-7.

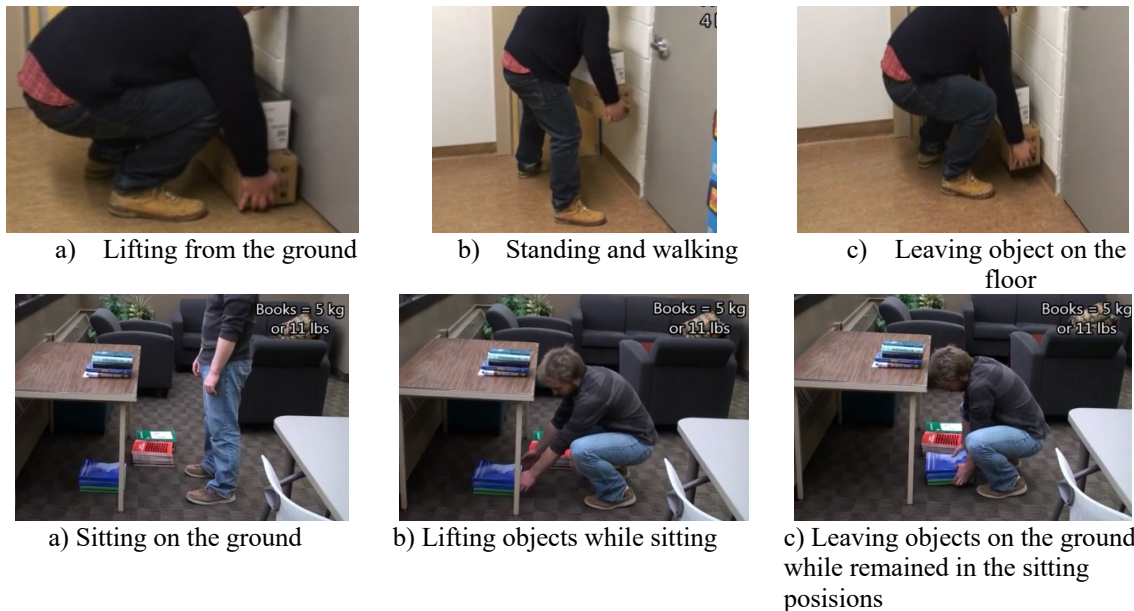


Figure 5-7: Three different stances of lifting objects from floor to floor for near and far horizontal distances.

5.2.7 Lifting Techniques

There was a statistically significant mean difference in risk perception between lifting technique stoop and lifting technique squat. Stoop lifting technique received a higher average mean of Likert score compared to squat technique of lifting. Additionally, there is no significant effect on lifting technique of squat in different VHs ($p=0.337$, Table 5-15). There is, however, a significant interaction effect of lifting technique squat vs. stoop lifting.

Table 5-15: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for squat liftings and stoop liftings, combination of medium weight for three different VH (FW, CW, KW).

Task	N	M	Std.D	p-value
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AveSquat	92	5.26	1.83	<.0001
AveStoop	92	6.26	1.94	<.0001

There are statistically significant mean differences in risk perception between stoop lifting and squat lifting techniques by two stratified different VH. Stoop lifting from floor-to-waist and knee-to-waist were perceived the riskiest with mean 6.62 (± 2.31) and 29% of increase in risk perception compared with squat techniques ($p < .0001$, Table 5-16).

Table 5-16: Results of t-test and Descriptive Statistics illustrate the mean average results of risk perception for squat liftings and stoop liftings for three different VH (FW, CW, KW)

Squat	Mean	Std.D	p-value	Stoop	Mean	Std.D	p-value
FW	5.14	2.27	<.0001	FW	6.62	2.31	<.008
KW	5.40	2.16	<.0001	KW	5.92	2.28	<.008

As claimed by all participants, there is a strong belief that squat lifting is the only proper technique while this seems to be in dissonance with what literature says. This gives the impression that the evidence in the literature may have not been translated or understood successfully by general populations. Interestingly, all participants faithfully believed in squat technique diminishing the risk of LBP.

5.2.8 Weight of Object

Results of t-test show a statistically significant mean difference in risk perception by three weight categories (light, medium, and heavy). The average mean for lifting heavy objects from all VH categories have resulted in the highest score, which means weight plays a significant role in the participants' risk perception ($p < .0001$, Table 5-17).

Table 5-17: The average mean for three different weight categories of lifting illustrated below. The heavier objects received the higher risk perception.

AveVHs (FF-FW-CW-KW-WW)	N	M	Std. D	p-value
AveLight (5Q)	92	1.02	0.72	<.0001
AveMedium (5Q)	92	4.86	1.58	<.0001
AveHeavy (5Q)	92	6.09	1.58	<.0001

Gender differences were investigated for lifting objects in three categories of weight. Weight was considered one of the main risk factors that impacted participants' perception about hazardous situation. Results of t-tests comparing average mean difference of three categories of weight (light, medium, and heavy) within gender differences are illustrated in Table 5-18.

Table 5-18: Results of t-test and Descriptive Statistics average of light weight, medium weight, and heavy weight by sex

AveVHs (FF-FW-CW-KW-WW)	N Female/Male	Mean/Female (Std. D)	Mean/Male (Std. D)	p-value
AveLig (5Q)	52/40	1.02 (0.74)	1.02 (0.70)	.539
AveMedium (5Q)	52/40	4.81 (1.39)	4.93 (1.82)	.654
AveHev (5Q)	52/40	6.19 (1.49)	5.96 (1.71)	.148

There are no statistically significant differences between male and female in terms of their risk perception score considering weight as a risk factor Figure 5-8.

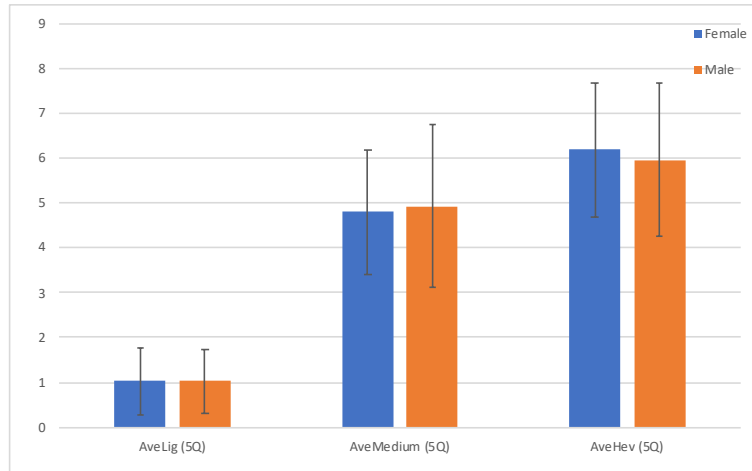


Figure 5-8: Comparison of mean scores for average of three weight categories (heavy, medium, and light) on Likert scale scores of risk perception stratified by sex. Scale ranges from 0 (Not risky at all) to 10 (Extremely risky). All differences are significant at $p < .001$.

There were significant interactions and main effects of VH when weight of objects increased ($p < .0001$, Table 5-18, Table 5-19). Interestingly, lifting heavy objects originated from floor-to-floor was perceived the riskiest and lifting originated from floor-to-waist was in the second place of riskiness. Lifting light objects from the floor were not perceived risky at all.

Table 5-19: Result of t-test and Descriptive Statistics for light and medium weight by five vertical height categories

Different VH	Light Weight (M) Std. D	Medium Weight (M) Std. D	p-value
FF	0.73 (± 1.065)	4.65 (± 1.88)	<.0001
FW	1.77 (± 1.407)	5.14 (± 2.27)	<.0001
CW	1.30 (± 1.823)	5.48 (± 2.55)	<.0001
KW	0.89 ($\pm .809$)	5.40 (± 2.16)	<.0001
WW	0.45 ($\pm .703$)	3.67 (± 2.25)	<.0001

Lifting heavy objects from the floor stand in the riskiest ranks comparing medium to heavy weight objects. The mean average for both categories increases as VH of lifting objects increases, see Table 5-20.

Table 5-20: Result of t-test and descriptive statistics for medium and heavy weight by five vertical height categories

Different VH	Medium Weight (M) Std. D	Heavy Weight (M) Std. D	p-value
FF	4.65 (±1.88)	7.40 (±2.01)	<.0001
FW	5.14 (±2.27)	6.97 (±2.24)	<.0001
CW	5.48 (±2.55)	6.42 (±2.08)	<.0001
KW	5.40 (±2.16)	5.79 (±2.21)	<.0001
WW	3.67 (±2.25)	3.91 (±2.40)	<.0001

Lifting light objects from waist to waist and floor to floor were perceived at the least risky and it seems that VH is not affecting participants perceived risk in lifting light objects Table 5-21.

Table 5-21: Result of t-test and Descriptive Statistics for light and heavy weight by five vertical height categories

Different VH	Light Weight (M) Std. D	Heavy Weight (M) Std. D	p-value
FF	0.73 (±1.065)	7.40 (±2.01)	<.0001
FW	1.77 (±1.407)	6.97 (±2.24)	<.0001
CW	1.30 (±1.823)	6.42 (±2.08)	<.0001
KW	0.89 (±.809)	5.79 (±2.21)	<.0001
WW	0.45 (±.703)	3.91 (±2.40)	<.0001

Overall, it has been found that participants consider VH as a risk factor. Closer the objects were to the ground, their Likert scale rating increased. Post hoc comparison using Tukey HSD test indicated that the mean scores for the five VH conditions (FW: 4.62, CW: 4.39, FF: 4.25, KW: 4.02) were significantly different and increased as the objects got farther from the waist Table 5-22.

Table 5-22: Result of t-test, Descriptive Statistics for different vertical height categories considering three weight options

	N	M	Std.D	p-value
AveFF-LMH	92	4.25*	1.25	<.0001
AveFW-LMH	92	4.62***	1.44	<.0001
AveCW-LMH	92	4.39**	1.52	<.0001
AveKW-LMH	92	4.02	1.30	<.0001
AveWW-LMH	92	2.67	1.25	<.0001

The bar chart in **Figure 5-9**, illustrates the increase in risk perception as far as VH increases for the average mean of three categories of weight, light, medium, and heavy.

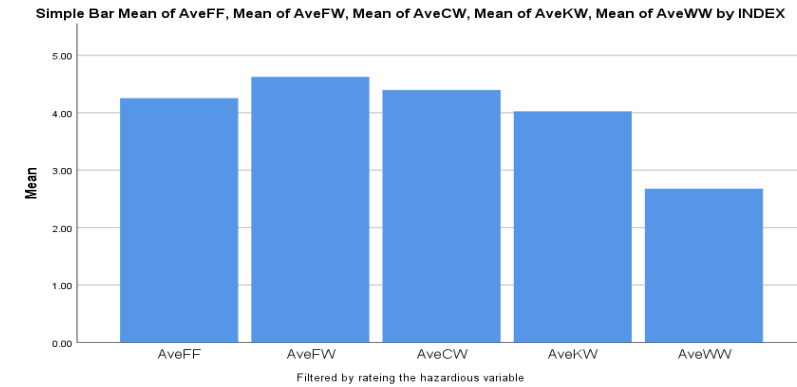


Figure 5-9: Comparison of mean scores and one standard deviation is shown. Lifting task was perceived riskier as the object got farther from waist. Each column illustrates a vertical height categories combination of average mean for three weight (light, medium, and heavy) on Likert scale scores. Scale ranges from 0 (Not risky at all) to 10 (Extremely risky). All differences are significant at $p < .001$.

In the interview data collection, lifting light objects from the floor were further investigated. Almost all participants did not believe that lifting light objects either from the floor or not could be harmful, even after receiving the educational message. Participants claimed that they would not consider lifting very light objects from the floor harmful. James's assertion as an evidence for not considering lifting light objects risky is illustrated below:

Even very light objects are going to hurt your LB", I don't believe that. Lifting from the floor is not going to be dangerous if the weight is light...lifting very light objects is not dangerous and I rate them 1 or 0.

5.3 Message Efficacy

The same task scoring differently in pre-test and post-test could illustrate the effectiveness of the message. In this section, the following two research objectives were addressed:

- Determine whether a simple (heuristic) educational message is effective in changing refugees' recognition of hazards
- Investigate if the participants find the message clear, understandable, and effective

Vertical Height (VH) was divided into eight ranges, and the weight for all lifting-associated tasks was medium. In order to quickly recognize and interpret the results, the difference between pre-test and post-test, the average mean of Likert rating score, was taken into account. All changes were illustrated as a percentage from pre to post-test. The focus of this study was to increase the participants' awareness towards considering the VH as the main risk factor for LBP. An increase in Likert score rating of an identified VH could illustrate their knowledge improvement (risk

awareness). In other words, it demonstrates the effectiveness of the simple educational message (an intervention) as an effective training approach.

5.3.1 Investigating the Effectiveness of Educational Message in Changing Refugees' Recognition of Hazards

Perceptions of LBP risk from lifting from floor-to-waist has slightly decreased in post-test by 7%, while in all categories we have significant change towards the effectiveness of the educational message. This result may have indicated that participants generally perceive risky the lifting objects from the ground even before receive the training. Lifting from waist-to-waist is perceived less risky in post-test by 2% when VH is at its minimum range and is not considered a risk factor. Lifting from waist-to-shoulder and floor-to-shoulder, on the other hand, increased by 55% and 44% respectively Table 5-23.

Table 5-23: Descriptive Statistics (Pre-test & post-test)

Task	N	Pre		Post		% Change from Pre	p-value
		M	ST.D	M	ST.D		
FF	92	4.65	1.88	6.11	1.86	31 %	↑ <.0001
FW	92	6.97	2.24	6.44	2.62	-7 %	↓ <.0001
FS	92	4.21	2.33	6.08	2.05	44 %	↑ <.0001
CW	92	5.48	2.55	5.64	2.58	3%	↑ <.0001
WS	92	2.32	1.75	3.59	2.07	55%	↑ <.0001
WW	92	3.37	2.29	3.32	1.97	-2 %	↓ <.0001
KW	92	5.40	2.16	5.95	1.70	10%	↑ <.0001
TW	92	3.24	1.95	3.71	1.86	9 %	↑ <.0001

In another test, the effectiveness of the intervention in improving participants' hazard identification was also illustrated. The mean of Likert scale rating for five main VH categories (FF-FW-CW-KW-WW), each in a group of three different weight (Light-Medium-Heavy), were calculated and compared for both pre- and post-test Table 5-24. Results in post-test showed an increase in their Likert scale rating average mean, supporting the effectiveness of the educational message on perceiving VH as a risk factor for LBP. Interestingly, the post-test of Likert score rating for waist-to-waist decreased by 4%. Clearer illustration depicts in Figure 5-10.

Table 5-24: T-test Comparing VH from Pre-test to post-test. Descriptive Statistics in three different weight (Light, Medium, Heavy)

Name of Task	N	Pre		Post		% Change from Pre
		Mean	STDEV	Mean	STDEV	
AveFF (LMH)	92	4.25	1.25	5.56	1.28	31% ↑

AveFW (LMH)	92	4.62	1.44	6.23	1.49	35%	↑
AveCW (LMH)	92	4.39	1.52	4.94	1.21	13%	↑
KW (LMH)	92	4.02	1.30	4.62	1.33	15%	↑
WW(LMH)	92	2.67	1.25	2.56	1.26	-4%	↓

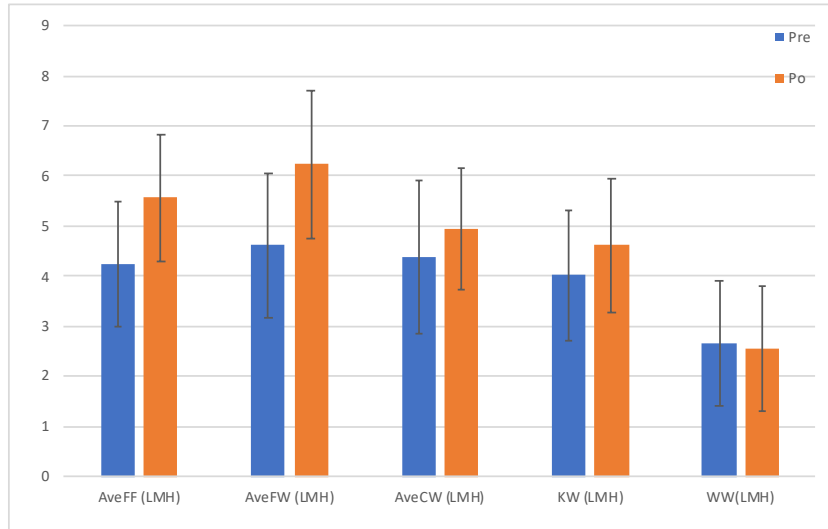


Figure 5-10: Comparison of mean scores for an average of pre and post Likert scale scores of risk perception for five categories of VH lifting combinations. Each combination contains all categories of weight (light, medium, and heavy). The scale ranged from 0 (Not risky at all) to 10 (Extremely risky). All differences are significant at $p < .001$.

There were no statistically significant mean differences in risk perceptions of VH between males and females **Table 5-25**.

Table 5-25: T-test Comparing female and male perceived risk from pre-test to post-test. Descriptive Statistics in five different vertical heights (FF, FW, CW, KW, and WW) for the average light, medium, and heavy weight.

Name	N	Female		N	Male		t-test (posttest)
		Mean	STDEV		Mean	STDEV	
AveFF (LMH)	52	5.55	1.23	40	5.58	1.52	.834
AveFW (LMH)	52	6.29	1.44	40	6.14	1.43	.539
AveCW (LMH)	52	4.96	1.09	40	4.92	1.36	.645
KW (LMH)	52	4.50	1.06	40	4.79	1.62	.148
WW (LMH)	52	2.46	1.30	40	2.68	1.22	.816

Participants generally considered many factors that affect their risk perception. In their video rating and interview, they mentioned the workers' age, gender, their own knowledge and work experience, and the environmental factors such as performing tasks inside or outside the

building. These commonly listed factors impact participants Likert scale rating. Although this survey was developed cautiously to cover many details of NIOSH equations and other considerations to reduce biases (Ngo, 2015), it is essential to consider participants' reflections when developing a survey in a future study.

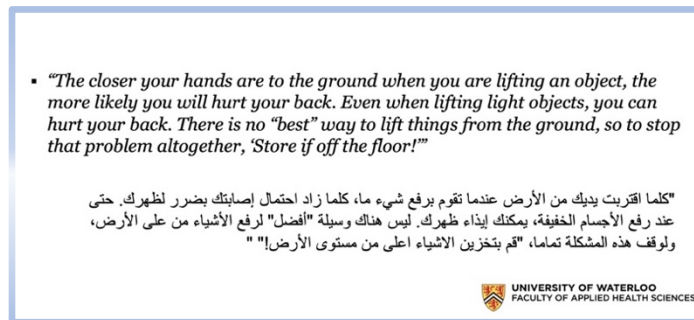


Figure 5-11: The simple educational message was used as an approach for a simple training.

Participants were expected to be more comfortable with the concept of Threshold Limit Values (TLVs) for understanding the idea of lifting from different VH. Based on TLVs idea, VH categorized lifts from regions such as knee, calf, and waist were used for being more colloquial phrases rather than using continuous lifting height concept (Ngo, 2015). But interestingly, participants' judgments about measuring the VH were more influenced by the message content "objects as much as closer to the ground," and "the closer their hands are to the ground." These two terms were found useful to convey the message and assist them in recognizing the hazardous lifting posture. Bahar explained her rationale for finding the hazardous situation as below:

From now on, whenever I want to lift objects, I know that if my hand is closer to the floor going to be more dangerous... I tried to keep it in mind when I was rating the video to check their hands and the closeness of objects to the floor. In some videos, the objects were not on the floor but the hands were too far from their body, so that is dangerous too.

The efficacy of the simple educational message Figure 5-11, as part of the training method, depends on how the message were perceived simple, understandable, and persuasive enough from participants point of views. As much as participants find the message simple, understandable and applicable, the intervention would impact their compliance and consequently their behaviors. Participants' understanding of the message content was investigated through interviews by asking them to explain the main points in the message back to the interviewer to make sure they were on the right track.

5.3.2 Message Simplicity and Clarity Exploration

The educational message was found to be clear enough to deliver the simple verbatim for all participants. Many noted that its simplicity and brevity helped them to be focused and did not distract them from the main point with unnecessary information. Omar, who was working in car manufacturing, summarized it in the following way:

The message is very simple without unnecessary information...getting too much H&S information is a common problem happening at training workshops... usually I forget to listen while I want to, but they feed us with many unnecessary info and I cannot concentrate... the words in the message is simple and understandable.

Alisha, working in a big car manufacturing company, is considered one of the educated and trained participants. Likewise, he found the message from the verbatim aspects simple and understandable. However, he neither found the message short nor simple in its content and meaning. He explained his opinion as below:

At big corporations, there are tons of H&S msg, so there is no way to write even this long msg that you have. To me, the shorter, the better... the msg is not talking about the weight, not talking about the twisting, gained strength. I do not consider this msg as a simple message... it is a complicated one and not simple. At workplace there are many signs and notes how you want to put this long paragraph there and who has that time to read it.

5.3.3 How Participants Understand the Message Content

Participants were asked to explain the message in their own words for comprehension checking, to find out how they received the message points. Interestingly, not all clearly and precisely grasped the message point in their first attempt of reading.

Participants' previous knowledge and experience had impacts on their understanding of the message. Participants admitted that they do not believe "there is no best way to lift things from the ground." They acknowledged that they had been informed before about different safe lifting techniques which would not hurt their LB. All participants asserted that they would keep the message in their mind as an MSDs preventative suggestion, but they were not convinced that "there is no best way to lift things from the ground" was valid. Their perception was clearly influenced by their background knowledge or experience. Reflecting on their background

knowledge, a beautician (Misha) commented:

It seems I got wrong information. May I read it again? ... all the time we focus on how to lift the heavy objects properly from the floor; it probably comes from my background information... that they told us squat and knee bending is the good option or we usually hear to not lift very heavy objects and I never heard about light objects.

When participants were asked for their opinion about the message, their perceptions differed from what they read. For example, Sapid, who is working as an accountant in her co-op, interpreted the message as below:

It says that we should stop lifting even light objects from floor because many people forget to lift objects in squat position and they would hurt their body.

When participants were informed about their misinterpretation, they looked for more explanation for the following part of the message “even when lifting light objects, you can hurt your back. There is no best way to lift things from the ground, so to stop that problem altogether, ‘Store it off the floor!’” Anna as a PSW in Canada and nurse in Syria noted:

I am not saying that the message is wrong. It is correct in general, but the part that says there is no better way to lift an object is totally wrong, and I do not believe it. Let’s read it again. Could you please explain it for me what do you mean?

Mostly those who had been trained in lifting objects at their workplace were more determined that the message was incorrect. Based on their training, a light object is not going to hurt and if it is heavy, they have to get assistance from co-workers as they are trained for that. Hajar explained what she learned in her training:

My work is physically demanding and all my body is engaged but you are only suggesting me to focus on my LBP. BTW it is a little different from what we have heard so far. I heard something else at work ... lifting light objects is not risky and for heavy objects you have to ask your coworker to help and only lift with squat. They told us do not leave objects on the floor too which is too low, I don’t think that suggestion help for my LB.

5.3.4 Message Efficacy Could Be Influenced by Other Factors

Once participants entirely understood the point of the message, they introduced other factors that impact their H&S compliance, regardless of transferred knowledge and being convinced by its

grounded scientific background. Participants discussed how their H&S and received training at work in general are influenced by managers' attitudes and accommodations, workers' cooperation, job description and levels of task heaviness in some occupations, and lack of H&S tips' consistency and relevancy to their everyday tasks.

More explanation and scientific support were required.

Participants required more explanation and scientific background in order to entirely understand and trust the message. It was found that participants required the message to be explained, and the content was not entirely that straightforward as we expected. After a thorough explanation to clear out the message by providing its scientific background, pictures, Google search, and back and forth conversation, ultimately it seemed that the message properly conveyed its point and might successfully change participants' perception about proper lifting. However, all participants emphasized that they needed the interviewer's explanation to realize that the message was correct and reliable; otherwise, they might not consider it if the information was transferred only in written version. In regards to requiring further support and justification, Alisha noted:

To me, the shorter, the better but people need to learn first and understand that short text, to know why they got the quick note. Your message is not short and leaves all judgments to yourself. The msg is not talking about the weight which is the most important, not talking about the twisting, gained muscle strength. I do not consider this msg as a simple one. It was complicated until you explained it in more detail. This msg alone is not enough.

Some participants found the message contrary to what they had heard before and they required to make sure that the message was correct. Mavi was a teacher and here she worked in library part-time acknowledged that:

I don't believe this msg is entirely correct. Anyway, I try not to lift even heavy objects from the shelf... are you really testing for me something or you really want to train me? [laughing]

Two males from big manufacturing companies found this message completely unusable and also contrary to what they practice at workplace. As Ali noted:

The message is persuasive honestly after your explanation, but you cannot find the situation applicable in heavy manufacturing. It is so too narrow, at least for my workplace with many heavy objects and full of real dangerous situations, it is not a good note there.

Five others, working in small corporations, admitted that their attitudes had changed based on our discussion to the point that made them change their behavior in future. They were aware that MMH characteristics of their work could affect their health over the time. Mitte, working as a retailer, mentioned that:

Our conversation has completed the msg content to help me do healthy actions. Message has enough to give me a hint and direction on how I should act since I struggle with LBP... in my work day, there are always many small tasks that I have to bend... keeping this msg in mind helps a lot.

The importance of the message relevancy to workers' everyday tasks results in participants' eagerness of knowing about the topic. Five out of fifteen participants strongly required to see the association of the message to their everyday tasks. As soon as the advice was irrelevant to their everyday job, the topic of the training failed to be of their interest. About the training relevancy and H&S training consistency with everyday work, Maher said:

This msg is not relevant to my job. We care more about hygiene in food so it is useless, honestly, I don't think I need this knowledge since it is not my concern.

Osman also needed close instruction about where exactly he could use the knowledge:

in which circumstances it is applicable... you have to direct me to that clearly. When and where to use those tips. If they teach me how to use a ladder but I am not using that, what is the point?

Similarly, Alisha said:

To me the shorter the better but people need to learn first and understand that short message, to know why they got the short note and what consequences it has and supposed to prevent them from in their real work environment. If I get this message but I am in a sedentary work environment how am I going to get the message? Some icons, figures, and examples can help too. Objects are too heavy and I have to leave them on the floor like what I am experiencing in my workplace with many heavy items, how this message could be transferred to my workplace.

Interestingly, the educational message made participants look for a situation in which they could apply it. Participants who were not interested in the message asserted some reason for their negative attitudes. Some found the message irrelevant, sensed more of a principle rather than having a practical basis, suitable for transferring knowledge rather than aiming to change behaviors, and not usable for their everyday tasks. Some could not imagine a situation in which

the message would work. Generally, participants looked for real example in their life to imagine how it could be applicable. Association and persuasion, regarding the content of the message, was explained by Sharifa as below:

msg is clear. But how can I pick the objects if I am supposed not to bend? If I am supposed not to put objects on the floor, where should I leave them? if I have to put something on the floor, what should I do? I worked in the bakery and we put everything on the floor. Big big box of things we have to lift from the floor. If I am supposed not to lift objects, then who should lift them? Or how?

Environmental characteristics such as previous training and knowledge impact the message efficacy.

The importance of environmental characteristics and their association with the message was another main finding that influenced participants on how to find the message practical. Those who were working in car manufacturing and heavy businesses neither believed this statement “*there is no best way of lifting the objects*” nor accepted its practicality. They said, in reality, it was impossible to act based on this message since their work environment was filled with many heavy objects, and there was no way to put all heavy items on a shelf. Alisha asserted that:

In the Big Corporation (BC), we have to work with many heavy stuffs such as hanger and ropes; we have to store things that are significantly heavy. How we could store them off the floor? ... no way to build shelf for them. they are supposed to be on the ground; even when you want to lift them with the crane, you have to tie some nuts and bolts to them ... the nuts and bolts are heavy too, each about two kg. So, there is no way to avoid the situations that you are talking about in the message. In an actual workplace, there are tons of situations that you cannot shelf the stuff. In my case, this message is idealistic and not a real practical thing for the place where I work.

And reflecting on his believe to the squat technique he supported it with his experience:

about proper lifting, there is “squat” that you didn’t mention... I get quite confused. I have experience carrying different weight and I do not believe that both methods of lifting squat and not squat produce the same risk and I know squat is the best way of lifting...your questions are not focusing on what I know is the real risk factor for LBP ... your study is just focused on only one risk which is not that important and useful in my work. Reducing the height is impossible in my work.

Others, particularly in SBs, emphasize that the layout of the workplace should be adjusted based on this message; otherwise, it would be impossible to comply with the message.

There is a work desk but no one uses that since it is too far, even though H&S guy is advising us always to do so ... if your boss does not provide you a good environment... then you cannot follow this message.

There were participants that indicated the lack of self-efficacy and found themselves unable of changing work environment's characteristics or of transferring received knowledge to their routine tasks. They emphasized that the message was applicable in their everyday life but not at workplace. Maher mentioned:

It is practical as long as it is relating to you and your decision. I mean you can do it in your life... it needs other people's action, like your managers ... About the effectiveness, since I got your education now, I can find some issue with our workplace layout and design. Even though I got the message and I think I am going to apply it in my life, but it is not going to proceed in my workplace organizations...

Reflecting on self-efficacy and transferring training to their routine workday, Ali declared:

Workers do not have that time, energy, and knowledge to adapt the msg with their workplaces and therefore they will ignore it ... they need to be trained first... in such circumstances, it is applicable... they have to be directed clearly when and where to use those tips.

5.4 Explore Participants' MSDs Hazard Awareness Challenges & Influential Factors

In this part, the last objectives of the study "Explore participants' hazard awareness challenge based on their typical workdays regarding their environment" are presented. They emerged from the participants' points of view. The main themes touched base on two categories. First and foremost, how participants were influenced by their workplace contextual and conventional thinking, developed either intentionally or unintentionally by managers or workers; this finding supports the idea that workers' H&S behaviors are strongly affected by the dominant attitudes of the workplace. The second set of themes embraced the topic of barriers towards H&S/MSDs hazard awareness or compliance, organized into two main categories: personal and institutional barriers.

5.4.1 Contextual or Conventional Thinking Could Pass Heuristically & Positively to Be

an Approach for H&S Awareness

Contextual or common thinking in the workplace had a strong tendency to affect workers' behaviors. This finding can be considered to support the fittingness of our utilized intervention and approach. Contextual or common thinking in the workplace affects worker perceptions about their priorities. Some participants stated a common phrase or slogan that described their work environment. Conventional thinking impacted worker behaviors, and some examples stated by participants are collected below:

“work slow but safe and clean “; “work slow but safe”; “First you!”; “They [employers] want you healthy and strong, “; “You are going to be unemployed if you have pain, “; “keep your time but meet deadlines” “H&S safety means customer service “; and “Work cooperatively.”

Participants expressed these phrases as conventional thinking and a priority in their workplaces and businesses. Some of the common phrases had been created by managers supporting the main objectives of companies. Maher stated that H&S is the main priority in his workplace, and he feels cared for and safe there. The common phrase that he heard constantly was a suggestion from his supervisor as below:

“Work safe, slowly, but clean.”

He feels that he was entirely supported in H&S at the workplace, and managers constantly supervised workers. He finds the message utilized in this study unnecessary since he is not lifting any objects alone, and had been told to ask for help if he wants to lift “heavy objects.” He believed that the message content was not important since he did not hear it from managers; otherwise, they would inform them.

The message in your study is good but I think it is not useful for our workplace. They really care for H&S and they do not teach us about these things that you said and we do not lift any heavy objects.

Anna's workplace emphasizes working with a partner (a co-worker) so she will have support whenever something urgent occurs. She was working as a PSW, and assists patients, so it is common in her workplace to get help from each other, and she never hesitates to ask since others get her assistance too. The common contextual phrase heard by Anna was:

“work cooperatively” This is the common behavior at workplace so everyone

is open to ask for help.

She worked part-time in a chocolate company as well, where the main priority was “work slowly but hygienically” and when asked about H&S in the chocolate company her focus was on hygiene since children are their main customers and their health is important. However, when it comes to H&S as a PSW, her focus is on workers’ health.

On the other hand, some common thinking was created by workers based on their perception and experience in their workplaces. For example, Misha said whenever you hear the word “Meeting” it means:

A customer’s complaint... and something was wrong with them and the owner wants to discuss that with us.

There were some contextual and common positive thinking that some managers wanted to apply. However, it seems that they were not that successful in the implementation since their behaviors and offers were not compatible with their H&S suggestions. For example, Hajar acknowledges that they heard the phrase “first you” all the time. It means you and your health are in the priority, but she said neither managers nor workers think in that way. Managers’ orders undermine their message since it goes against their priority, which is to get the work done.

Managers only want you to work hard and always push workers to work faster and harder without proper respect...no one knows what this phrase means exactly with few English literacy, and managers only focus on the job that should be done and nothing else.... They say first you but they don’t care for you.

Further, Hajar found that other workers need more explanation to understand the points; some workers are not good in English and do not know exactly what “first you” means. Moreover, those that understand the message receive no support from managers. The worst experience of contextual culture came from Mitte. Her manager only cares for her businesses:

I don’t care, I want just to get the job done; you get paid to get the job done. If you don’t want to, you could leave (her managers attitudes).

5.4.2 Personal factors that contribute to MSD development

Lack of MSD knowledge.

Participants were asked about their MSDs pain experience to see whether they were aware of

MSD knowledge and its development. All participants considered “Musculoskeletal Disorders” (MSDs) as an academic or technical term except one. Participants were generally unaware of explaining or providing an example of MSD correctly. Whenever they were asked about H&S/MSDs, their focus was only on accidents, injuries, mental pressure, hygiene, and customer service, and as a result, the interviewer needed to refocus their attention on the topic of interest frequently. For instance, Hajar exemplified her knowledge of MSDs as below:

I know two of my coworkers that are around their 50's ... they got this problem (MSD) at work and they left the job. One of them he wanted to put the garbage out, and he fell when it was snowy and icy outside and he broke his hip... and one of ladies they let her go because she was pregnant and she had a miscarriage last time.

Only one participant had extensive MSD training for her recent position as an accountant for a governmental organization. A weekly exercise time pursued her training as a follow-up. However, Sapid did not recognize the term MSD until the interviewer explained her:

Oh, ... Ok now I got what you mean... we had training at college and every week someone comes to our office and reminds us to do exercises, which is really helpful and made me to get used to my exercise every day in my break and behind my desk.

Participants found the phrases challenging to learn or remember. Thirteen participants particularly emphasized that they had never come across the term WMSD, MSDs, or the existence of such an idea for their pain. They were pleased to know that their pain can be defined and is not a result of “tiredness,” “arthritis,” or “aging,” which they had always been told. Their gained knowledge through the interview allowed them to view the problem differently and to consider how it could be prevented. Misha noted that:

Whenever I had pain, they told me that you have arthritis so I felt I have this problem and I have to bear it, so what is my option I have to work either at home or outside. I have never thought that I have pain because of my work, I thought I have pain because I have arthritis and I felt that I cannot bend because my body is weak and have never thought that I should bend less.

Addressing problems with a specific name was favored above talking only about symptoms and characteristics. Mitte asserted that whenever someone says “I have pain,” everyone considers it a common phenomenon resulting from “aging, tiredness, and the job that you do but not from some particular risky posture or movement that you could target for mitigation.” Some people

were convinced that their job is causing them the pain, and there would be no resolution except with changing the job. If they stay there, they accept that one day they will experience disability like others. Covering this point Sharifa asserted:

What is the choice... my husband cannot leave his job and he knows all of his friend get disabled and are not able to work... if he leaves this job where he can find the job... we are hoping one day our kids would take care of us like what we did for our parents.

Addressing a problem with a name, it's clear definition, and the importance of how it could change gradually into a serious health problem was the important part that Mitte mentioned:

I prefer someone explains you and telling you some information and providing you with its specific name rather than just telling you this is because of work. It is very important if you know even the phrase of MSD instead of just say I have pain. I mean when something has the definition, it is going to be bold and noticeable and then if someone like you introduce some tips then you could consider that to see its effectiveness... and make people aware that these on and off pain one day would be intolerable.

Workers suffer from MSDs but it is hard to uncover the causes.

Two participants provided examples of MSDs development at their workplace that resulted in coworkers becoming permanently disabled. Most participants (11 out of 15) experienced MSD that caused them get time off from work (three days to six months). All participants claimed that anticipating MSD hazards is hard, and usually, they are unaware of potential hazards due to lack of knowledge or inattention to training. Farida mentioned that:

Usually you feel something is wrong there but you don't know what is that exactly and you don't have that much energy or time to think about it ... you see your colleague is telling about his pain but you feel it is not going to happen for you [laughing]

Anticipating MSD hazards usually starts with participants own extreme pain experience or the specific repeated complaint of pain from coworkers. They assert that even if you know that you are developing MSD, it is hard to figure it out how to identify the hazardous task or posture and the solutions. Usually, participants end up having days off and rest to relieve their pain without knowing the exact solution. Ali said:

I see people getting unable to continue their career because of MSD. I don't know how they could have been stopped its development from beginning, or in

my case how to prevent having the same experience. However, we usually think that this situation is not going to happen for us.

Also, some asserted that a heavy job has more potential to educate you that you are developing MSD since you would more easily detect what causes the pain and why it developed. If you do a simple repetitive task, it is hard to believe that kind of job makes you have extreme pain. James has been in Canada for five years, and has worked in a couple of work environment during that times:

If you work with heavy objects it might educate you more about the risky acts than light objects [laughing]. If you work with light objects, you might only work a long time, but you do not get notice of its damages and hurts on your body. You gradually start to develop MSD, but you might have never noticed that you got your body pain from your light work duty. Like recently that people never thought that sitting long hours could causes LBP.

Pessimistic about Recovering from MSDs.

Three participants insisted that serious pain from MSD would never go away. Most of the participants claimed that workers usually neglect the pain and notice its seriousness only when it is too late to treat, and the result is inevitably reduced worker performance and quality of life. They believe that those workers who become unemployed due to MSDs will never be able return to work. Mitte expressed her experienced as below:

If you hurt, you hurt! it is not going to be ok, you will have that pain all the time. Probably you should have acted on it way earlier but who knows that you will get that worse conditions that would keep you away from work for that long time. Pain will stick with you forever. I tried everything but nothing worked and I know people they had never got back to work.

MSDs pain and training undermined due to lack of knowledge.

Four male participants felt that workers did not take training regarding MSDs seriously because it develops more gradually than injury from accidents. Two female participants claimed that they usually take care of their pain by having a bit more rest, but often, it is too late, leading to inability to work and absenteeism. Sharifa mentioned that:

You know you feel it is going to be over and you don't take it seriously... and it is really ... but one day at work I got terrible pain and they took me to the emergency since that time my pain never relieved... I rest for several months but nothing is like used to be ... I think nothing could help me now.

All participants declared that they may detect the starting point of developing MSD/pain, but since it is relieved through rest, they do not take it as a serious health problem or they look for another reason. Three participants acknowledged that workers do not believe that their pain could be alleviated by a little adjustment or that it would cause them disability and loss of occupation. H&S regarding MSD and hygiene was perceived as simple, not important, and easily fixed with a little adjustment, so it is not perceived as important training.

They train you but you feel these things are basics and your body are not that sensitive to get hurt from these actions, how you would guess that packaging small piece of chocolate would cause you headache.

Based on the participants' statements, MSD pain is usually poorly recognized, and people understood it as a natural result of their work. For example, participants asserted that it is typical to have pain at the beginning of a career. This pain, when they are new in their job, is perceived as the body's adaptation to the new tasks. After a while, they considered it to be a symptom of their tiredness, and it was not usually considered serious since it resolved with rest. Some people regarded it as part of their aging process or a sign of diseases such as osteoarthritis and fibromyalgia. Such justification of MSD pain was another approach that undermines MSD prevention and decreases the efficacy of MSD training among participants. For example, Omar said:

When you work it is normal to have pain and stiffness on your body. At the beginning it is because your body is not adapted to the job but after a while you will be ok... and later it is because you are tired.

Compliance with H&S/MSD advice and instruction were not taken as part of their job responsibility.

Avoiding accidents and acute injury is the priority rather than lessening cumulative trauma disorders. Some participants asserted that in Syria people generally do not pay attention to H&S and they consider it somehow a waste of time. Ali and Omar, who works in a big corporation, asserted that they did not take H&S to be part of their job and duties in Syria but they find that it is a serious topic in Canada. Omar mentioned as below:

In Syria, workers do not care about H&S advice; it seems H&S is not part of your job. It is just something there and not necessary. I don't know about Canadian workers but in Syrian labors think H&S activities are a waste of time and worthless. The important thing is the result of the work and benefits.

You feel you have to know about H&S but they are not paying you because you cared for H&S.

James worked in Canada from his first months of relocation when he was 18 and he believed that “You are paid to get the job done not to complain or make H&S an excuse.” Participants believed that workers usually find H&S unnecessary except when using heavy instruments that may cause a considerable strain, and they rely more on their instincts and experience to handle hazardous situations. Maher said:

I lost my fingers when I was working in a wood company in Turkey. I did not need instructions on not hurting myself; it happened because I was tired and didn't care. I would have saved my fingers if I cared. What kind of guidance would avoid that accident!

They did not care for H&S and found it unnecessary and a waste of time, not the central part of their job responsibilities, since they were not evaluated based on that.

I feel lazy in applying H&S ... I think it is not important... they could fire you if you don't know how to work but they don't fire you because you did not care for H&S... I think it is a waste of time... I know companies have to do H&S paper work.

Three younger participants (Hajar, Osman, and Maher) in comparison to others (middle-aged) admitted that they “feel lazy” when they want to work correctly based on H&S advice. They declared that they are still young and healthy and would not get hurt like others. Other participants also mentioned that they had the same feeling when they were younger. Anna in her 50's believe that she had the same attitude when she was young “When you are young you feel you are superman.” Interestingly young participants were aware of this feeling of undermining H&S regulations.

At work you hear many advices and see many people getting unbalance to work but you feel this is not going to happen for you. You are young and different.

H&S regarding technical instruments, avoiding accidents and incidents, and customer service were perceived to be taken more seriously than MSD development and was participants' first assumption about H&S. Avoiding accidents generally was the first priority of H&S for participants in heavy industries, and customer service was the main focus of those in small businesses. One of the participants' answers (Misha) regarding what she thinks about H&S at work was:

It is very important to keep customers happy and their H&S is in priority. We have many H&S meeting to get inform about how to treat with customers.

Alisha was working in car manufacturing, and he found safety more towards machine and devices safety. His immediate answer to H&S was as below:

H&S is really important... particularly in our workplace we use many heavy machines and instrument that are very expensive, [so]we have to care to not make any big mistake which is going to be big financial burden on company

He experienced LBP and severe twisting of his ankle at a worksite even though there was an assigned H&S supervisor; that person did do anything in that role. Alisha sent several emails regarding his problem. He tried to convince the supervisor that there might be a chance of an acute accident outside since it was slippery, but he did not receive any assistance. Usually, participants were not comfortable about sharing their MSD/H&S concerns if they were related to their health unless the focus was on work and businesses progress. They shared their situation only when they were not able to continue their jobs, or they were in a severe hazardous case.

Many workers there complain about their health but they never share it with that H&S person or they may not know if there is an option of sharing their pain experience with H&S department. They do not have another choice. They share only things that may cause damages to the businesses.

Mental pressure may be considering a main reason for MSDs pain rather than looking for some physical work-related modification.

Three participants claimed that, for them, mental pressure is a trigger for body pains. Misha asserted that she was unable to recognize whether she had pain as a result of her physical work characteristics or that the severe pain resulted from mental pressure and the stressful situation of her relocations.

I cannot believe why I had that much of pain ... for only few movements every day as a part-time worker. Even I cannot believe that my pain was from developing MSDs. I was in a terrible condition. I went to Dr. and they told me my pain is coming from my work but I didn't believe. I had many mental pressures and I didn't believe anyone's advice. I was so depressed because of long time continuous pain.

Family proximity has also been brought up as an important mental support. Those participants who have their families around believed their family proximity has profound impacts on their mental or physical (doing chores and on task division) comfort. Having a good weekend with

family, taking care of each other whenever someone is sick, sharing responsibilities, enhancing the quality of rest days, preparing a healthy meal together all constitute forms of mental support.

I think many of pain in our body is coming from the pressure in our brain; I mean mental pressure. First year I was terrible, I felt I am nothing here but support from my family helped a lot., At least in my case now when I am going home, I feel better in compare to those that their family is not here and I enjoyed those couple of hours. My parents doing a lot at home which help me to have more rest time... they came recently and it was a big change.

Four participants considered that they were under tremendous pressure when they were in their first workplace, and the pressure from relocation made them more vulnerable to the pressures from the workplace in comparison to natives. As Misha asserts:

I think I am under pain because of mental pressure; other people [are] doing the same job but they do not complain

Hiding MSD related pain since its development is an accepted fact and participants have fear of losing their job

Lack of confidence and knowledge stopped participants from talking about their MSDs pain, as it tended to be poorly understood at the beginning since it was relieved through rest and care. Participants claimed that they investigated to find a reason for their pain other than its link to everyday tasks. For example, they changed their shoes or did a blood test, or they thought they had pain because of the mental pressures that they were experiencing.

I was working in the dormitory food facilities... I had LBP ... I changes my shoes, did blood test and many things but nothing helped ... when my position changed to other place I relieved from the pain and now I understand it was painful since I was standing half way and not straight in that position.

Most participants also mentioned that it is a reality that you might get MSD from work, and it is naturally occurring since we are aging, making it just an accepted fact of life. Always talking about what you feel in your body was considered equal to complaining about what you are doing. Participants do not feel comfortable about discussing their pain, and some also worry that they could lose their jobs as a result. Azam expressed her thoughts as below:

It is normal you develop MSD and you cannot complain for the things that no one could stop it... you cannot say I am not lifting ok who should do the job.

MSD experience is not something participants felt comfortable sharing, in part due to it negative

associations (stigma), and in part because workers just accept it and keep quiet rather than risk losing a job. Hajar believed:

You can't always talk about your body that has pain; no one cares and even you might lose your career.... I saw people that they lost their job just because the manager heard they have LBP... and you feel this is stand on you negatively ... people don't like to hear about your pain

Participants reasoned that they were experiencing pain from not having enough sleep, tiredness, aging, lack of vitamin D, the nature of their work, and doing the same task for a long time without rotation. Vitamin D deficiency for most of the female participants was the reason given for their tremendous pain in their first two years after relocation. Two participants had to leave their job and were off sick for more than three months (Hajar: 3 months, Misha: 6 months) as a result of vitamin D deficiency. Finally, they planned to change their jobs through studying for other types of work instead of keeping on with their current jobs, since they thought their body was not capable of physical work.

Hard work means doing more duties than the assigned one.

Some participants believed that immigrant and refugee workers were more passionate than other workers. They asserted that “natives only do whatever they are assigned” while immigrant people try to overwork and do more than what they should do and take on more responsibilities.

This kind of job that we refugees are doing is not the thing that natives could endure... and then they are not that hard worker as us ... we want to prove ourselves and we have a lot to lose if we couldn't survive there... what I can do if lose my job at least I would work hard here and hopefully to get more chances to work somewhere better.

These workers believed that they put more pressure on themselves than is expected, and that makes them tired and not diligently care for H&S details. Hajar believed similarly; however, she later noticed that some managers and co-workers did not appreciate this kind of behavior from workers. She said, in Syria, people appreciate it if you complete your tasks and go even further than what you were asked to do. But here in Canada, managers do not expect workers to do something that you have not been requested to do.

At the beginning I tried to cover everything even the jobs that some people miss to do and hope to see promotion and it is never happen. Then the culture is different...than back home... there they appreciated a lot if you do more than

what you have [been] requested [to do].

Participants overload themselves to prove their capability. Some participants believed that they had some core values such as being capable of doing many tasks, and being hard workers. They claimed that sometimes these values push them to work harder and put excessive pressure on themselves so as to illustrate their capabilities and superior work ethic. As a result, their exertions became a drawback to their health and wellbeing. Misha took the shifts that no one else wanted, and she worked long hours to cover co-workers on their sick days off or work faster to cover a shortage of workers. After a while, she became sick and required a long rest to recover, but nothing changed in her occupational mobility.

5.4.3 How Institutional Barriers Underline MSD development

Fatigue as a result of managers' pressure to speed up the working pace

Participants suggested that they failed to comply with H&S advice whenever they were rushed through tasks. That usually happened when managers had too few workers and made the ones, they did have work harder. Mitte:

One day I give up, and I told her you know what! I want to quit, and this is not safe to work that fast, and you (manager) cannot push me to do it since it is going to be against the people's health if I work when I am tired. I just ran to the MP's office [laugh] ...she didn't allow me go to home... she was telling me you don't have small kids why you don't stay... we have many customers now...

Feeling tired, having MSD pain, being urged to work faster, and the presence of too few workers for the amount of work to do all made workers less diligent about MSD/H&S regulations. These factors cause distraction since participants believed that workers needed more effort and concentration to consciously apply H&S. Ali developed a hernia from rushing while pulling heavy objects:

We were in the shortage of worker and we had to meet the deadline. I felt so tired and do not care how I am pulling the device; I know I had to ask someone helping me but everyone was busy and I hurt my LB and hernia... I got training before but my mind was busy just to finish the task.

Increasing workers' self-efficacy; workers require training about their rights and responsibilities towards MSD/H&S

Generally, participants acknowledged that they have little knowledge about the occupational structure in Canada. They lacked knowledge about workers' compensation, full-time and part-time job differences and benefits. Getting hired illegally and getting paid lower than minimum wage (cash) and its consequence, the outcome of hiding injuries/pain from managers due to being afraid of losing their jobs were also topics that came up and were particularly the experience of participants with a low level of illiteracy.

I worked for cash and my husband. He is disabled now without any coverage. He worked in Turkey for 18 years and 5 years here in construction for cash, he thought he is saving money. But any way labors here do not have any benefits as long as I know.

Almost 80 percent of the participants were not aware of their benefits. Five male and three female participants were fulltime, and the rest (seven) worked part-time in several workplaces, all considered to be in the low-wage categories.

They were also unsure about who was responsible for providing workers with insurance, benefits, and training. Mitte explained how she ran to her MP's office to get their assistance:

I just ran to the MP's office [laugh] and just cried and complained about her [my manager] I didn't know where to go and how to get help... It has been 4 years I was working for her, and this time I get really tired I didn't care to lose my career... Honestly I wasn't that brave first years of my working... imagine after five years working here this was the only way that I find to go and complain about her. Many people left the job in their early stages but I needed my job and she was the only one accepted us full time.

Skilled participants had heard that any reports they made of incidents or injuries would impact their overall performance evaluations. They were also concerned about not getting a response on their requests for Personal Protective Equipment (PPE) provisions such as safety shoes or other H&S requests and not being aware of how to formally report their accidents, pain, or work-related issues such as discrimination or mental pressure from managers or co-workers. Although they had heard that they could inform their superior about their health concerns, it did not seem not practical, and they did not feel comfortable about doing so. Interestingly, all participants had been told that they could refuse tasks if they found the situation hazardous; however, they usually did not. Bahar asserted that:

You could stop working if the task is dangerous but you know you were hired to get the job done. If I am not going to do someone else will do for sure there

is not a situation that is 100% hazardous to feel comfortable to say no. They push you to work faster, which makes you tired. You want just to get the job done and go home, managers usually are not easily reachable [laughing]

Experienced participants who have lived longer in Canada have acknowledged that when they entered the work environment, they were not aware of soft skills, and were untaught about their rights and insurance, and insecure about opening up to others and seeking support in the workplace.

I don't want to look weird [at that time] I don't know how to act and what is the norm here... I go to work just to do my job not involving with other things. I don't know how professionally report my concern to be taken seriously and also, I don't want to be a person all the time complaining.

Two participants asserted that they had to keep their jobs to survive. They perceived from their managers that they would be unemployed if they informed them about their pain or concerns, particularly LBP or pregnancy. Such beliefs pressured them to tolerate difficult situations and not share their H&S/MSD concerns or not care if any training was missing from the workplace.

According to Hajar, at work, no one asks for days off due to health concerns since they worry that managers suspect that they are developing health problems. Hajar said many workers request days off as a vacation (usually three weeks) rather than rest time, because workers did not want to reveal that they have pain. If managers were informed of injuries or pain, workers would be expected to stay off work until a report from a physician confirmed that the person was fit to return to work.

A common point from most participants was that they believe immigrants and refugees are so vulnerable and stressed that they hardly ever stand up for themselves in their first years of at work experience. They usually tolerate workplace situations, misbehavior, missing H&S training and adjustment since they would find it hard to find another job; they consider themselves lucky just to be employed, as new immigrants have significant challenges in this regard. Participants felt very grateful to have jobs that their only concern was to keep themselves employed and be accepted by other workers.

Differences in Cross-cultural Work Environment management in Small and large corporations.

Half of the participants claimed that they prefer to work in a Canadian corporation (big companies) operating under Canadian H&S standards, rather than to work for small companies

with managers from other countries--“Immigrant managers” --who might not be trained in H&S. They found only some of the managers of small businesses to be professional in their performance and expectations. It was not clear what participants meant precisely by saying the Canadian workplace. Sometimes they mentioned about proper H&S situations in big corporations rather than a small one, and sometimes they used words like Canadian vs. international people. Overall, they found managers in a small corporation to be less educated. Their behavior seemed less professional and less organized than that of managers in larger corporations, especially around handling H&S training. Four female participants assumed that managers coming from other countries were not aware of human rights and H&S, and that they behaved based on their instincts, without having any training before they started their businesses.

Managers here ...how they have been treated in home country ...they behave similar to what they experienced in their own country in a corrupt system They treated you in a way that is common in their own country... without any consideration and respect... they don't care about H&S training, and if do they provide you some training [it is] because they have to and were forced by the government.

Three female participants said they would prefer to be employed in a Canadian company due to the pressure they experienced from their managers in small corporations. The rest of the male participants did not mention any details regarding the topic of management misbehavior, but all female participants did. None of these participants raised issues like racism, or the pressures that they might experience in a hierarchy; however, interestingly, all female participants declared that they had experienced pressure from their managers, being pushed to work harder, and being asked to take longer shifts, that impacted their health in general regardless to what extent they had received training.

Managers' attitudes could alter whole systems regarding H&S particularly in small corporations.

Workers felt that H&S advice should be applied consistently, wherever one works. In small corporations, H&S depends on the manager's attitude, and workers execute tasks based on what managers emphasize. Participants in small businesses acknowledged that managers or owners in did not pay consistent attention to H&S. Sometimes they came with some advice, and sometimes they did not take H&S seriously; their focus usually was on business success. Sharifa was working for a store in the food and bakery sectors, starting as a baker, working there without any

H&S training and very little equipment. The owners were working in a similar situation and even harder since they were struggling to keep their business alive. Most of the H&S concerns in her place were MSD-related or involved the high temperature of the work environment, particularly in winter, as it affected their lungs. They had to lift many heavy objects and carry them. She said:

I couldn't complain—there was no one to complain to, and the owner was working like us too.

Workers' H&S was not emphasized in small companies, and the focus was on customer services (the prioritized value in small businesses). Sharifa asserted that people who are in small businesses--both workers and managers--coming from another country often were not trained to take H&S seriously. Mitte:

They are immigrant too, they came here, have enough money to start their businesses without any knowledge and they push us hard to work faster without caring for workers health and there is no respect.

On the other hand, some participants in larger corporations complained about the H&S there too. Hajar spoke in terms of the “Canadian work environment vs. the international work environment.” As explained earlier, these terms were commonly used among participants. She was part-time in the food and services section in a college, where workers received and had to sign many papers advising them about H&S. She usually kept the documents until late shifts to find spare time and read them thoroughly. Most of the papers that she received were related to H&S. She assumed that managers wanted to inform workers and get their signatures to protect the company from financial or legal consequences, not necessarily because of caring about workers' health. Her interpretation of the Canadian workplace vs. international workplace mostly related to the number of workers who had recently immigrated, since English was their second language.

Some participants mentioned that managers seemed to want a strong sense of control over what workers were doing in their work hours in small corporations compared to the “Canadian work environment” (big corporations). And such micromanagement made workers likely to work harder and faster, and they did not have enough energy to care for their H&S. This situation, claimed several participants, caused them excessive fatigue and commonly required repetition of the same task since, in a rush, some tasks were not accomplishing well, and needed redoing.

Workers who got instruction for every single detail in their work hours and were monitored closely (with instructions even about their break times) found themselves more tired and stressed than usual. These workers believed that this way of controlling people and micromanagement was usually experienced in small businesses; however, these participants did not have experience of working in a big corporation or as they called it a “Canadian work environment.” (It was their perception that micromanagement did not occur in big corporations.)

Managers and coworkers may not perceive refugee workers as being competent or capable of providing advice or complaining about their situation. Some participants perceived people as expecting that refugees should be grateful for what they experience in Canada. Five participants acknowledged that it is true that refugees like themselves become so excited and grateful about ending up in Canada and being hired that they usually try to illustrate their feeling to express how thankful they are, but that does not mean everything is perfect.

At work, they see us less than what we are. They believe we have to be very thankful that they gave us these jobs and that's why they don't like it when I am complaining, or I need some changes in my situation. Since they expect I should be happy from the general situation or they may think I am unskilled.

On the other side, some employers or co-workers do not expect to receive complains or advice from refugees regarding to their training or H&S. Ali remarked that he is perceived as not capable or competent enough to understand any drawbacks in the workplace and that others expect him to be grateful for any circumstances here because they presume that he experienced way worse situations in his home country:

I feel they don't like to hear any complaint or adjustment from me. They think everything here should be perfect from my eyes since I came from Syria. I think they listen to me but not hear me.

Lack of environmental support.

Generally, most participants were on the same page regarding H&S environmental support, as related in the details below. H&S advice needs to be supported cooperatively by managers and co-workers. Participants claimed that it is easier to comply with H&S when a workplace is clean, organized, and the managers are trained to care for workers' health and wellbeing. Supervisors were identified as the point in the workplace hierarchy that should be responsible for informing workers about H&S and making sure that they understand it.

Half of the participants deemed that they found it hard to gain managers' support regarding their request for days off. Hajar stated that she would be more confident if someone in authority would clearly indicate that workers should not wait to request days off until their LBP or health status became severe. Some participants were not comfortable about asking for days off unless there was no choice except staying at home, and their feelings came from managers who had treated unpleasantly. She said if you inform them that you have a health concern, they did not want to be responsible and would try to make you leave the job by your own choice so you end up unemployed.

If they notice that you have health concern, they would let you go and you may probably not be hired again depending on your situation. Workers never reveal they have health problem, rather they ask for vacation.

As the nature of most jobs was physical, managers want only strong and healthy people. Hajar acknowledged that when you are working in a workplace whose primary concern is to get the job done and work as fast as possible, and the aim is to hire fewer people, it is evident that H&S concerns would be ignored. Managers only care if staff shortages threaten their ability to get work done.

Another group of participants mentioned that immigrant workers in the lowest-level occupations usually have a low level of English literacy. They are informed about H&S through a written document and asked to sign papers confirming that they were informed. Hajar believed that the signed informative H&S documents act as proof for the company that they provided training, but the administrative person usually was not that careful about what workers understood from the papers. She and four other participants believed that dissemination of preventative MSD information through passing out some papers, with a few unclear pictures, followed by short informative meetings, was ineffective.

I do not believe my coworkers understand what "first you" means. They only know few words, actually I do not believe them, I think they only want to inform you not to protect you.

Additionally, work environment layouts need to be adjusted to prevent MSD. Hajar mentioned that in her workplace, no one was supposed to leave objects on the floor; however, acting based on this rule was not helpful since the shelves were relatively close to the floor. Ali and his co-workers had been advised to use a table instead of working on the floor, but the table was far

from where it should be; as a result, no one used it regardless of advice from H&S representatives.

Participants' concern about H&S accommodation included 1) not getting responses from supervisors to their requests for safety PPE, 2) not being comfortable about asking for help when needed, and so putting more pressure on their bodies, 3) not being allowed to register for other training or certification except what might be offered, 4) being pushed to work faster and for longer hours, 5) not getting respect from the owner of the business, 6) being forced to use and buy the store's own products even though the expiry date was close.

Revealing MSD pain only to co-workers is common in the workplace.

Participants acknowledged that they rarely shared details of their MSD pain with the H&S department, even though workers commonly discussed their concern together.

It is been common we talk to each other and share what is going there [our pain or accident], but no we usually do not report it if it is not serious like accident. I don't know why we act in that way probably because it has been not taken seriously, personally I am shy.

Three participants mentioned the importance of sharing their H&S concerns with the right person and noted that most workers share their H&S interests or pain experience with each other instead of their supervisors. They also expressed frustration, stating that they knew it would be better to inform those with the authority or enough knowledge to modify the work situation. Talking only with each other is common in the workplace but ultimately achieves nothing.

When I had pain in my wrist, I noticed that all coworkers there had the same problem... but they never report that ...and they know how it developed ...what is the point we only discuss it with each other? You know it is common workers know many things but they don't have the habit to let the managers know.

Partially this behavior may come from participants' attitudes: they do not take MSD development as a serious topic to share with managers, and owners and managers have a similar attitude. For example, James noted that:

Its normal to have body pain in physical job and I think no one wants to share the obvious things [laughing].

Immigrants make up a docile work force in precarious work environments due to job insecurity and fear of losing their jobs.

Feeling insecure about holding their job, even though it is low income, offers no security, and has no opportunity for any growth, makes participants accept any circumstances. Even though most participants work situation was were less than they had hoped for (often consisting of many part-time positions at the same time and seasonal, and without any benefits and insurance coverage), they still worried about keeping that work. Due to this insecurity, they worked harder and tried to not complain about hazards or missing H&S regulations or requirements. Participants' insecurity justified them staying in a precarious work environment while experiencing both mental and physical stressors.

I had to work, I didn't have any choice ... even after two years and after I had worked hard there. I saw they hired a someone from outside (the managers' friend) to do my exact job and not letting me know I wasn't able to leave the work... I got so upset but I stayed in spite of all the disrespect from managers there... My father got injured, and my mom is old--what was I supposed to do except stay and work and I wanted to sponsor my fiancé here... I feel if he came my situation would get better.

Participants employed in SBs or service industries believed that the labor force for these industries consisted of newcomers and refugees. They claimed that their job was not a place that native people would endure. No one needed any certificate for such employment; they got their positions since they looked more capable and healthier than other candidates. It is a fact that participants in low-level occupations got jobs that do not need any skills, but these participants believed that they were hired since they were more capable than the job requirements or other candidates. They worked harder regardless of potential health complications and usually did not bother employers with a complaint about any missing H&S regulations or requirements.

I know they hired me because I am really good compared to others, and those times I was too naïve to complain about anything. I just wanted just to have a job and feel that I was able to get involved here, I didn't care for my health honestly I felt it wasn't the time to care... at the beginning I was even worried to lose my job, and later when I noticed they could not find better than me I really needed the money.

Their primary argument was their financial constraints and the need to support their family either here or in their home country. They needed jobs to support family, to help themselves transfer to a better career path, and to gain Canadian work experience so as to get decent reference letters.

I wanted to sponsor my family here so I need paper [proving] that I can earn... if they come, they would take care of me [laughing] ... I need job no matter

what just to get Canadian work experience and reference letters... everywhere they ask... but I don't know how I should have had them while I wasn't in Canada. So, I didn't care where I am working I wanted just to pass this stage [laughing]but still I am doing labor work after 4 years.

The injury and health concerns that might lead to disability were one of the main reasons for three participants to leave their precarious work environment; otherwise, other participants (eight) continued working in physically demanding jobs for at least their first two years in Canada. Those participants who continued in precarious work until they were confident enough to leave and look for other positions were aware that they were working in unhealthy work environments. Sharifa, Bahar, and Maher complained that they worked illegally at the beginning, but if they had their current knowledge, they would never have done so. These three participants quit the job since it was physically heavy and ended up having pain for a long time and not being able to continue the job. They had no benefits, sub-minimum wages for Sharifa (female), and only minimal safety standards, and workers performed tasks without proper equipment. Maher (a tile installer) got LBP and felt if he continued the job, he would not be able to maintain his health after a while, but the wage was satisfactory.

I said to myself that I am young and, in this way, I have to sit in wheelchair after a couple of years. Dr told me you are young what are you doing that you have this pain? Honestly the salary was good but I could not continue in that way without any benefits.

5.4.4 Career Trajectory

Eight participants had higher levels of literacy than the others. Five of them stated that they had experienced professional downward mobility on coming to Canada and considered themselves capable of more, but three were satisfied with their current positions. Young or uneducated participants did not complain about the level of their jobs as most were first-time workers. Most participants, especially older and educated ones, seemed restless and impatient to improve their work and lifestyle, which made them more agitated and harder workers. Pushing themselves to work faster and putting more pressure on themselves were qualities mostly found in mid-aged participants. They believed that when they worked harder and focused on getting the job done to show their great aptitude, they were vulnerable to unhealthy behaviors associated with MSD.

Furthermore, young participants expressed that they often worked in a rush as well; however,

their stimulation differed from that of older workers. Some of them that had been relocated here alone (usually through sponsorship programs) were planning to sponsor their families to come as well. They were under pressure first from being alone here and, second, from worrying about their families in camps or in Syria. Young participants wanted to create a good financial history so as to provide documents and gain eligibility for sponsorship programs, and usually did not take H&S seriously since they prioritized other objectives and responsibilities. Particularly when it comes to chronic pain or initially developing a non-acute MSD, they could cope. In addition to ignoring their health at work, they were also ignoring their nutrition, lacking time and someone to prepare and share meals.

Participants were trying to improve their careers by working harder and covering longer shifts, hoping that their hard work would count one day, and their manager would consider them for promotion. However, some suggested that they might need to gain other soft skills rather than pushing themselves just to work harder and hurt themselves. Participants also believed that when confronting challenging situations regarding their H&S and general well-being, they were not able to make changes. Moreover, even if they felt they had sufficient authority to make changes, they did not have enough skill in analyzing hazardous situations. For example, those participants who found the message effective and helpful believed that their managers already knew about the problems and should take action to change the work environment. They did not think workers should have to inform their supervisor or provide them with suggestions.

I have to get the job done and I cannot say that I am not lifting objects from the floor because it might cause me LBP sometimes in future, but if they set a rule that no one should lift objects from the floor then no one would question why you are not lifting objects.

They were inhibited by their lack of skill in MSD detection and analysis; for example, they did not have enough knowledge to provide suggestions for their work environment layout. Often, they only felt that something was wrong, but could not figure out the details or a solution.

I know something wrong but I don't know what is that exactly or I am so tired to think about solution. It takes time and they are not paying me to think about solution or what is going to save my body; they want me just to get the job done. You know I don't know how to say it to not look strange. For example, I like your topic and I like they apply it for our workplace but I am not going to suggest them. I feel it is not my duty and I want to lift objects once in a while (2-7 times during a day) and who cares for that.

Participants also emphasized other concerns apart for MSD, such as lack of knowledge on how to protect themselves from discrimination, how to properly document their concerns and requests or opinions, and feelings of powerlessness. In fact, being new in this society has made them appear docile about their situation, primarily because they feel they must just accept the pressure that they experience at work.

Four participants did not feel they are in their “real” job and expect that their situation will be temporary. They try to handle health drawbacks, particularly pain from repetitive motions and fatigue, and hope that these days will be over soon. Thus, they put off taking care of their pain. They think they will leave the workplace shortly and will experience a better place and so have no need to invest in improving the workplace. They do not encourage themselves to complain about problems as they plan not to stay. Plus, they do not believe they can make a difference, mainly because they do not have a good rapport with managers or supervisors, sharing their concerns would be stressful.

These workers do not attach to their workplace, and they do not want to invest their time and energy to improve what they regard as a temporary situation. Their dissatisfaction regarding their current job does not arise from experiencing downward mobility. Most of their resentment results from the workplace’s negative atmosphere and attitudes, pressure to work faster and harder, and disrespectful behaviors, and not being optimistic about the chance of promotion in the same workplace. They attribute the lack of promotion to perceive aptitudes by managers.

Another participant who was satisfied with his career level, again did not like to share some of his MSD/H&S experience, since he did not want to argue with people to whom he had just recently been introduced. He hoped to inform the workplace about its drawbacks when he leaves the company. He did not plan to stay in the job as it was irrelevant to his education; however, he was satisfied with the job level.

Some participants believed that immigrant and refugee workers were more passionate than other workers. They asserted that “natives only do whatever they are assigned” while immigrant people try to overwork and do more than what they should do and take on more responsibilities. And they believe that the labor market is occupies with refugees and immigrant workers.

This kind of job that we refugees are doing is not the thing that natives could endure... and then they are not as hard workers as us ... we want to prove

yourself and we have a lot to lose if we couldn't survive there... what I can do if lose my job; at least I would work hard here to hopefully to get more chances to work somewhere better.

Newcomers tend to work faster since they have feelings that they are judged to be and their anxiousness unconsciously stimulates them to work faster. Working fast gives them some sense of fulfillment but in the long run, the stress of working like that makes them burn out.

You want to try to do your best, you feel you are behind... I work too fast and I hate to work slowly, I feel I am behind and I have to finish everything to feel relaxed... otherwise I feel my downward situation coming from my negligence.

It depends on how your supervisor convinces you about the hazard situation. If you do not have the training, then you do not know how to work properly, and you can cause harm and damages to worker health and also to the company. So, it's good to have knowledge before doing anything. At work, we are working as a team, and others' behaviors impact your behavior too. It's encouraging if they are complying with health and safety. For example, when it is necessary, they can give advice and stop me from doing sth wrong.

Some participants did not believe that their part-time situation would turn fulltime after they had been working for several years in the same company. They experienced a lack of opportunity for career advancement. They commented on seeing others providing favors for their managers or supervisors, for example, buying gifts and celebrating their newborn babies. They regarded this approach as informal and were not happy about it since this behavior affects the careers of other workers. Hajar believed that managers and supervisors became biased as they were not trained to avoid favoritism. For example, when it comes to judging workers based on their performance and capabilities, it could affect managers' decisions, and Hajar does not find it fair. She recommended that this kind of behavior originates from eastern countries and is not common in western ones. Feelings of not being perceived as capable and not having the opportunity to progress make some workers hopeless and less attentive to H&S suggestions or training. Plus, Hajar asserted that these circumstances made her more tired, frustrated, and less tolerant to her work situation.

When you see managers are not fair and they do not see your hard work and you don't have that opportunity for growth you lose your interest and passion even to care for H&S... you want just to get the job done and nothing else.

And Mitte said:

You have to butter them up if you want to survive there and I am not that person ... they have to judge you based on your performance and general attitudes. They coming from the same background and countries and have back of each other.

Having regular H&S adjustments and updates at work and notifying everyone with recent H&S incidents in meetings as a routine way of engaging and involving workers were acknowledged in helping workers to accept and take charge of their own H&S. Workers, especially younger ones, felt that they would learn more and more by watching each other's performances as well as role models' (such as supervisor's) behaviors in the workplace and this was perceived as fundamental in their development of good H&S behaviors. Overall, participants declared that they valued getting H&S training, but admitted they might not comply with those suggestions at their workplaces or take it seriously.

If workers accept as a general rule that they have to get updated, then they will look for a new technique. Like other science, you have to learn to update yourself if you are a teacher for example.

Experiencing pain also was the most effective element in making workers diligent about taking H&S suggestions seriously. Moreover, young participants did not take H&S training seriously as much as experienced workers or participants in middle-age do. It seems to have experience, pain and injury history, and level of education impact participants on taking training seriously.

Irrelevant training distracted workers. They preferred more interactive training with colorful pictures, video clips, and follow up sections or regular H&S meetings. Supervisors are the most likely people that their suggestions were taken seriously by workers. Furthermore, young participants stated that when they noticed their managers or their supervisors' compliance with H&S, they would get encouraged to follow their H&S instructions.

Training efficacy

Participants have found H&S/MSD training helpful. Those who had received proper training at their workplace emphasized the importance of being monitored by their supervisors until they got used to the rules and regulations and "made it a habit." They found it useful to have the training and its follow-up together (actively practicing training) as a package. Misha asserted that:

You usually get many trainings but it depends how much workers do based on

that... I saw people that they hurt their back. They have gotten the training and they supposed to not lift heavy objects... but ... you need someone to force you at the beginning but after a while you will [become] used to that... training alone without follow up is not going to work.

Participants were clear and consistent about the importance of being supervised for H&S. They believed that they need it until they get used to the regulations and make the rules and directions a practice at work. Furthermore, they feel they need someone reminding them or pushing them to comply with H&S when they are tired and not concentrating well. Moreover, some participants acknowledged that frequently updating H&S/MSD related to new tasks and responsibility made them regularly reconnect to H&S and MSD awareness. More task correction and adjustment in the workplace, updating with new H&S suggestions, allocating regular H&S meetings, verbal communications, and more interactive training on H&S were all cited as helpful for the acceptance of H&S regulations.

When you are tired you don't that much care ... you want just to get the job done You don't have that much time to think if you are doing thoroughly healthy behavior.

Having regular H&S adjustments and updates at work and notifying everyone about recent H&S incidents in meetings as a routine way of engaging and involving workers were acknowledged as helping workers to accept and take charge of their own H&S as well. Workers, especially younger ones, felt that they would learn more and more by watching each other's performances. As well, a role model supervisor's behavior in the workplace was perceived as fundamental to employee H&S behaviors. Overall, participants declared that they value getting H&S training, but they might not comply with the suggestions at their workplaces or take the advice seriously.

If workers accept as a general rule that they have to get updated, then they will look for a new technique. Like other science, you have to learn to update yourself if you are a teacher for example.

Experiencing pain was the element most likely to make workers diligent about H&S. However, young participants did not take H&S training as seriously as experienced workers or participants in middle-age did. In summary, experience, pain and injury history, and level of education all impacted whether participants took training seriously.

Irrelevant or poorly thought out training distracted workers. They preferred more interactive training with colorful pictures, video clips, and follow up sections or regular H&S meetings.

Supervisors were the people whose suggestions were most likely to be taken seriously by workers. Furthermore, young participants stated that when they noticed their managers or their supervisors' compliance with H&S, they were encouraged to follow their H&S instructions.

Particularly about MSD, participants believed there was a lack of knowledge, and recognized the need for training about how MSD could develop, especially linked to their everyday tasks. Plus, they mentioned the lack of information about where, from whom, and in which circumstances to claim support for MSD since it develops gradually. According to Ali,

When you are working, always you notice something is not working well, something is wrong but it is your feeling, and you don't have any idea what is that because you don't have the knowledge, or you are so busy to put enough attention there. I noticed that there is something wrong that no one using the table, but I wasn't that attentive or aware to think about why and what can be the solution. It seems you know, and at the same time, you don't know.

Mitte said:

You feel it is not comfortable to do it in that way, but you do not take it seriously. You are not that educated to understand that it is going to be problematic in the long run. I have more information today after you directed me towards the topic about how it can impact our body in the long term.

Newcomers tend to work faster since they have feelings that they are judged to be and their anxiousness unconsciously stimulates them to work faster. Working fast gives them some sense of fulfillment but in the long run, the stress of working like that makes them burn out.

"You want to try to do your best, you feel you are behind... I work too fast and I hate to work slowly, I feel I am behind and I have to finish everything to feel relaxed... otherwise I feel my downward situation coming from my negligence.

Maher acknowledged that:

It depends on how your supervisor convinces you about the hazard situation. If you do not have the training, then you do not know how to work properly, and you can cause harm and damages to worker health and also to the company. So, it's good to have knowledge before doing anything. At work, we are working as a team, and others' behaviors impact your behavior too. It's encouraging if they are complying with health and safety. For example, when it is necessary, they can give advice and stop me from doing something wrong.

Among the things recognized as contributing to a healthier workplace are regular job rotations, having access to H&S documents on rules and regulations relevant to everyday tasks and

responsibilities, receiving more concentrated and pertinent training, seeing demonstrations of successful and unsuccessful examples rather than many scattered H&S topics, regular reminders to take work easier and not put too much pressure on oneself,. These last two points were particularly important for newcomers as they tend to think they are behind other workers.

Chapter 6: Discussion

This pilot study aimed to test and investigate the effectiveness of a brief and simple educational message given to recently relocated Syrian-refugee laborers. To mitigate WMSDs and to control the MMH characteristics of physically demanding occupations, a conceptual knowledge was developed, based on the heuristic concept, to improve awareness of LBP risks and prevention. Syrian refugees, as a target population in this research, were chosen intentionally for their high probability of being exposed to MSD hazards. They notably experience unique characteristics from their relocations and trauma, their probable lower educational opportunities either before or after immigration, and typically low English literacy levels. As a consequence, they face a strong likelihood of ending up in physically demanding occupations or in precarious job positions, which usually feature little to no access to safety resources. They thus comprise a useful target population for this study on WMSDs. Furthermore, including refugee workers in the process of investigating MSD risks is appropriate, given they are directly exposed to many hazards, so the research findings will be applicable to them, and information on the feasibility of the knowledge-transfer prevention strategy takes into consideration their experiences and circumstances.

The results illustrate that a brief educational message that carries the main risk factors for LBP effectively influences participants' ability to identify WMSD hazards in the directions expected. Additional to the VH factor, other risk factors of developing LBP were also utilized in the survey, to provide us with further background from study participants' general knowledge. Other risk factors, including lifting\lowering objects, objects' weight (light, medium, and heavy), how they are held (grasp), whether twisting is involved, and horizontal distance (horizontal location and travel distance) (Teichner & Olson, 1971), were also explored.

Each of the three sets of investigations included the following:

- 1) General understanding of LBP risk factors
- 2) Message efficacy
 - Knowledge transfer
 - Simplicity
 - Effectiveness
- 3) Barriers that impact participants' MSDs development
 - Personal and institutional barriers

6.1 Risk Perception

Next, the list of hypotheses is explained briefly, with the overall results about which lifting risk factors study participants perceived to be hazardous.

6.1.1 Vertical Height (VH)

Hypothesis 1: It is expected that vertical height will have an impact on participants' perceived risk.

Videos that show people lifting objects from closer to the ground have a higher rating score than ones lifting objects at a higher level (i.e., waist). Both the pre-test and post-test video ranking of risk perception was significantly affected as the VH increased. Any lifting that originated below knee height was seen to be riskier than lifting that occurred above that level. The hypothesis that participants would perceive VH as a risk factor has been confirmed, and this finding is similar to the results of the study conducted by Ngo (2015).

Overall, VH from calf-to-waist received the highest risk score in the rating pre-test. Calf-to-waist was followed by floor-to-waist, floor-to-floor, and knee-to-waist in the risk ranking, which implies that the VH of lifting is definitely perceived as a risk factor. After receiving the educational message, VH risk awareness increased based on the results of the average mean for Likert scale rating. Even though in the pre-test, it was found that participants already considered VH as a risk factor, their awareness increased markedly after they received the simple message in the post-test. One fact supporting this finding is the 4% decrease in the mean score of the Likert scale rating for lifting from waist-to-waist, which became statistically significant between the pre and post-testing.

Participants' perceptions about their training/message differed from one to another. The interviews revealed that each participant was differently influenced by the educational message content and the interviewer's explanation. This result reflects those of Haslam (2002), who also found that in some cases and circumstances, people may fail to properly identify the hazardous situation or understand the transferred knowledge even though all receive the same training (Haslam, 2002).

For example, many participants did not perceive lifting light objects from ground level or near

ground level to be risky at all; VH interactions with very light objects is, in fact, associated with much different risk perception than heavier ones. Even though results from the quantitative study support that VH was a definite perceived risk factor throughout the course of the training, the interviews and field notes reflect a different opinion. Most participants, even after persuasive conversations, were quite unwilling to regard light lifting as risky, particularly those participants with a very low level of education and experience. The study has made it very evident that demographic background, cognitive abilities, educational achievement, and work experience all affect how individuals perceive risks perception, a finding supported by Robson et al. (2010).

Some participants claimed that their workplace was regulated based on the rule “store it off the floor” (instead, put everything on a shelf), but were often confused about its main intention or had forgotten earlier explanations. Was it imposed for hygiene (6 inches off the floor for food hygiene) and ease of cleaning, or for back safety? However, most found it useless if it was supposed to prevent or lessen LBP. Participants did not find any differences between the strain of lifting objects from calf level or from the floor.

Interestingly, participants initially ranked floor-to-floor lifting fourth (the mean average) in riskiness, and even with some training on the associated risks their mean average reranked it only to second place. Based on Merryweather and Bloswick's 2013 study, longer lifting duration would appear to be twice as risky as shorter-duration lifting, that is, floor-to-floor lifting takes longer than floor-to-waist lifting. As a consequence, there is greater risk of LBP, but participants did not make that connection and perceive the risk (Greenland, Merryweather, & Bloswick, 2013). Participants' perceptions differed entirely based on their individual experience. Most did not consider floor-to-floor lifting as risky since the video recorded tasks performed while sitting on the ground, and they perceived them as easy. On the other hand, those who did work sitting on the ground, such as farmworkers or floor-installers, saw floor-to-floor lifting as one of the riskiest undertakings and all experienced LBP after working for a while, and in fact, had to change jobs because of it.

Even before they received the training message, participants agreed lifting from lower heights to be risky, with a higher chance of developing injuries. This finding is supported by work by Callaghan & McGill in 2001, in which spinal flexion was determined to cause spinal compression and shear, and that compression and shear steadily increase as the VH of objects are

lifted increases. A study conducted by Marras et al., 1995, also suggests that decreasing VH minimizes the amount of lumbar spine flexion when lifting objects (Marras et al., 1995; Callaghan & McGill, 2001; Hoozemans et al., 2008).

Part of the content of the simple message “*the closer your hand to the ground*” developed by researchers has tried to convey the exact concept that Callaghan & McGill (2001) explained in their results; the potential for LB injuries increases when objects are lifted from closer to the ground, and the risk associated with VH is a continuous variable. Attempts have been made to more precisely describe safe lifting parameters in terms that the average worker can relate to and understand.

Russel et al. suggested that participants would be more comfortable with the concept of Threshold Limit Values (TLVs) for understanding the idea of lifting from a different VH. Based on the TLVs idea, but in less abstract terms, VH has been categorized by physical regions such as the knees, calves, and waist, a more useful approach than trying to visualize the whole possible lifting distances as one continuous space (B. Ngo, 2015; Russell, Winnemuller, Camp, & Johnson, 2007). As we aimed to achieve the highest delivery and acceptance of our training message, VH was broken down into the above regions (B. Ngo, 2015; Russell et al., 2007). Conversely, interviewed participants acknowledged that they were happy and comfortable using the terms “objects as much as closer to the ground,” rather than using the threshold concept. Some participants also found “the lower their hands are to the ground” to be useful for recognizing hazardous postures related to VH.

6.1.2 Lifting vs. Lowering

Hypothesis 2: Lifting vs. lowering will make no difference in participants' perceived risk.

The unexpected finding from this section was that participants perceived lifting objects to be 50 percent riskier than lowering them. This hypothesis is thus rejected, and the finding is compatible with results from Ngo, 2015. When this unanticipated result was investigated during interview data collection, participants reasoned that they have to invest more energy when they are lifting objects as they must overcome gravity (Seay, Sauer, Frykman, & Roy, 2013).

Lowering involves different muscle operations; muscle elongation happens in lowering task compared to lifting, in which muscle shortening occurs (Davis, 1996). Lowering produces more

compression but less anterior-posterior spinal shear as both compression and anterior-posterior spinal shear have equivalent force. Increase in compression is influenced more by the type of task (lifting/lowering) rather than by increasing the weight of the load by 9.1 kg and the compression and shear counterbalance each other; increase compression and decrease shear (Davis, 1996).

Investigation of the spinal load force per unit moment has found that lowering produces less compression and shear per moment than lifting. This difference in perceived compression made participants use a variety of techniques when they were lifting that they felt they did not need when lowering. A study based on assessing the gross kinematics of lifting conducted by Lariviere et al. found that lifting and lowering have similar LB kinematics but more effect on the hips, knees, and ankles (Larivière, Gagnon, & Loisel, 2002).

Another study found that most people usually use similar strategies when lowering objects but a variety of techniques for lifting. Using different techniques in lifting may come from their notion that they need to overcome the effects of gravity (Seay et al., 2013). Overcoming gravity was study participants' reasoning behind their higher Likert scores and perceiving lowering as comparatively less risky.

Lifting and lowering have received a balanced risk association based on biomechanical evidence, supporting the conclusion that an increase in compression and decrease in shear when lowering objects trade off against each other, and make lowering as risky a job as lifting. Furthermore, 52% of the MMH tasks in the industry studied consisted of lowering, whereas only 32% involved lifting (Davis, 1996). This trend emphasizes the need to enhance workers' knowledge so that they do not underestimate the risks of lowering tasks in the workplace.

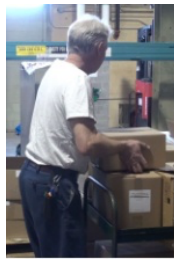
6.1.3 Asymmetric Lifts

Hypothesis 3: Asymmetry (twisting vs. sagittal-plane lifts) is expected to influence participants' risk perception. Videos that show twisting while lifting are expected to be rated as demonstrating greater risk.

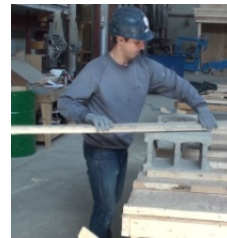
Lifting while twisting was perceived as riskier than sagittal-plane lifts. It is worth noting that as VH increased, risk perception also steadily increased. Interestingly participants, even those with only low levels of education, identified lifting while twisting to be risky, a finding similar to

Ngo's (2015). According to interview data, participants' reasons for judging twisting while lifting to be a risk factor for LBP is compatible with the scientific justification. Based on NIOSH variable tests, twisting while lifting, for all VH variables, is riskier than sagittal plane lifts (Ngo, 2015). Overall, twisting was perceived to be significantly more hazardous than sagittal lifting, except for the waist-to-waist category. In interviews, participants noted that they ranked sagittal lifting from waist-to-waist as riskier than twist lifting only because the worker in the video clip was senior. Otherwise, for all other categories, they perceived significantly higher risk when the lifting involved twisting than when it did not **Error! Reference source not found.**

Waist-to-waist
lifting comparing
sagittal vs. twisting



(a)



(b)

Figure 6-1: Comparing sagittal vs. twisting waist-to-waist lifting. Sagittal lifting (a) perceived as riskier than twist lifting (b) due to the workers' age difference.

6.1.4 Good and Poor Coupling

Hypothesis 4: Lifting poorly coupled objects will be rated riskier than lifting well-coupled ones.

Lifting with good coupling was perceived as less risky than lifting objects with poor coupling for all three categories of VH (FW, FF, WW) at medium weight. Poor coupling seems to just slightly affect risk perception (by 9% compared to good coupling), and it was only tested for medium-weight lifts. In the qualitative investigation, it appeared that participants did not differentiate between lifting well- and poorly coupled objects when they were ranking these tasks.

6.1.5 Repetitive Lifts

Hypothesis 5: Videos that illustrate repetitive tasks will be rated higher than their single lift counterparts.

Repetitive lifting was perceived as significantly risky, except for floor-to-floor tasks. Single lifting from floor-to-floor was perceived as riskier than counterpart repetitive tasks. The

hypothesis is thus accepted. The average Likert scale ratings for medium weight lifts in the three VH category combinations increased in total by %16. The cumulative features of MMH rise as the speed of lifting decreases (longer duration of lifting), and as a result, there is more risk of LB injury (van Dieën, Hoozemans, & Toussaint, 1999).

One interesting explanation mined from the interviews illustrated that most participants do not perceive repetitive lifting in a sitting posture as arduous. Some of the repetitive tasks in videos were performed only in sitting posture. Some participants thought that the repetitive lifts from floor-to-floor were not risky due to the sitting position of the operator. To them, it seemed that the task was not lifting objects but merely moving them around, which was considered to be easier than lifting an object from the floor, standing, and again bending to place the object Figure 6-2. However, participants who had experience of working in a sitting position, such as harvest laborers, rated such tasks as very risky. Tile-installers and crop-harvesters who usually worked in sitting posture strongly believed that lifting objects from floor-to-floor could eventually lead to LBP. These participants rated video clips in which objects were lifted floor-to-floor as riskier than did inexperienced participants. For instance, Maher asserted that he quit his job as a tile-installer after six months due to LBP, and his physician informed him that he could not continue in that line of work for long as he would end up with serious back injuries.

Height Combination

Single

Repeated

Floor to Floor

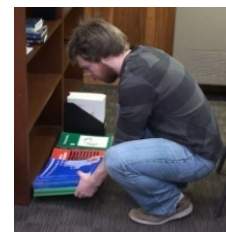


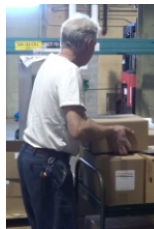
Figure 6-2: Some of the repetitive tasks in videos were performed only in sitting posture. Some participants thought that the repetitive lifts from floor-to-floor were not risky due to the sitting position of the operator.

6.1.6 Lifting Along with Horizontal Distance

Hypothesis 6: Lifting with horizontal reach (objects need to move away from body) will be rated higher than lifting objects that are close to the body.

Unexpectedly, lifting with horizontal distance was perceived as less risky than lifting objects close to the body, in contrast to Ngo's findings. Video clips in which the distance between the worker's body and the objects' being lifted was 2 feet/60 cm were intentionally chosen so that participants could clearly see that detail. However, participants asserted that they were not influenced by the extreme posture induced by the horizontal distance. Interview data also illustrated that participants were more concerned about the fact that the lifter was older than the difficulty of the lift. In fact, they allocated a higher Likert score for near lifting than for lifts involving reaching, in waist-to-waist VH Figure 6-3.

Waist-to-Waist lifting for near and far distance (horizontal distance)



(a)



(b)

Figure 6-3: Lifting waist-to-waist for near and far distance (hands closer to vs. hands far from the body)

Floor-to-floor far and near distance also had an unexpected result. Lifts requiring horizontal reach were perceived as less risky. Participants claimed that lifting objects from the floor, standing up, and placing them back on the floor was more dangerous than sitting on the floor while lifting objects from one place to another at floor level without standing. Again, only participants with experience of working in a sitting position perceived it to be hazardous; otherwise, people did not take sitting and lifting objects to be risky at all Figure 6-4.

In reality, prolonged sitting forces the muscles to hold stable the trunk, neck and shoulders (Eu, 2019). This limitation in movement squeezes the blood vessels in the muscles, decreasing blood flow to the operating muscles at a time when it is needed. An insufficient blood supply causes fatigue and makes the muscles susceptible to injury. Prolonged limited movement, as when a worker must stay in one position for extended periods, contributes to injuries in the regions of the body handling the movement: the muscles, bones, tendons and ligaments. Another factor is the chronic, localized tension in certain parts of the body, most commonly the neck and lower back (Cashman, 2010). Limited body movement increases the likelihood that muscles will pull, cramp, or strain when stretched suddenly, and fatigue occurs due to the reduced blood supply, high tension, and compression on the spinal discs. Compression on the spinal discs affects their intake of nutrition and contributes to their premature degeneration (Canadian Centre for

Occupational Health and Safety, 2011).

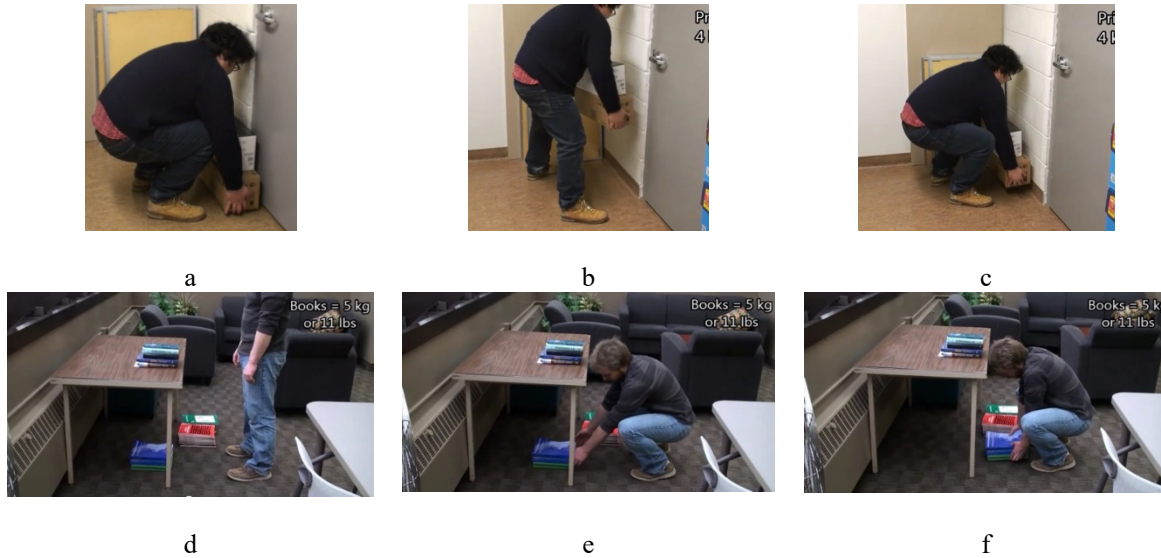


Figure 6-4: Floor to floor far distance lifting as illustrated in the picture (a) participants lift the objects, stands (b), and sit again to leave the objects on the floor. Picture (d), (e), and (f) illustrates how participants do the lifting in a prolonged sitting position.

6.1.7 Lifting Technique

Hypothesis 7: Videos showing workers stooping to lift objects will be perceived as riskier than squat lifts.

Lifting using a stooping posture was perceived as significantly riskier than squatting lifts. This hypothesis is thus accepted. Interestingly, participants strongly believed that the squat technique diminished the risk of LBP. They had challenges in understanding and accepting the educational message since it conflicted with their previous knowledge about proper lifting. This finding supports Robson et al. (2010), who noted that workplace experience and background can cause understandings different from the training (Robson et al., 2010).

Squat lifting, based on Straker's (2003) definition, is lifting where the knees bend slightly at an angle greater than 135° (L. M. Straker, 2003). This technique was strongly supported by participants, who claimed that it is the best way to lift an object from the floor, particularly if the lifter does not have knee complications. Stoop lifting from floor-to-waist was perceived as the riskiest option, with a mean of 6.62 (± 2.31) and a %29 increase in risk perception for the same VH task comparison.

Evidence regarding the squat technique is in fact, unclear, with some debate about whether it is a proper lifting technique or not. Squat lifting is hard for people who have a high body mass due to the pressure that it causes on participants' cardiovascular systems. However, Bazrgari et al. (2006) recommended utilizing the squat technique, a suggestion established on the results from a novel kinematics-based quasi-static model (Bazrgari, Shirazi-Adl, & Arjmand, 2006). Based on the findings, the use of squat lifting techniques has been encouraged. Findings support the characteristics of nonlinear passive ligament forces, muscle wrapping, and muscle forces, and meanwhile, the squat technique reduces net moments, muscle forces, and internal spinal loading, which supports their arguments.

On the other hand, a review of the biomechanical literature found that both techniques involve the same intradiscal pressure and spinal shrinkage trigger. While the spinal shear and moments may be lower in the squat technique, the moments and compression are higher, so there is no clear advantage for either technique (van Dieën et al., 1999). Thus, individual studies do not contribute sufficient evidence for practice and policy changes promoting one technique over the other (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012).

There is a strong belief among participants that squat lifting is the only proper technique, but this viewpoint seems to be at odds with many expressed in the literature. The impression is that the evidence in the literature has not been transmitted or understood successfully by the general population. Or perhaps, the knowledge has not been successfully translated from scientific language into a more accessible form (Grimshaw et al., 2012). Prior studies have certainly noted the importance of educating workers in general lifting guidelines, but more clearly needs to be done.

Interestingly all participants believed that using the squat technique would diminish their risk of LBP, and they were highly resistant to the educational message since it conflicted with their previous knowledge about proper lifting. Participants wanted more-detailed explanations for the following part of the message "Even when lifting light objects, you can hurt your back. There is no "best" way to lift things from the ground, so to stop that problem altogether, 'Store it off the floor!'" When they were asked for their opinion about the message, their perceptions differed from what was in the message. Participants admitted that they did not believe "There is no "best" way to lift things from the ground," and they had been informed before that there are ways of

lifting (squat technique) that would help protect their LB.

6.1.8 Weight of Objects

Hypothesis 8: Videos showing lifting of heavier objects will receive higher ratings of perceived risk.

Lifting heavier objects was perceived as riskier and rated higher than lifting lighter objects. This fact was true for all VH combinations and steadily increased as VH increased. These results are compatible with findings reported in the literature: the biomechanical risk of lifting increases as objects get heavier due to the increase in muscle activity, compression and LB moments (W S Marras et al., 2006; McGill, 1997). Interestingly most participants claimed that they perceived weight as a greater risk factor for LBP than VH, and as long as the weight was light, they perceive lifting as not a risky task even from the floor. Even though the educational message content had been thoroughly explained, they did not believe that lifting light objects (e.g., a pillow) from the floor could lead to LBP.

The weight of a load is one of the main risk factors for MMH tasks; however, in a study conducted by McGill, (1997), it was shown with the existence of a threshold weight, the positions of the load and body must also be factored in to calculations of risk, rather than just the weight. Careful positioning of both the load and body can effectively moderate low back injury risk, since most pressure on the spine results from the lifter's trunk and upper limb (Hoozemans, Kingma, de Vries, & van Dieën, 2008). In a study investigating the VH of lifting and load mass on the LB, similar shear values resulted from a load of 7.5 to 15 kg depending on how the handling height of the objects was manipulated. Handling heights ranging from 0.32 m to 1.55 m were used to categorize four ranges with significant effects on three low back loads (moment, compression, and shear) (B. Ngo, 2015).

6.2 Message Efficacy

Hypothesis 9: The message increased risk awareness regarding LBP whenever VH was characterized as part of completing a task. Increasing the VH corresponded to the video Likert scale being rated higher when pre-test to post-tests were compared.

Participants perceived lifting objects in different VH categories for an average of weights (light,

medium, heavy) riskier in the post rather than pre-test, with an increase in mean average ranging from 13% to 35%. Surprisingly, lifting objects waist-to-waist, from pre- to post-test, saw changes towards less risk perception by -4%, which supports participants' awareness of the transferred knowledge. From floor-to-waist lifting tasks were perceived as riskiest in the post-test. The main objective of the intervention was to convey that the VH is the main risk factor for LBP, and that reducing lifts height towards the waist would lessen other risk factors that cause LBP. Results from the survey data analysis support that the simple message successfully improved participants' work-related LBP risk awareness. However, lifting light objects from the floor was an exception and was not perceived as risky. Another interesting point is that participants did believe that lifting objects (medium to heavy) from the floor might eventually lead to LBP. Similarly, they did not believe that the squat technique is not helpful, as explained earlier.

In an attempt to reduce work-related LBP risk, many suggestions and MSD regulations could be implemented. However, regardless of whether a job's demands are considered in relation to MSD principles, and training is devised relevant to protect workers' risk of LBP, evidence illustrates that workers may fail to change the way they lift or understand the MSD knowledge, ultimately diminish the intended benefits of any applied interventions (Beach, Stankovic, Carnegie, Micay, & Frost, 2018). So far, the data from the survey supports the efficacy of using a simple educational message for worker training, but it does not reveal other variables that may impact workers' understanding—and acceptance--of the message content. Also, it has not revealed other considerations that may impact workers' understanding of and compliance with H&S/MSD training, especially when the unpredictable nature of work environments influences them. For example, in the interviews and field notes, it has been found that participants do not recognize lifting light objects from the floor to be risky at all regardless of what they have been told during training.

Initially, the simplicity of the message was investigated, and results support that the message was perceived to be simple and brief. Participants acknowledged that its simplicity made the topic straightforward and easy to follow as it did not cause any distraction with the unnecessary provision of information. The efficacy of the message content; however, remained controversial due to participants' previous experience, state of knowledge, and perceptions.

Interestingly, as discussed before, identifying VH as a risk factor for LBP when lifting light objects was uncommon, regardless of what participants had read in the message and the interviewer's attempt at explaining the topic. Participants did not believe that lifting light objects from the floor would hurt their LB. Moreover, participants did believe that lifting objects (medium to heavy) from the floor may eventually lead to LBP, but they did not believe that the squat technique is not helpful. They felt that lifting objects with the squat technique would provide security from hurting the LB.

Participants' different interpretations from the message resulted from their previous knowledge or how they had been instructed to behave at their workplace to maintain safety. Since they had never received any cautions about lifting light objects, they were difficult to convince that lifting even light objects over time could hurt their LB (resilience to accepting new ideas). Furthermore, believing in the squat technique conflicted with their ability to assimilate the new message.

So far, the study's findings suggest that success in transferring a simple written knowledge strongly depends on participants' correct understanding of the concepts involved. Conveying to participants why specific instructions would help limit the effects of hazards they are exposed to (e.g., the amount of cumulative strain on the LB) has been found to be one effective way to reduce complications and improve workers' understanding and consequently their commitment to received instructions.

As hypothesized, the educational message had significant effects on participants' Likert scale rating of risk perception as a result of improvements in risk identification and awareness. The message generally was found more effective if adjustment was applied to its associated verbal instruction so as to target participants' presumptions. Results specifically suggest that educational message content such as "there is no best way of lifting..." are unlikely to elicit the desired impact on participants. Participants' previous knowledge about proper lifting and their strong belief that the squat technique is the best way to lift objects make their understanding of the subject of interest complicated. These finding underlines that in developing a simple educational message, researchers should consider other factors that constrain the transfer of knowledge.

If the message is well thought out and procedure of transferring knowledge are carefully implemented, participants should easily understand the principles. Plus, retraining to counter

previous incorrect or outdated knowledge would help them to better understand the right rationale why lifting from the floor could lead to LBP. So far, the only emphasis was on the notion of knowledge transfer, making sure that participants understood the concept, and the clarity of the simple message approach. This finding supports evidence from previous observations conducted by Beach et al. (2018), suggesting that clear verbal instruction can eventually influence people towards desired behaviors and may be used as an approach to regulating biomechanical exposure and promoting healthier behaviors (Beach et al., 2018).

The complex nature of LBP development and causation necessitates that any intervention and H&S management approaches cover a variety of influential factors. This could include the use of instruction, and providing participants with feedback (Beach et al., 2018). Therefore, similarly, these participants through the interview investigation, were asked about their understanding and their explanations of how they perceived the transferred knowledge through their own words to interviewers and how they think the message might be useful in their everyday life. Interestingly, participants' responses differed about what they perceived the researcher's aim to be, and that was an enlightening moment in the research that stressed the need to seek clarity and not make assumptions about their understanding.

From the findings in this part of investigation, it appears that participants needed a more interactive approach, with some discussion the topic of interest to make sure their questions were answered and the topic was clear. Most participants required examples of how the message could be applicable in a real work environment. Plus, they wanted encouragement and reasons to learn about the topic. They wanted to know why they needed this instruction and how it would help them at their workplace. One reason they felt disconnected from the material and unmotivated to learn about it was that they had been recruited for the study from a variety of fields, some of which did not involve much lifting but were more concerned with hygiene rules for example.

The heuristic concept that was developed in the 1970s and 80s by psychologist Amos Tversky and Daniel Kahneman postulated that human decision-making and problem-solving operate within "bounded rationality." Based on their discussion, this concept better relates to situations where individuals look for solutions or judgments that are appropriate enough for their situations but are also brief and optimized (Tversky & Kahneman, 1974). Regarding to this study's participants, it is worth taking into consideration that these participants were not necessarily

looking for the type of solution that we offered them. As a consequence, they were not curious about any solutions being “fast and frugal” even though this concept has the capacity to largely correct and reduce cognitive bias when different factors are interacting. As Tversky and Kahneman explained, the interaction of different cognitive elements makes decision making not very straightforward, and it is usually complicated to find the best choice (Gigerenzer et al., 1999). Thus, we could not expect to see optimal results of our intervention since most of these participants had had different careers and jobs previously, and had experienced a variety of H&S concerns.

After we disseminated the message, those in retail and SBs easily found the connection between the knowledge and the physical demands of their workplaces. Other participants, particularly those in large corporations, had difficulty picturing the practices in their work environment. Their workplace featured more-hazardous situations, and they dealt with many circumstances in which they had to prevent incidents and accidents. So obviously, H&S regarding the cumulative triggers of MSD were not regarded seriously. This fact may emphasize the fact that developing MSD is not generally regarded as of immediate concern in large industries by workers, as much more serious injuries are more likely. Workers therefore downplay and even ignore the lesser concerns. Providing detailed instructions, plus examples of how the message could be applicable in their environment and everyday lives, might have brought the material alive to a wider range of workers, by making it seem relevant to them. Additionally, a deeper level of interaction, in which workers had a chance to talk and think up examples from their own lives, tended to stimulate buy-in, or at least interest.

Interestingly, young participants were the least likely to believe the educational message or take it seriously. Young participants also were found to rate all risk factors as less risky compared to middle-aged or experienced participants (having five years or more work experience). United States Bureau of Labor statistics from 2015 illustrate that less injuries are reported among the older worker population than the younger (Bureau-of-Labor-Statistics, 2015). For example, in the construction industry, the number of injuries reported compared to length of service with the same employer seems problematic (Alwasel et al., 2019). Workers with less than three months service made up 15% of injuries compared to the workers with 1-5 years services with 34% of the injuries, and the numbers dramatically decreased to 26.5% for workers with over 5 years of services (Bureau-of-Labor-Statistics, 2015). Furthermore, experienced workers with health

issues required more time for recovery (Silverstein 2008). These findings are problematic in view of the general shortage of workers, which is compounded by the number of first baby boomer reaching retirement age (Statistics Canada 2011). The result will be jobs being filled with younger workers who tend to work less unsafely (Alwasel, Abdel-Rahman, Haas, & Lee, 2017).

The educational message instructions were not expected to immediately elicit the maximum effect on workers' hazard identification and awareness we hoped ultimately to achieve. We were aware that we would have to bring up other influential factors, including participant's ability to understand the message from the written text; whether it reminded them of their previous experience, injury history and pain; their knowledge backgrounds; individual enthusiasm for learning about and protecting their general health, and the topic's relevancy to their everyday activities, plus the role of interviewers in disseminating the topic.

6.3 Personal and institutional barriers toward H&S training

A series of barriers increased the likely development of MSDs in some participants. These barriers were divided under two main themes-- personal and institutional--to better explain the findings.

6.3.1 Personal barriers

Lack of knowledge undermining MSDs development.

The initial phase of MSD prevention is to verify that workers are aware of MSD hazards (Yazdani and Wells 2018). Personal barriers in this study initially primarily involved participants' lack of MSD knowledge. Whenever they were asked about H&S/MSD concerns, their replies focused only on accidents, injuries, mental pressure, hygiene, and above all, customer service. No participants had even heard about MSD. Many suffered or knew someone who suffered from work-related MSD pain (after it had been thoroughly explained what MSD is), but they were unable to determine the causes without help. For example, Ali stated that:

I see that people are getting unable to continue their career [due to pain] but I don't know how they could have stopped [the condition's] development from the beginning.

Many participants just ignore the pain caused by MSDs, or are slow to recognize it as a potentially long-term problem since in the early stages it subsides with rest. Their pain usually ends up becoming chronic, by which time, they are pessimistic about recovering. The chronic pain of MSDs, interestingly, is usually taken as a natural procedure of “aging,” “tiredness,” “illnesses,” and a “common workplace trend,” and therefore not preventable.

Similarly, our findings suggest that participants who are in physically demanding positions and whose families have always been in such positions have no expectations of occupational health interventions, believing that what they experience is the norm in physically demanding jobs; thus, they consider MSD development to be natural and inevitable, and accept their situation and the fact that one day they will experience disability. Covering this point, Sharifa said:

What is the choice... we are labor and hoping when get old, our kids would take care of us like what we did [for our elders]?

Clearly, training, knowledge, and advisory support promote H&S practices, whereas a lack of awareness impedes them. To implement an MSD strategy, workers’ knowledge and comprehension of the implemented strategy must be taken into account if researchers are to devise ways of effectively educating them on workplace safety (Beach et al., 2018; Yazdani & Wells, 2018).

H&S is not taken as part of the job responsibility.

Participants asserted that workers in the Canadian workplace have different attitudes towards H&S compared to what participants experienced before. Interestingly compliance with H&S/MSD advice and instruction were not taken as part of their job responsibilities, and they considered them to be as source of extra effort and useless. They believed that they were paid to “get the job done.” They perceived that managers were not really concerned about H&S/MSD compliance, particularly when it related to workers’ health. Avoiding an accident seemed to be the priority rather than cumulative trauma disorders. Some participants asserted that in Syria, people generally do not pay attention to H&S, and they consider it somehow a waste of time and just a small portion of the formal procedures of work. Worker culture establishes the habit for an organization, particularly if a specific population is in the majority. A negative perception can impair the effectiveness of the best programs, policies, and services, even though they were intended to support the workforce and workplaces (Canadian Centre for Occupational Health and

Safety, 2011).

Lack of confidence inhibits sharing MSD concerns.

Participants acknowledged that they are not confident about sharing information about their MSDs (stigma). Plus, MSD grow gradually without any sign that others can see, and usually their development is an accepted fact. Participants believed that their managers, particularly in SBs, would regard them sharing any MSD concerns as a complaint about their situation. They were unwilling to risk losing their job through looking for assistance and advice. Some participants, on the other hand, could give no explanation for why they did not want to share their MSD concerns.

Working hard due to cultural norm is an approach to showing appreciation.

These workers held the idea that they put more pressure on themselves than what was expected because their cultural norm required them to show their appreciation and capability. This pressure made them tired and slack about following H&S/MSD details. Hajar believed similarly; however, she later noticed that some managers and co-workers did not appreciate this kind of behavior from workers. She said, in Syria, your managers and co-workers appreciate it if you complete your tasks and go even further than what you have been asked to do without looking for their permission. But here in Canada, managers do not expect workers to do something that they have not been requested to do.

The perceptions, apprehensions, and attitudes of workers have been shown to affect MSD interventions by provoking situations in which workers put pressure on themselves (Yazdani & Wells, 2018). For example, in this study, it has been found that participants overload themselves to prove their capability. Some participants believed that they were demonstrating their core values, such as being capable of doing many tasks, being hard-workers, and being able to cover long hours in the absence of others.

They claimed that sometimes this perception pushed them to work too hard and put unreasonable pressure on themselves to illustrate their capabilities and get promoted. As a result, it became a drawback to their health and wellbeing. Plus, failure to receive promotion or praise for this behavior (personally-mediated racism) caused these workers bitterness over time, and even made them careless about their H&S.

Personal barriers including 1) lack of MSD knowledge and understanding of its causes; 2) considering work-related chronic pain as a natural phenomenon to be expected from their job; 3) pain as a natural part of aging; 4) working hard to prove their capability and appreciation; and 5) not considering H&S as part of jobs' main responsibilities and finding it useless were all factors that contributed to participants' MSD development.

6.3.2 Institutional Barriers

Discussions with Syrian participants provided a notion of how they perceive institutional pressures that contribute to their likelihood of developing MSDs. In fact, the prevention of MSD is a challenging issue. The first steps in overcoming barriers to MSD prevention should start with researchers understanding how front-line workers experience knowledge exchange, which has been the focus of this study.

The attitudes of managers/owners in SBs can alter the whole H&S/MSD system in their organization.

Some participants mentioned that many managers have a strong desire to control what workers are doing and to limit their autonomy. This micromanagement makes workers frustrated, and propels employees to work harder and faster; thus, they do not have enough energy and enthusiasm to care about their H&S. This situation, claimed several participants, caused them excessive fatigue. Some participants even got instructions for every single detail, such as where and how to spend their break time. They found themselves more tired and stressed than usual. These workers believed that this way of controlling people and micromanagement is common in SBs that are operated following attitudes that do not align with mainstream Canadian workplace culture. Many of these employers are in fact immigrants themselves, and are perceived as following norms from their countries of origin. Lack of time and fatigue as a result of managers' pressure to speed up the workplace were the reason that participants failed to comply with H&S/MSD advice. These results further support the idea of Yazdani and Wells (2018) that lack of time due to managers' pressure to boost productivity should be considered an important general H&S issue related to small to medium-size enterprises (Yazdani & Wells, 2018).

Workers' lack of self-efficacy due to managers' resistance, indifference, or lack of knowledge about the need to inform workers about their rights was another finding. Some participants

believe that their managers do not want to educate workers on their rights since it might interfere with their profits. Similarly, participants were usually not informed of who was supposed to be in charge of assisting them regarding their H&S requests in SBs; in fact, usually the family physician was their resource. Experienced participants who had worked longer in Canada acknowledged that, initially, they were unaware of many soft skills and workplace culture, uneducated about their rights, and very insecure. A study conducted by Premji et al. (2014) noted that the self-esteem of immigrants was affected by the hardships and frequent setbacks they had experienced in gaining employment, and linked their early work experience in Canada to multiple physical health problems anecdotally, including chronic musculoskeletal disorders--the subject of our interest (Premji, Shakya, Spasevski, Merolli, & Athar, 1969).

Participants claimed that they were insecure and uninformed about opening up and seeking support in the workplace, and in consequence, afraid of losing their low wage positions. Most participants believe that immigrants and refugees are always vulnerable to job loss and other stressors and so hardly ever stand up for themselves in their first years of work in Canada. They usually tolerate problematic workplace situations, employer misbehavior, and missing H&S training since they find it hard to explain themselves or understand the topic entirely. Some also reported that supervisors looked down on them in front of others whenever they have asked for help. These participants considered themselves lucky just to have a job, as it is hard to get employment as a new immigrant without any Canadian work experience and references. Participants felt grateful to be employed, and their only concern was to keep themselves in work. They felt they did not at this point have the luxury to object to poor workplace conditions.

Respondents reported that managers and coworkers may not perceive refugee workers as competent or capable of offering H&S advice or are justified in complaining about a bad situation. As a consequence, their requests were often not listened to or given proper consideration. Some participants had the notion that refugees are expected to be grateful just to be here, whatever they experience in the workplace. Five participants acknowledged that it is true that refugees like themselves were initially excited and grateful about ending up in Canada and being hired. They still usually try to illustrate their positive feelings and express how thankful they are, but that does not mean everything is perfect. However, they are sometimes afraid of complaining in case they are seen as ungrateful.

As mentioned, participants claimed that they sensed a huge difference in management approaches in multicultural management environments when the managers were also a recent or non-recent immigrant. They believed that management in big corporations would operate based on Canadian H&S standards and would have preferred to be in such workplaces. SB managements were seen as inferior, most being immigrants, and possibly not trained or interested in H&S. Only a few participants found managers of SBs to be professional in their performance and expectations. Overall, they claimed that managers in SBs are less educated, their behaviors seemed less professional, and they were less organized to carry out regular H&S training.

Workers in SBs have stated that managers rarely, or even never, speak of H&S, offer little guidance, and structure the workplace for safe work. Even if they do initially mention H&S to new workers, there are no regular reminders, reinforcement, or retraining to instill careful habits in the workers. This ignorance creates a culture that does not focus on H&S; in fact, workers were often not aware of this topic. Similarly, Yazdani and Wells (2019) regard training to be an essential approach to preventing back injuries, and that reinforcement of H&S messaging is key to workers long-term retention of prior training knowledge. A scoping review by Yazdani and Wells (2018) acknowledged that improving knowledge through comprehensive training is best paired with teaching about an MSD intervention's effects (Yazdani & Wells, 2018). Overall, as study findings indicate, just spreading a simple educational message may not be a sufficient to promote injury prevention in SBs; management also needs to buy in to the value of workplace safety. Managers rarely revisit workers' H&S instructions, even in the deal case where previous H&S training has occurred.

The consistency of H&S application and implementation seems imperative, as workers execute tasks and follow behaviors based on what managers emphasize. Participants in SBs acknowledged that managers did not pay consistent attention to H&S. Sometimes they came with some advice, but commonly they did not look that attentive, and their focus usually is on business success, with the only prioritized value being customer service. Some managers have been found to be unaware of even their own H&S. Sharifa asserted that people who are in her workplace (a bakery), both workers and managers coming from other countries, often were not trained to take their H&S seriously and, as a result, she wondered how workers could be expected to receive the H&S advice.

Negative attitudes were reported by participants when H&S information was accompanied by signing papers. When workers were asked to sign papers confirming that they had received H&S information, their attitude was that the employer's priority was simply to cover themselves legally in case problems arose that might leave them open to liability. Little attention was given to whether participants actually understood what they were signing off on. Participants believed that dissemination of preventative MSDs information through passing out papers with a few unclear pictures, followed by a short informative meeting without any examples was ineffective. Usually, just a few common slogans were used to jog workers' memories about H&S; more attention was paid to reminders related to economic growth rather than workers' wellbeing. Participants' negative perception of H&S were thus commonly rooted in what was viewed as an unpleasant and uncaring approach of supervisors.

Some participants in larger corporations also complained about H&S in their workplaces. Workers claimed that they received and had to sign many black and white papers or do online training modules advising them about H&S without any interactive instruction. Again, it is assumed that managers want to inform workers and get their signature to protect the company from financial or legal consequences, and not necessarily because they care about workers' health. While supervisors and managers were identified in the hierarchy of those responsible for arranging to inform workers about H&S, it was suggested that a third party might be more effective in spreading H&S knowledge in its initial phase. Later, managers' emphasis on H&S was found to be essential. Young participants have asserted that they considered managers as role models in persuading them to comply with H&S. For example, Hajar did not believe that managers care for the workers' H&S; their concern was only collecting evidence to avoid responsibility in the case of injuries. On the other hand, Maher observed that his managers were more responsible, as they seemed more considerate and concerned. A possible way to overcome the institutional barriers interconnected with managers' performance might be to emphasize the importance of integrating MSD prevention into management systems and their H&S considerations, such as in an integration strategy explained by Yazdani et al. (2015 a,b).

Lack of environmental support and training for H&S

Generally, most participants were on the same page regarding H&S environmental support in the following details. H&S advice needs to be supported cooperatively by managers and co-workers.

Usually managers only spread some idea of H&S to workers but are neither consistent nor regular in their instruction. Their major focus and most of their attention goes toward customer service and business success, which is indeed also the primary focus of workers themselves. The workers were almost all unaware of their potential for injury unless the tasks they were doing were particularly difficult or challenging. Thus, they tended not to anticipate problems or associate eventual pain with minor seemingly easy actions, even when these actions were repetitive over long periods. The unanticipated nature of their health problems was not surprising, since none of them seemed to focus on their H&S status and link their everyday tasks to any health decline. They generally accepted health problems as a natural feature of life and aging.

Half of the participants in SBs declared that they find it hard to gain managers' support regarding requests for extra days off. Hajar stated that she would be more confident if someone in authority would clearly indicate that workers should not wait to request days off until their health concerns became severe. Mostly workers' reluctance to ask for days off came from managers who had treated them unpleasantly and left the workers afraid of losing their job. Another group of participants mentioned that immigrant workers in low wage occupations usually have a low level of English literacy. Any training they received about H&S was through written documents, online training, or common slogans. The written documents were usually not understood by them, and pictures were also not clear. Hajar advised that workers usually could not read or understand this disseminated content. Tekla et al. (2010) noted that workplace methods regarding H&S improvement should be simple to understand, practical, and engaging. As many scholars describe ergonomics as too complicated for lay people to understand, increasing awareness of it among unskilled laborers requires well-thought out and specifically designed interactive training and tools.

Common slogans were the typical practice used to disseminate H&S and customer service information in SB workplaces. These common phrases are short and are usually utilized to improve workplace productivity, either by promoting business success or H&S. Participants, even those with poor English skills, found it easy to recall these messages, largely because they were not only short, but striking, and conveyed more detail than was held in the words alone. For instance, "First you" meant that your health is the priority, claimed Hajar. However, many of the short messages mentioned by participants were not complied with as they seemed positive in

their content. As the approach utilized in this study was to evaluate the efficacy of educating workers with a simple message, it is important to take this finding into consideration. Of interest is how other simple messages that have already been developed consciously or unconsciously in workplaces impact workers' behavior. However, the positive point is whether participants remember these short slogans and act upon them. For example, when Maher was asked to consider the value of our transferred knowledge, he said:

Your message is not useful for my case, in my work our only concern is hygiene and protecting our skin, but all the time [manager] remind us "work slow but safe."

Other participants' concern about H&S/MSD accommodations included: 1) not getting a response from supervisors to their requests for safety PPE; 2) not being comfortable about asking for help when needed, and so putting more pressure on their body; 3) not being allowed to register for other training or certification except the ones that the corporation offered (in large companies); 4) being pushed to work faster and for longer hours; 5) not getting respect from the owner of the business and being closely monitored; 6) being pushed to use and buy the store's own products as part of their wage; 7) not clearly informed about their promotion opportunities and often as a result working hard to show their capability but with no reward. The feature of non-standard work arrangements is that there is no expectation of permanent positions no matter how well workers perform (Howard, 2017), while these types of employment comes with the loss of standard arrangements for workers' access to legal protection and social benefits (Friedman, 2014). Participants pushed themselves hard to show their capabilities and appreciation and often developed MSDs and unhealthy behaviors while hoping for promotions that never came. At the very least, these newcomers should have been informed clearly from the beginning about the way things work.

Sharing MSD pain only with co-workers is common but excludes those in the authority who could make changes.

Participants acknowledged that they rarely shared details regarding their MSD pain with the H&S department or managers, even though they routinely discussed it with each other. Some participants mentioned that they found it vital to share their H&S concerns with the right person and probably would be preventable. Partially this behavior may come from workers' attitudes of not taking MSDs development to be a serious topic to share with managers, as well as managers

seeming to have the same attitudes, a type of workplace climate that developed gradually. For example, Sapid explained her experience as

When I had pain in my wrist, and I used carpal tunnel brace, I noticed other coworkers had the same problem...as we all carried clothes in the store but they never reported that [they all have wrist problems]... it is common workers know many things but they don't have the habit to let the managers know, particularly health concerns; they only share sometimes together.

Immigrants are the compliant workforce in precarious workplaces either from workers feeling insecure about holding their jobs or employers' perspectives as were felt by participants

Feeling insecure about holding precarious jobs, which are usually low-income, without security and opportunity for any growth, makes participants accept any circumstances. Even though most participants' employment was lower than their expectations, they were insecure about keeping themselves employed. Due to this belief, they worked harder, and complaining about a lack of H&S regulations was not viewed as an option. Participants' insecurity justified them staying in a precarious work environment while experiencing both mental (e.g., manager disrespect) and physical stressors.

Participants employed in SBs or service industries in precarious positions believed that the labor force for these industries consisted of newcomers and refugees. They claimed that their job was not a place that native people would endure. No one needed certificates for such employment; however, they got the positions since they looked more capable and healthier than other candidates. Even though their roles were lower than their expectations, they were insecure about keeping themselves employed there. Due to this belief, they worked harder regardless of potential health complications and usually did not bother employers with complaints about H&S requirements. They also strongly believed that since the nature of their jobs was physical, managers wanted only strong and healthy people. Thus, they tried to hide their pain and concerns. Hajar acknowledged that when you are working in a workplace whose primary concern is to get the job done and work as fast as possible, and the aim is to hire fewer people, it is only natural that H&S concerns will be ignored. They only care if staff shortages threaten their ability to get work done. Supporting this idea Bahar said that:

My sister gets aborted her baby when she was at work. Next time when she got pregnant, they found and asked her to leave the job while her Dr. permitted her to work, so for long time she was depressed and hopeless since she was in

pressure in her private life and she needed a job.

Participants' basis for why they accept precarious positions is initially their financial constraints: supporting their family, creating a transfer path to a better career, and gaining Canadian work experience to get decent reference letters or get promoted gradually. Among these participants, three left their precarious occupation due to health concerns that caused long days-off. Otherwise, other participants (eight) continued working in physically demanding jobs for at least two years. Participants continued to work in precarious work until they became confident enough to leave their job and look for other positions. Later, these participants overall transitioning was claimed as an improvement regarding their feeling of receiving respect from the managers and having control over their situation (self-efficacy), yet these participants' career transitions were not considered progress concerning wages or the level of the occupation (still physically demanding with MMH characteristics, part-time, etc.). Sharifa, Bahar, and Maher complained that they worked illegally at the beginning to handle their financial constraints. These participants quit the job since it was physically heavy, and they ended up having pain for a long time and not being able to continue their careers. They had no benefits, sub-minimum wages for Sharifa (female), and only minimal safety standards, and workers performed tasks without proper equipment.

Interestingly, male participants did not mention any details regarding the topic of management misbehavior. Still, all of the female participants did; consequently, after expanding the coding and interview questions, in further interviews, we asked the rest of the participants about managers' roles. None of the participants reported issues like racism or pressures that they might experience in a hierarchy. However, most female participants voluntarily declared that they had experienced pressure from their managers. Participants found tension in the form of being looked down on, pushed to work harder, being asked to take long shifts with no opportunity of full-time employment, all of which impacted their health in general. Only one female was full-time; while all interviewed males were.

The impact of racist experiences on racialized people and their health is evident (Nestel, 2012; Okechukwu, Souza, Davis, & de Castro, 2014). Self-reported poor health and the experience or perception of racism strongly linked in many works of literature and strongly supported by statistically significant associations clearly illustrate how racism produces physiological responses leading to increased cardiovascular, endocrinal, neurological, or immunological

diseases (Nestel, 2012; Okechukwu et al., 2014). For one example, there is the “healthy immigrant effect,” which emphasizes the better health among new immigrants, in general, compared to their Canadian-born counterparts, but which worsens after their arrival (Subedi & Rosenberg, 2014). Premji et al., (2014) emphasized the role of employment situations as contributing to this deterioration, explaining how being trapped in precarious employment leads to damage to the mental and physical health of racialized immigrant and refugees (Premji et al., 1969).

Researchers from the Employment Conditions Knowledge Network, established under the umbrella of the World Health Organization, have gathered compelling evidence revealing how workers in precarious employment and vulnerable working situations are at increased risk for cardiovascular, musculoskeletal, respiratory, mental health, and chronic illnesses (Premji et al., 1969). Looking to the levels of racism and how they are experienced among racialized populations may be explained by studying participants’ claims and experiences during their economic transitions.

A theoretical framework guided by Jones, (2000) better illustrates the three levels of racism: institutionalized, personally mediated, and internalized (Jones, 2000). In the context of Canadian society and the Canadian self-perceptions that are strongly practiced to create the appearance of an equitable society, it is vital to effectively reveal the cause and circumstances of situations that cause racism and consequently the development of health disparities (Nestel, 2012).

Institutionalized racism includes unequal and limited access to services (e.g., health care facilities) and opportunities (e.g., low-wage labor) (Molina & James, 2016). This type of racism is sometimes legalized and displayed as perceived disadvantages. Institutionalized racism presents itself in terms of material conditions (e.g., sound housing, gainful employment) and access to power. Take one of the barriers toward getting into occupations as a challenge that incoming refugees confront. They do not have Canadian work experience, and lack reference letter, and due to a limited social support system (Wayne & Michelynn, 2014), many end up in precarious positions because they have no other choice except enduring and accepting any work environment due to their limited professional network (Wayne & Michelynn, 2014); as was Alisha’s experience: “I am doing a job that is fit for someone like a technician not for me with MSc degree, but at least I got a job which is not labor.”

Personally-mediated racism is characterized as intentional or unintentional discriminatory acts upon people of a particular race through negative interpersonal interactions and prejudice (Chelsea McCann, 2018). For instance, in this study population, refugees and immigrants acknowledged that they were perceived by managers as lesser populations that should bear physically demanding work and be a compliant work-force.

Finally, internalized racism is a form of discrimination in which the members of the stigmatized race accept negative messages about their own intrinsic worth and end up not believing in themselves (Jones, 2000). Crucially, our study captures the participants belief that the precarious work environment is naturally the place that most immigrants end up, and that refugees and immigrants are the only populations that can endure such work conditions and accept its adverse impacts on health and the likelihood of becoming disabled.

All three forms of racism can impact the health of people, but can also have implications for diminished population-level health (Jones, 2000). Although it is vital to take into consideration all forms of racism to understand their potentially relative, additive, and/or synergistic influence on specific circumstances, we are limited in this study, as we focused on investigating factors contributing to work-related MSD development. Further study should investigate the role of racism intentionally or unintentionally in all three categories embedded in the Canadian multicultural precarious work environment.

Through the findings from study by Premji et al., 2014, precarious employment is not limited to newcomers, yet non-recent immigrants are also trapped in low paying precarious jobs with MMH characteristics, particularly female workers, even after living here for over ten years. Considering this trend steadily even a decade after relocating puts more emphasis on considering the overall health of works in vulnerable groups such refugees.

6.3.3 Limitations

The Syrian refugee data collection took place in person, since we did not expect many participants to have access to a pc or would not find it easy to do the survey on line. One of the limitations for this study was English literacy that was preferred for the interview part due to budget limitations regarding translation costs. Another limitation of the study was that findings were based on the perceptions of participants as there was no opportunity to observe behaviors

that are relevant to MSD development.

6.3.4 Future Work

The survey data in this study was collected one on one, and each participant was closely monitored by researchers. This close observation made clear that most participants were looking for some simple examples to see whether the message was pertinent to their everyday life. These participants were chosen randomly (Survey), and many could not find the connection between the message and the H&S in their work (for instance those for whom the main concern at their workplace was hygiene). So, they had challenges in picturing how the message regarding “stop lifting objects from the floor” would apply for them. As a result, participants required more explanation and guidance towards their received education regarding increasing the efficacy of the message if the survey were supposed to be collected in an online version.

The focus of this study was to assess and explore the MSD knowledge of recently relocated Syrian refugees, either working or not, and evaluate the success of a heuristic message for knowledge transfer. Thus, the study has been conducted without any assumption about what size of organization that would benefit from this approach, even though a research group at the University of Waterloo earlier had suggested that this intervention is suitable for SBs. In this study, again, it has been established that a simple educational message is an appropriate approach and more practical for SBs. Future work is suggested to explore and develop a series of simple contextual messages to implement in SBs, focusing on health issues specifically associated with each profession such as sales and services, packaging, sewing, bakeries, etc. Probably the development of a simple tool that could broaden the level of H&S knowledge of owners, managers, and workers with different culture and backgrounds would be most useful.

Furthermore, participants were informed that they would be questioned about LBP risk factors in their everyday tasks, and they found that the message focused only on the VH factor. Some participants were thus confused about other LBP risk factors that were not included, and to some extent they lost their faith regarding the validity of the message. They perceived that other risk factors had been ignored and were not considered part of the risk, which was confusing. To overcome this challenge, participants needed to be provided with more background information, and more details about why research has illustrated that there is not any best way for lifting

objects. After this confusion has been dealt with it the time to focus on the short message content. Probably the background information (“there is no best way of lifting”) should not have been included as part of a simple educational message as it seemed confusing. So, the message should be kept as simple as “store it off the floor”, but supporting background information is necessary, which was missing from the survey.

Pursuing the objectives of this study, an explanatory sequential mixed method was utilized. Usually this kind of study starts with a quantitative first step, followed by a qualitative part; usually a strong initial quantitative start is mixed with a comparatively small sample size for the interviews. So, as a result, this research may not meet the saturation concept that places limitations on interpreting qualitative results and generalizing the outcomes (Spencer, Ritchie, Lewis, & Dillon, 2003). Overcoming this limitation probably requires a stronger qualitative study design.

Overall, the study has illustrated the benefits of using a mixed methods approach to evaluate an MSD intervention. Future studies on immigrants and refugees affected by work-related MSD may reflect the development and validation of an instrument to measure personal and institutional barriers to MSD improvement with the goal of pinpointing specific areas for intervention.

Chapter 7: Conclusions

The objective of this dissertation was to investigate recently relocated Syrian refugees into Canada on their work-related MSD hazard awareness. A simple educational approach as an intervention was examined to identify its capacity in improving workers' abilities to recognize lifting situations that would put them at risk for low back injury or LBP.

The study participants were mostly able to identify LBP-associated risks, including vertical height, horizontal distance, weight, twisting, coupling, and repetitive task except for lifting and lowering. These results were evident either before or after receiving the intervention. Lowering objects were not perceived as much as lifting as a risky task and participants did not recognize the hazards of lowering objects as much as the lifting. Biomechanical as well as epidemiology studies provide evidence that lifting and lowering objects are equivalent in risk so participants underestimated the risks of lowering tasks. This result may emphasize the need to enhance workers' knowledge so that they do not underestimate the risks of lowering tasks in the workplace. The lifting light objects from ground were not perceived risky at all as well and probably the same attempt regarding increase the awareness may advocate to take strain of repetitive tasks more seriously as it was not the focus for the most participants.

Regarding message efficacy, it cannot be expected that the educational message instructions alone will immediately elicit our maximum planned effect on workers' hazard identification and awareness without taking into account other influential factors. Factors that impacted the efficacy of the message included participant's ability to understand the simple message (either written or symbolized) thoroughly; the linkage of the message to workers own experiences or the tasks that they perform; sufficient and correct knowledge of the topic; workers willingness to learn and protect their general health; and the role of facilitators. Therefore, in future interventions it would be advisable to consider:

- Verbal communication and pictorial instruction after the training or disseminating of H&S knowledge to keep workers more engaged in the process of knowledge transfer (this approach have been already implemented in an updated version of Ontario's MSD Prevention Guideline focusing on "work shouldn't hurt").

- Holding regular H&S meetings to create more attention on the topic of H&S and providing regular updates to encourage continual engagement of workers and management.
- Workers' and managers' background knowledge should be updated whenever new evidence is available; older ideas such as the value of back-belts and lifting techniques should be addressed so that the workers' knowledge is concordant with the educational messages.
- Colloquial phrases that commonly used by workers or managers can be targeted to polish and establish a healthy culture in SBs supporting the effectiveness of the heuristic concept.

Concerning MSD development, due to the usual gradual onset of symptoms in the early stages, alongside the study participants' general lack of knowledge, it is not considered a serious health concern. Many accept MSD development as a natural part of the work experience, and thus inevitable. Most participants do not expect that on and off pain one day may result in work disability. Participants in this study who suffer from chronic pain also did not have hope that their condition would improve. And even at the onset of pain, if they believe that it could make them disabled, they do not have enough knowledge to pinpoint the cause and may not understand how to protect themselves or that rules exist that are meant to help them.

Syrian participants from their point of view had brought the notion of how institutional and personal barriers underlines their MSD development in their employment transitions. Prevention of MSD is a challenging issue, and steps to promote it should start with helping frontline workers that they are expected to receive appropriate protection from MSDs in their work environment.

Generally, participants have been found to be lax about protecting themselves from work related hazards when embraced with the interaction of other workplace and personal factors. These influential considerations included environmental factors (e.g., managers' attitude on focusing only on customer service or incident and accident prevention), workers' own employment transitions and being in a survival economic situation, relocation pressures altogether, and discrimination embedded in workplace structures and culture.

Particularly vulnerable participants were those who were unexperienced, uneducated (not trained), and those with limited social support and language efficacy. This was especially true for

those either men or women who are young and women who may have had the role of caregiver pre-migration and do not have exposure to a working environment. Other general factors also interfere with their interest in their work H&S, including, illiteracy (which prevents them seeking clarification at work), lack of cultural competency (e.g., workers own belief that H&S is not taken as a part of their job responsibility), pressure to support their family (as a reason not to make their own H&S a priority for the time being), and other psychosocial factors that inhibit them from caring for their own health conditions.

- Accordingly, workers age, work experience, and already developed MSD pain; managers' general approach and attitudes about H&S, were the factors that participants acknowledged as impacting their understanding about H&S.
- Participants in large organizations took H&S advice more seriously when they experienced dangerous incidents or accidents, and those in retail industries paid attention when H&S was linked to customer service. As for MSDs, they tended to ignore or trivialize them since they do not initially recognize the hazards or outcomes and perceive the early stages of pain as a symptom of fatigue which is associated with the nature of their work.
- Employers should be informed and directed about the attitude of caring for H&S and express this care to the workers so as to develop a culture of H&S. Focusing employer and employee's attention on this fact would be a positive incentive to persuade workers to take care of their own H&S and the H&S of all workers.
- Often scientific advice-givers (mediators) are sources of reliable information that workers trust over the advice given by managers. Using H&S practitioners to expand and develop H&S instruction and wisdom in SBs may be an effective way to approach workers and persuade them to comply with H&S regulations and advice. Managers were considered as role models in persuading workers particularly those new to work environment to comply with H&S.

Utilizing the mixed method approach and triangulation of the data from multiple data sources contributed to an understanding of the complex topic of work-related MSD development among Syrian refugees in the context of occupational transition in the host country.

Overall, the study has illustrated the benefits of using a mixed methods approach to evaluate an

ergonomic intervention. Future studies on immigrants and refugees affected by WMSD may reflect the development and validation of an instrument to measure personal and institutional barriers to MSD improvement with the goal of pinpointing specific areas for intervention.

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Appendix A: Refugees

Target Audience Belief System

Ethnography exploration illustrate that refugees from developing countries may carry a belief system differ than the natives. Their perception and belief system may influence their occupational mobility and work environment H&S perception. For example, people from low class belief that their occupational improvement is restricted due to the hierarchical belief system. From the gender difference perspectives, women usually experience controlling relationship and vulnerable to experience excessive workloads of *double day* based on traditional gender ideology as a homemaker; working outside and homemakers in a same time (Oxman-Martinez et al., 2005; Reid & LeDrew, 2013). This section of literature review covers the possibilities of existence belief system of immigrants and refugees that might impact on their risk perception.

Traditional Gender Ideology and Occupational Opportunity

Refugee women have often declared experience of sexual abuse, abduction, and being in an abusive or controlling relationship yet after resettlement (Oxman-Martinez et al., 2005). Experiencing traditional gender ideologies *double day* as a homemaker and in a same time working outside is common acceptance believe (Oxman-Martinez et al., 2005) that makes them more overwhelm and expose to greater stress and MSDs development due to fatigue and repetitive nature of home chores. They are vulnerable due to what they experienced in accepting job with low wages and more workloads. Reid and LeDrew (2013), studied South Asian immigrants in British Columbia, and noticed that women in this population inclined to worked in unskilled occupations due to their overwhelmingly homemakers' responsibilities (Reid & LeDrew, 2013).

Promoting Immigrants' Occupational H&S Knowledge

Many refugees in Canada are coming from low-income countries including Syria, Afghanistan, Iraq; Africa; the Democratic Republic of the Congo; and Somalia. Data on the prevalence of

MSD have been considerably collected only in western countries in several decades. For instance, many epidemiological studies of low-back pain (LBP) are mostly restricted to high-income countries with just less than 15% of the world population (Habib, Hamdan, Nuwayhid, Odaymat, & Campbell, 2006). In low-income countries, for the majority of the population, 80% to 90%, labor work entailing heavy tasks are the only occupational options (Habib et al., 2006). Whereas the occupational health, particularly small businesses occupations with manual material handling characteristics, remains neglected in developing countries for its challenge when it comes to practical implementation of knowledge and sciences and sometimes because science should be applied in another context (Habib et al., 2006). Occupational health and safety findings usually are not practically implemented in developing countries, and this makes many workers unaware of how protecting themselves at workplaces (Nuwayhid, 2004).

Moreover, many researchers advise that an occupational health sponsors in developing countries should be constructed based on their social context, if they want to achieve progress in promoting their occupational health (Nuwayhid, 2004). Occupational health history in the United States have been illustrated that occupational health progress is not linear and has been influenced with many factors than events only inside of the work sites (Nuwayhid, 2004). Social movements and changes in the delivery of health care and perception of health among population of interest are influential factors (Nuwayhid, 2004) that should take into consideration for the developed countries that refugees are going to be relocated and employed there.

Refugees and Canada's Intake

A refugee, as defined by the United Nation Convention, is someone who:

“Owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group, or political opinion, is outside the country of his nationality, and is unable to or, owing to such fear, is unwilling to avail himself of the protection of that country” (UN General Assembly, 1951).

Under this definition, each year Canada accepts about 25,000 refugees from the global total of over 21 million in 2015 (Society & Houle, 2019). With this number, Canada is following the Organization for Economic Co-operation and Development (OCDE) with 36-member countries in the number of refugee acceptance. Through the UNHCR promise, 107,100 refugees from 84

countries resettled to another 36 countries in 2015. The Canadian government accepted 25,000, whereas the United States took, overall, triple that amount; however, the United States intake is only half that of Canada based on national population (Society & Houle, 2019). One refugee for every 2,000 people is the intake proportion for Canadian government compared to 30 and 20 for Sweden and Austria respectively (Redditt, Janakiram, Graziano, & Rashid, 2015). Australia and Norway took 9,400 and 2,400 each, respectively close to the Canadian intake on a per capita basis, and a total of 85 percent of the UNHCR's submissions relocated (UNHCR, 2016).

The Middle East region, including Syria, Afghanistan, and Iraq; Africa; the Democratic Republic of the Congo; and Somalia were where most refugees came from. The Canadian government has emphasized the Syrian refugee crisis, and so continuously updates refugees' accommodation policies in comparison to other OCED countries. In 2015, Canada accepted the following: economic class 62%, family reunification 25%, and refugees just 9% (Landau & Achiume, 2017). The refugee intake rate of one-third of the reunification class and 14 percent of the economic class illustrates the difference in intakes between classes.

The expansion of refugee programs and increased engagement of Canada's new liberal government and their commitment the resettlement of 25,000 Syrian refugees near the beginning 2016 and 46,700 by the end of 2016 are the incentives for targeting this population for investigation. Up to now, the breakdown by categories comprised 21,876 Syrian refugees who were Government-assisted, 3,931 individuals who were Blended Visa Office-Referred, and 14,274 Private Sponsor refugees in January 29th, 2017 (Elgersma, 2015).

Refugee Acceptance Programs

Canada accepts refugees through three different programs developed by the Immigration, Refugee, and Citizenship Canada department (Immigration, 2016a). The federal Citizenship and Immigration Canada department have designed their programs based on recommendations from the UN Refugee Agency in Canada (UNHCR) for supplying potential applicants (Taylor et al., 2016). These programs, which differ mainly in the support and services provided, are the Government-assisted Refugee (GAR) and Private Sponsorship of Refugees (PSR) programs (Wilkinson & Garcea, 2017).

The GAR Program provides support with Federal Government funding. Income support may be

provided to help with basic needs at the beginning and one year of income support for 12 months or less and can be extended for 36 months in some cases, after arriving in Canada until they become independent (self-sufficient) (Oxman-Martinez et al., 2005). The federal governments provide all financial support in the GAR program such as, accommodation, clothing, food, help for employment and connecting to other settlement and community programs. Generally, this financial support lasts only one year and is intended to cover the period of getting reestablished in a new life (CIC, 2016b).

The Private Sponsorship of Refugees (PSR) program, in contrast to the GAR program, supports not only refugees in conventional abroad class but also the country of asylum class. All financial support has been committed through private sponsorships (CIC, 2016b). Sponsorships can come from incorporate organizations such as Sponsorship Agreement Holders (SAHs), Community Sponsors (CSs), Groups of Five (G5), Constituent groups (CGS). All these sponsoring groups have the responsibility of providing the cost of day to day living expenses, helping refugees with finding family physicians and dentists, school enrollment of children, introducing them to the similar community and families and helping them in their search for employment (CIC, 2016b).

The main categories of private sponsorship groups are briefly explained below:

- Sponsorship Agreement Holders (SAHs) include organizations such as religious, ethno-cultural groups or humanitarian organizations that signed a formal document of sponsorship agreement with Immigration, Refugee and Citizenship Canada (IRCC).
- Community Groups (CSs) comprise of for-profit/not-for-profit, incorporated/non-incorporated organizations aiming to support the refugees. CGS can sponsor under the SAHs' agreement. These organizations located in the same communities that plan for resettling the refugees for making organizations more responsible for their support. Their financial and settlement plan must align with the established funding level. They have to ascertain that their applicants have identified as a refugee by the UNHCR.
- Groups of five (G5) includes a group of more than five individuals with Canadian citizenship or permanent residence status in the same community of resettlement, guarantee to sponsor the refugee for supporting their requirements.
- Blended Visa Office-Referred (BVOR) program is blended resettlement between Government of Canada and Private sponsors. The refugees that were identified by the

UNHCR get their support financially up to six months from government and next six months by private sponsors.

Settlement and Integration

There are programs that available to all categories of immigrants, and attempt to accelerate their social and economic integration (Béchar, 2012). Information and orientation services, which is a commonly used program, offers:

- Orientation to Canada and communities that newcomers are living in.
- Language training; for the purpose of social, educational and employment assistance.
- Employment related programs; learning about workplace culture, job searching and resume preparation, interview preparation, developing work skills (work related skill augmentation), health and safety training and certification (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, Riziki, et al., 2017).

Theoretically, only eligible refugees, not those who are waiting for their refugee-claimant or asylum-seeker status to be confirmed, can use these programs from the time of being permanent residents until citizenship is achieved. However, in practice high demand for these services, lack access to enough childcare services to give refugee's parents sufficient free time, and scheduling conflicts between service hours and work are likely to minimize individuals' accessing these services (WSIB, 2013).

Only 58 per cent of Syrian refugees have a high school diploma or higher educational degree (IRCC, 2016), which can pose problems related to Canadian workplace knowledge requirements (Wilkinson & Garcea, 2017). Refugees are more likely than other groups of newcomers to arrive without adequate job skills for the Canadian labor market (Wilkinson & Garcea, 2017). Even though longitudinal research on 608 Southeast Asian refugees in Toronto has suggested that within five years after arrival, most illiterate and uneducated incomers can find work, this work tend to be precarious and minimum wage (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, Riziki, et al., 2017). To facilitate refugees' transition to the Canadian knowledge-based economy (employment), the federal government provides one-year financial support; however, the crucial time is when their income support ends or is insufficient and income from work is a necessity.

Appendix B: Target Population Employment Overview

Data regarding the refugee labor-market integration is limited and often outdated (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, Riziki, et al., 2017). Furthermore, researchers often do not differentiate between different classes of immigrants in their collected data sets. The last Longitudinal National Survey of Immigrants to Canada (LSIC), completed in 2004, was on immigrants who arrived in Canada between 2000 and 2001. In 2003, statistics Canada illustrated that refugees accounted only for 6 percent of immigrants, compare to the economics class for 67 percent of admitted applications (Chappell, 2003). These statistics illustrate that different groups of immigrants have a different rate of secure employment, and most categories have been more successful than the refugee one (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, Riziki, et al., 2017). The matching-skills-to-employment-position rate even for economic-class immigrants was only 50 percent, while this population has selected for their skills and are considering the most successful among all classes (Xue, 2008). Similarly, between 2008 and 2012, the Western Canadian Settlement survey surveyed immigrants and refugees in the four provinces, Manitoba, Saskatchewan, Alberta, and BC (Xue, 2008). Results from the few studies that focus on only refugees again showed that not only are refugees more likely to be unemployed than other immigrant classes but they are also more inclined to be in precarious employment positions, including part-time, contract and temporary jobs (Esses, Medianu, & Lawson, 2013). For example, in this population, only 25 percent successful refugees were ended up in precarious employment in contrast to 80 percent of secured permanent employment rate among economic immigrants.

Average annual income earnings for refugees are subpar compared to other immigrant classes (Wilkinson & Garcea, 2017). After a year, \$20,000 is their average annual income, whereas this number increased after five years to \$50,000 among economic classes (Wilkinson, Garcea, Bhattacharyya, Abdul-Karim, Riziki, et al., 2017). The lowest income bracket among refugee belongs to those in GARs, with \$18,000/year, five years after arrival and converging with PSRs after ten years still \$14,000 below their Canadian-born counterparts (Wilkinson & Garcea, 2017).

Five years after arrival, evidence shows that refugees are at a lower rate of employment than other immigrant equivalents (Bevelander & Pendakur, 2012). In fact, it takes between 12 to 15

years for refugees to get to the equivalent rates of income point as Canadian-born counterparts (Wilkinson & Garcea, 2017). Concerning the type of employment, as earlier mentioned immigrants are more inclined to be hired in temporary jobs (precarious employment) and employed in manual and mixed-manual occupations (Wilkinson & Garcea, 2017).

Investigating details of employment, particularly jobs with a higher chance that they ended up with can link us to predict what threatens refugees' health and well-being in their occupations. So far, works of literature suggest that refugees' underemployment is in MMH occupation; physically demanding jobs that makes them at the higher risk of developing Musculoskeletal Disorders (MSDs) (MacEachen et al., 2010a; Sienkiewicz et al., 2013).

Refugees' Employment Barriers

Most studies find evidence that entering the job market is more difficult for refugees than for other immigrant groups (P. M. Smith et al., 2009), largely because refugees' characteristics such as demographic and skills, the forced nature of their migration, and their traumatic experiences differ from those of other migrant groups (Codell et al., 2011).

Factors such as relocation (displacement) (Codell et al., 2011), age and sex (Mamgain & Collins, 2003), illiteracy, discrimination, language barriers (P. M. Smith et al., 2009), lack of Canadian experience, the vital role of settlement agencies and their follow up, cultural and economic pressure (due to leaving assets and belongings behind) add to the stress of employment transition (Codell et al., 2011).

Language Proficiency

One of the main predictors for employment integration is language comprehension (Codell et al., 2011; Sienkiewicz et al., 2013; P. M. Smith et al., 2009). Unlike other immigrants, refugees do not require assessment of their proficiency in one of Canadian official languages before their refugee claims are accepted. Only 30% of incoming refugees, and only 10% of Syrian refugees, arriving on the GARs program are proficient in speaking English; this is in comparison to other immigrants (economic class), of whom 80 % have English proficiency (Colic-Peisker and Tilbury 2007; Wilkinson and Garcea 2017; Hyndman, Payne, and Jimenez 2016).

Those individuals with lower English literacy are less likely to find employment. Moreover,

individuals with higher credentials but lower English proficiency are less desirable for employers than those with some English proficiency but weaker credentials and this is another reason that drive them to be hired in precarious positions (Sienkiewicz et al., 2013). Lower Language proficiency direct individuals to lower job quality and salary than to what they achieved in their home country, so many ends up in occupations for which they never trained. Formal education of refugees is closely connected to their language fluency after migration and higher chances of gaining employment (Government of Canada Publications, 2016). However, the case is worse among Syrian refugees; study among early Syrian refugee suggest that most only have a high school diploma, and low levels of English comprehension due to significant education disruption from the war, and the transitional period of their resettlement (Immigration, 2016b). Thus, it may take more time for their integration compared to other refugee groups and a longer period as labor before they gain higher level of occupation (Immigration, 2016b).

In a longitudinal cohort study of recent immigrants to Canada, Smith et. al. (2009) found that less proficiency at speaking English among refugee applicants led to a greater probability of employment in a physically demanding occupation 2 to 4 years after their occupational transitions (P. M. Smith et al., 2009). Prevention of workplace injuries among particular groups of new immigrants with poorer English skills requires greater attention particularly ending up with physically demanding occupations (P. M. Smith et al., 2009) make them a population at the highest risk of developing MSD (MacEachen et al., 2010).

Non-recognition of Foreign Credentials

Accessing jobs in line with foreign credentials necessitates recognition of immigrants' credential by employers in Canada, which can affect immigrants and refugee's economic integration (Sienkiewicz et al., 2013). Determining the equivalency of foreign credentials to Canadian standards is hard, specifically for this population due to circumstances such as lost documents and the closure of institutes in Syria (Sienkiewicz et al., 2013). Underutilization of immigrants' and refugees' skills in lost earnings is approximate to \$2 billion annually (Hartvigsen et al., 2018). The rate of credential recognition among refugees is just 15 percent in contrast, immigrants are comparatively more successful, at 51 percent (Houle & Yssaad, 2010). Substantial time and money are required for refugees who need to get their credentials and skills validated if they want to practice their occupation (Guo, 2009). Failure to meet Canadian

standards leads most refugees to pursue other employment, and 60 percent end up to the manual labor positions (Guo, 2009; Krahn, Derwing, Mulder, & Wilkinson, 2000). Not having Canadian work experience is another factor linked to diminished career opportunities and the delay of immigrants' economic integration (Guo, 2009).

Counterbalancing these barriers to new settlers' work, government educational-credential-assessment services and local licensing centers such as the Alliance of Credential Evaluation Service of Canada (ACESC) have been formed in several parts of Canada. However, due to the long process and in many cases the loss of documents or closure of institutions in the country of origin, many refugees are not able to get their credentials evaluated and suffer downward occupation mobility(Krahn et al., 2000).

Discrimination

Attitudes towards immigrants and refugees and their interaction into new society together with their other barriers explained earlier can deter refugees from better work integration from different stances. Discrimination can slow their success and occupational growth due to undervaluing their credential, minimize their capability of complying with Canadian rules, culture, and regulations due to isolation and not easily accepted at workplaces.

Employment discrimination can include negative attitudes towards newcomers' credentials (Hartvigsen et al., 2018), language comprehension, or employers may utilize regulations in labor market shelters (union, organizations) to deny immigrants' credentials and postpone the existence of positive employment outcomes (Hartvigsen et al., 2018). Statistics Canada's ethnic studies illustrate that being in a visible minority can increase the chance of experiencing racial discrimination within the workplace by up to 35 percent (Reitz and Banerjee, 2007). The immigrant's credentials are considered less valuable in the labor market since they are not labeled Canadian due to the split labor market theory (Buzdugan & Halli, 2009). The devaluation of and discrimination against immigrants and refugees' credential can be explained by the split labor market theory that divides the labor market between Canadian-born workers with higher wages and foreign-trained migrant workers with lower wages (Buzdugan & Halli, 2009).

Lack or delay of recognition of foreign credentials by professional organizations that regulate professions, and whose focus is on supporting local labor, prevent immigrants' entry into a

particular job market or push them towards secondary labor markets (Houle & Yssaad, 2010). The physically demanding feature of the secondary labor market, the shift toward lower levels of occupations demanding manual or mix-manual tasks, and being hired in several part-time positions make individuals at higher risk of experiencing MSD (MacEachen et al., 2010a).

Refugees have often experienced significant trauma, such as torture, sexual abuse, imprisonment, the death of closed relatives, and time spent in a refugee camp (Asgary and Segar, 2011). Long wait times for intake processing and difficulty in adjusting to a new society and social system subject them to additional stress. The rushed nature of their departure to an unknown environment, culture, language, norms, and behavior, plus being far from family and friends or loss of family, make them more vulnerable and prone to mental health disorders and depression (Asgary & Segar, 2018). A systematic review done by Rebelo, 2018 have suggests that the willingness of refugees in seeking help or social supports regarding to their health can be impaired through hostility and mistrust that can be developed in the host countries and societies and make these vulnerable population to have difficulties in requesting services or pursuing health advices (Rebelo, Fernández, & Achotegui, 2018). Pre-migration factors plus post-migration pressures, mainly in adult migrants can impair their employment integration and success either concerning their economic stances or healthily occupation.

Settlement Agencies Assistance

Settlement agencies assist refugees in socially and economically integrating into society and are funded by the federal government of Canada. They offer many programs to speed up employment integration, including assisting with resume writing, preparing them for job interviews, explaining the cultural expectations in Canadian workplaces, and job searching and referrals to potential employers (Kosny et al., 2012). Settlement agencies have limited funding in relation to the number of clients that they serve. This limited funding is only enough for directing individuals to a low-level job, not necessarily one aligned their skills and education (Kosny, Santos, & Reid, 2017). No follow up is done on their employment experience and outcomes, only tracking of their employment for completion of records (Kirmayer, Dandeneau, Marshall, Phillips, & Williamson, 2011).

A recent study on immigrants and refugees demonstrated that newcomers are reluctant to speak

up about their concerns such as about health and safety in the workplace, since they do not want to be perceived as ungrateful particularly among those that get their job through connections (Kosny et al., 2017). Evidence illustrates disconnections between programs offered by settlement agencies, and no regular series of sustained skills-development programs (Kosny et al., 2012). For example, some events and training related to licensing are offered just once a year, or as part of a program only held in big cities such as Toronto, ON. These one-offs, rather than continuous programs, minimize the chance of employment training and so worsening the cycle of low-skilled jobs, low wages, ending up with second labor market and higher reliance on provincial welfare in their transition “Month 13” and, for many, redoing their education.

When it comes to our population of interest, early outcome evaluations among Syrian refugees illustrate that refugees arriving through the GAR and PSR programs actively search for employment at the same rate. However, individuals under the PSR programs were more successful than GAR ones in obtaining secure work (Hyndman, 2011), respectively with 52.8 percent among 9,000 Syrian PSR refugees and a mere 9.7 percent among 15,000 Syrian GAR refugees being successful (IRCC, 2016). Typically, those who are sponsored under government-assisted programs have less education than those who are privately sponsored in Canada. Presumably, the success of those in the PSR programs in entering the labor market comes from their education level, financial constraints and as consequence they self-support themselves faster than other groups (Kosny et al., 2017). Another main reason can be the built network through the PSR program that can help these newcomers enter more quickly into the labor market; however, many of these positions are in the sales and services and transportation industries, with manual material handling characteristics—and no indication of matching positions with pre-migration skills or credentials.

Facilitating the relationship between settlement agencies and deskilled employment requires a systematic approach (Kosny et al. 2017) that adequately prepares refugees through language training, health and safety rights, training and knowledge, and tracking their progress (Hyndman & Giles, 2011).

Immigrants’ Employment Descriptions in Canada

In Canada, most precarious work which carried out by immigrants is characterized by low wages

and likely involves contract, part-time, temporary, seasonal work which lacks security and stability (Syed, 2016) Law Commission of Ontario, (LCO) 2012). Additionally, precarious work excludes bonuses, health, dental, maternity or paternity benefits and lacks associations with unions. In the late nineteenth and early twentieth centuries, contingent and precarious work was the norm among immigrants and research illustrates that immigrants in the later period experience more negative labor market outcomes than earlier migrants (P. M. Smith et al., 2009). Currently in large Canadian cities such as Great Toronto Area (GTA) and Hamilton, it is estimated that half of the workers are employed in precarious positions and many immigrants chose these big cities for its job opportunities (Lewchuk & Laflèche, 2014; Syed, 2016).

Appendix C: NIOSH Equation

The NIOSH Equation

The NIOSH lifting equation is a tool commonly used among ergonomists to calculate risk of MMH tasks (Yazdani et al., 2018). The components of NIOSH equation include a horizontal, vertical, vertical distance, asymmetry, frequency, and coupling components that are multiplied together with given factors to suggest a weight limit. A recommended weight limit has been used as the denominator for the load weight. This load weight can produce three lifting index value (LI) categorized into tasks including nominal risk ($LI < 1.0$), increased/medium risk ($1.0 < LI < 3.0$), or greatly increased/high risk ($LI > 3.0$) (Dempsey, McGorry, & Maynard, 2005).

Emphasis on Vertical Distance

The NIOSH equations (seven inputs) has a significant impact on LIs and illustrates the risk association. Three vertical components: vertical origin, destination, and distance are the vertical lifting height factors, and risk has been found to increase when lifting and lowering distance gets above or below the range of waist height (Elfeituri & Taboun, 2002).

The investigation has also found that lifts that start-off from the ground cause significantly higher compression and shear forces in the spine compared to lifts originated above the ground (Russell et al., 2007). Load weight is another factor, as it rises, increases the amount of risk, with a corresponding impact on the biomechanical, physiological and psychophysical aspects of lifting (Hoozemans et al., 2008). The maximum moment experienced in the low back increases when the horizontal length from a lifter to the object increases, which is another risk factor (Hoozemans et al., 2008).

Evidence illustrates that horizontal distance has a very significant impact on LBP and increases the risk factors in MMH and decreasing the horizontal distance of lifting can reduce significant risk factors (Hoozemans et al., 2008). Another input, lifting frequency and duration, also have shown a significant risk impact on lifting: plus, the cumulative physical and physiological strain increases as the lifts per minute/hour/day hikes (William S. Marras, Ferguson, Burr, Davis, & Gupta, 2005).

The solution for reducing this risk is to decrease the horizontal reach distance for any lifts (Elfeituri & Taboun, 2002). As the frequency of lifting per minute (e.g., 2 lift/minute of 2 hours per day) increases, the cumulative physical and physiological pressure on the body increases (William S. Marras et al., 2005). The angle between the sagittal plane of the lifter to the object can be measured as lifting asymmetry, also known twisting, which is another indication of risk as far as the angle increases (Elfeituri & Taboun, 2002). Quality in coupling can decrease risk and can be categorized into good, fair, and poor. Biomechanical studies have illustrated that spinal compression, shear, and moments significantly decreased when handles are introduced to box lifting (William S. Marras et al., 2005). However, coupling seems to be a more complex input that other factors such as grip friction, and comfort can have an impact on it when labeling lift coupling (Granata, Marras, & Davis, 1999).

Different hazard analysis tools have been developed that can be utilized in the design of manual material handling tasks. In this study, the 1991 revised NIOSH equation has been used as a model for creating video lifting instances by (K. J. Adams et al., 2010). The revised 1991 NIOSH equation is often selected as an analysis tool in MMH for investigating its' effectiveness and sensitivity compared to other tools such as Snook tables and 1981 NIOSH equation for its precision of identifying of high risk job but low and medium risk (B. P. T. Ngo et al., 2017).

Appendix D: Survey Questions Development

Overview of Lifting/Lowering Videos

The survey consisted of two groups of 44 questions, each question linked to ten-second videos of lifting instances (Ngo, 2015). The ten-second videos of lifting were captured from the posture in the frontal and sagittal planes, giving the audience enough posture analysis. Lifting as a large-scale work action can be properly captured by participants particularly when the lifting and lowering are happening in symmetrical postures (Ngo, 2015). Additional attention was paid when filming those tasks targeting twisting risk factor to ensure the motions were captured clearly.

Various factors of lifting instances were filmed and utilized in the survey (Table 2.1). Vertical origins and destination were categorized into 6 lifting heights (VH), while 8 different height combinations made lifting tasks more natural and less distinguishable from one another for participants. Videos of lifting variables were randomly ordered into a set of 44 questions for the pre-intervention part of video rating trials. The same videos of lifting variables but in a different order were utilized for post-intervention video rating trials. Lifting objects were categorized into 3 masses; light ($< 1 \text{ kg}/< 2.2 \text{ lbs.}$) (LIT), medium (3-10 kg/6.6-22 lbs.), or heavy ($> 15 \text{ kg}/33 \text{ lbs.}$) (HEV) (Snook & Ciriello, 1991). Everyday items such as lumber, coca, paper, and pillows were used in the lifting demonstrations in order to provide participants with an idea of heaviness. Moreover, the weight of each object was displayed in the video clips in pounds/kilograms as the default weight in the medium categories (B. Ngo, 2015).

Lifters used squat lift technique where it was needed except in one video that showed a stoop lift technique (STP) to offer participants an opening to comment on their understanding of proper and improper lifting methods. However, studies have illustrated that no single lifting technique is better than others among stooping, semi-squatting, and squatting when various criteria (such as, psychophysical, physiological, and biomechanical criteria) are examined (K. J. Adams et al., 2010; L. Straker, Burgess-Limerick, Pollock, & Egeskov, 2004). Each lifting stance was filmed in a natural workplace setting, where workers walked into frame, performed the task, and walked towards the next work duty. Any noises and sounds or other workers that could cause distractions were eliminated. Other environmental factors such as temperatures, lights, noises, and floor surface were kept simple so as not to distract participants from focusing on lifting

stances (B. Ngo, 2015). Davis et al. (1997) have investigated loud noises and their effects on spinal musculature and found that muscle activity can increase 1.5 times that in quiet conditions in some participants. Other non-lifting MMH tasks such as pulling, pushing, holding, carrying, walking, and climbing were kept to a minimum or did not account for more than %10 of total work energy (L. Straker et al., 2004; Waters et al., 1994). No sign of twisting was included except when a researcher attempted it. Lifting tasks were performed in standing and squatting postures, with stable objects (that did not vary in their center of mass during lifting activity) (Waters et al., 1994).

The NIOSH captured variables, see Appendix C for the details about the NIOSH variables and lifting equation, in videos were frequency (FREQ), horizontal (HORI), asymmetry (ASY), or coupling (CUP) (Ngo, 2015). The typical and default frequency of each lifting task was one lift within 10 second, and it was changed to approximately 8-second lifts per minutes by researchers. The typical horizontal distance for lifting was approximately 10 inches, but it was changed to a task requiring a reach of 20 inches or more (Ngo, 2015). A typical asymmetry angle is zero degrees, and based on the researcher's aims, tasks with at least 45 angle degree from the lifting subject's sagittal plane were captured. Coupling of the lifted objects also were categorized to a good as a typical and poor as a manipulated one or without handling. Lifting Videos. Forty-Four lifting tasks were filmed organized by factor (Table: 4-3).

Table 0-1: Lifting Videos. Forty-Four lifting tasks filmed organized by factor. Each cell represents one lifting trial unless otherwise specified. The lifting height combinations are from Calf-to-Waist (CW), Floor-to-Floor (FF), Floor-to-Shoulder (FS), Floor-to-Waist (FW), Knee-to-Waist (KW), Thigh-to-Waist (TW), Waist-to-Shoulder (WS), and Waist-to-Waist (WW).

Vertical Height (VH) (8 combos)	Lower	NIOSH Variables				Stoop	Weight	
	(Low)	Frequency (FREQ)	Horizontal Reach (HORI)	Asymmetry (ASY)	Coupling (CUP)	(STP)	Light (LIT)	Heavy (HEV)
F - W		F - W	F - W	F - W	F - W	F - W	F - W	F - W
C - W							C - W	C - W
K - W						K - W	K - W	K - W
W - W		W - W	W - W	W - W	W - W		W - W	W - W
F - F		F - F	F - F	F - F	F - F		F - F	F - F
T - W								
F - S								
W - S								

Lifting risk factor and their rationale for inclusion (Table 4-4).

Table 0-2: Lifting Factor Rationales (Ngo, 2015)

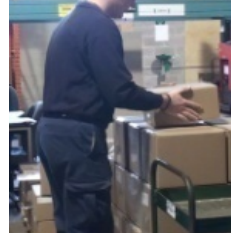
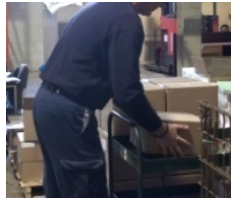
Factor	Rationale
1. Vertical Height Lifting from/to multiple heights <ul style="list-style-type: none"> Repeated videos (oversample waist, knee and floor lifts) Shoulder height lifts (under-sampled) 	To find if participants know that “low” lifts have a higher risk of LBP. <ul style="list-style-type: none"> To emphasize activities related to the key message The focus of the study is LBP
2. Lowering <ul style="list-style-type: none"> Only at waist, knee and floor heights 	Principle is as applicable to controlled lowering <ul style="list-style-type: none"> To reduce number of trials
3) Other NIOSH Variables <ul style="list-style-type: none"> Only focus at waist and floor level 	Although not the focus, this is valuable information in a larger context <ul style="list-style-type: none"> To reduce number of trials
4) Alternate Lifting Technique <ul style="list-style-type: none"> Only at floor and calf level 	To see how current recommendations, affect peoples’ risk perception <ul style="list-style-type: none"> Maximize effect and to reduce the number of trials
5) Different Weights	To determine perceptions of the effect of weight

Lifting Heights: S = Shoulder; W = Waist; T = Thigh/Knuckle; K = Knee; C = Mid-Calf; F = Floor/Ankle
NIOSH Variables: FREQ = Frequency; HORI = Horizontal Distance; ASY = Asymmetry; CUP = Coupling

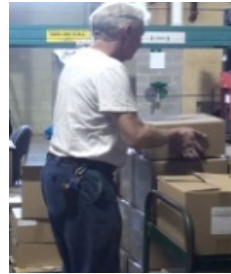
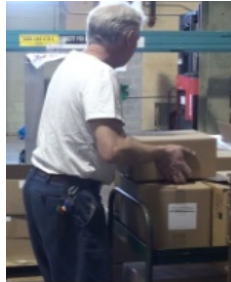
Table 0-3: Stills of eight vertical height combinations of a medium lift.

Task	Origin	Destination
Floor to Floor		
Floor to Waist		
Floor to Shoulder		
Calf to Waist		
Knee to Waist		

Tight to Waist



Waist to Waist



Waist to Shoulder

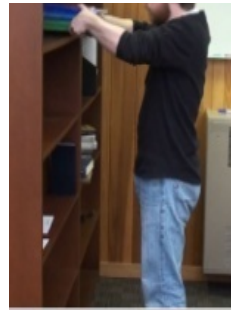
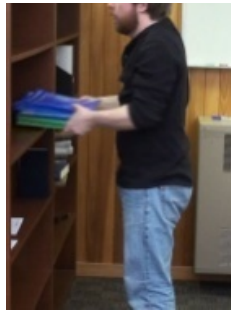


Table 0-4: Stills of Lifting vs. Lowering at 3 height combinations.

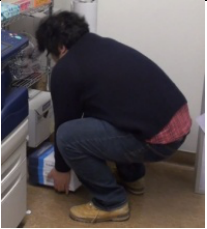




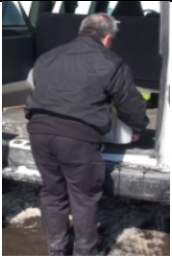



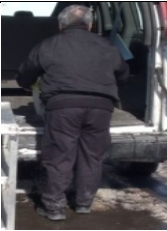

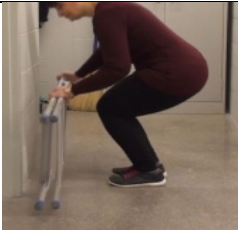
Lifting from	Origin	Destination	Lowering from	Origin	Destination
Floor to Waist			Waist to Floor		
Calf to Waist			Waist to Calf		
Knee to Waist			Waist to Knee		

Table 0-5: Stills of symmetric and asymmetric lifts at the origin or destination.




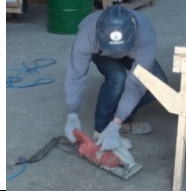
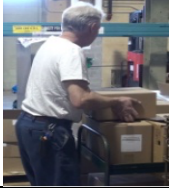

Height Combination	Sagittal	Twist
Floor to Floor		
Floor to Waist		
Waist to Waist		

Table 0-6: Stills of good and poor coupled lifts at the origin





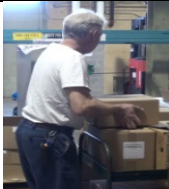
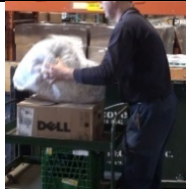
Height Combination	Good Coupling	Poor Coupling
Floor to Floor		
Floor to Waist		
Waist to Waist		

Table 0-7: Stills of single lift and repeated lifts.
Height Combination

Single

Repeated

Floor to Floor



Floor to Waist



Waist to waist

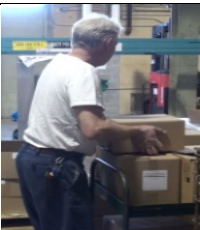


Table 0-8: Stills of Near and Far Lifts.

Height Combination	Near	Far
Floor to Floor		
Floor to Waist		
Waist to Waist		

Table 0-9: Stills of Squat and stoop lifts at the origin.

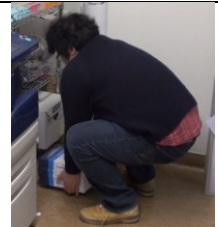



Height Combination	Squat	Stoop
Floor to Waist		
Knee to Waist		

Table 0-10: Stills of light, medium, and heavy lifts at the origin.

Height Combination	Light	Medium	Heavy
Floor to Floor			
Floor to Waist			
Calf to Waist			
Knee to Waist			
Waist to Waist			

Appendix E: Template for Each Survey Question

Templates of utilized message and a survey question.

Message:

- *“The closer your hands are to the ground when you are lifting an object, the more likely you will hurt your back. Even when lifting light objects, you can hurt your back. There is no “best” way to lift things from the ground, so to stop that problem altogether, ‘Store it off the floor!’”*

"كلما اقتربت يديك من الأرض عندما تقوم برفع شيء ما، كلما زاد احتمال إصابتك بضرر لظهرك. حتى عند رفع الأجسام الخفيفة، يمكنك إيذاء ظهرك. ليس هناك وسيلة "أفضل" لرفع الأشياء من على الأرض، ولوقف هذه المشكلة تماما، "قم بتخزين الأشياء اعلى من مستوى الأرض!" "



Figure 0-1: Screen capture of the message.

Q43: Chose a number that represents how likely you think doing this task several times a day, could eventually lead to low back pain.

اختر الرقم الذي تعتقد انه غالبا يعبر عن أن القيام بهذه المهمة عدة مرات في اليوم، يمكن أن يؤدي في نهاية إلى آلام أسفل الظهر.



Figure 0-2: Screen capture of a sample of video clip.

Appendix F: Interview Questions

Interview Questions

I am a graduate student at the University of Waterloo, this is my card with contact information. I am interested in your experience of entering the labor market since you have arrived in Canada as a new refugee. This interview is a complementary part of the survey that you have participated in and again relates to hazards that causes LBP at workplaces. I am going through some open-ended questions to explore more about your experience at workplaces. For example, how you find this simple message clear, compelling, and useful in your everyday life and workplaces. Your challenges at the workplace and your suggestions regarding to minimizing MSD hazards can be useful in creating a proper intervention at workplaces. your comments and suggestions would help many workers (particularly refugees) that might experience your situations. There are no right or wrong answers and all your response are kept anonymous. Interview will take between 10-30 minutes. I will take note just to help me remembering the key points. Feel free to stop me at any point for any questions, concerns or for further clarifications. Please consider this is a conversation and we can direct it as much as you are pleased and feel free to stop the interview whenever you do not feel comfortable.

Interview Questions:

1. I am curious whether you remember what we discussed last time when we did the survey and do you remember what was the topic?
2. Have you ever experienced Musculoskeletal pain/LBP? If yes, what was the cause of the pain? If job, why do you think your job is causing this pain?
 - Probe: When did you last time suffer from pain on your body (i.e., LBP or injuries)?
3. How the likelihood of workers getting MSD from your current job and what the consequence would be?
 - Probe: What do you think may cause that MSD/LBP?
4. Did you get any health and safety training before you get started? If so, how do you find health and safety training helpful at workplaces?
5. How do you find the educational message clear? Let's read it again and tell me what you got from the message?
6. How compelling and persuasive do you find the message?
7. Did you do anything differently after hearing the message? If yes what you did? If not, could you

explain why not?

8. Based on the message that you got, objects in which height is fine to carry?
9. What are the other main risk factors you would consider when picking up an object to prevent LBP? Which one do you think is most important?
10. Do you think picking an object from the floor could eventually cause Low Back Pain (LBP)?

(Resilience) (Finding this kind of simple message practical)

11. To what extent do people think ahead to try and anticipate when things might go wrong or might provide suggestions?
 - Probe: How do you think someone at your work could apply and consider this message, in his/her everyday task?
 - Do you have any other simple health and safety messages suggestions similar to this concept?

(Leadership)

12. Overall, how committed are leaders (managers, lead guy, health and safety representative if existed) regarding WHS?
 - Probe: How do you get health and safety advice? Are there any cases that you think they miss to warn you? How do you like to inform them about that hazards?

(Communication)

13. To what extent are WHS communications at your current workplace tailored to meet your health and safety needs?
14. How do you like to get your health and safety suggestions, written or verbally and how often? Why?
15. What do you think about simplicity of this message? How do you think it is going to be effective? Any positive or negative feedbacks? How is the overall quality?

(Learning)

16. To what extent are people here open to new ways of thinking about WHS?
17. How do you think health and safety at workplace could be improved?
 - Probe: what other things probably stop you to comply with healthy behaviors? Could you provide an example?
18. Do you encouraged by your employers to report hazards in the workplace?
19. Is there a culture here of open reporting and sharing of WHS incidents?

- Probe: for example, sharing your knowledge in this survey if you think this message is effective there? How about if you see other person in your work environment do not follow the health and safety suggestion?

Appendix G: Questionnaire template sheet

Survey Answer Sheet

Name: Age: Occupation: Length of stay in Ca: Previous injuries: Gender:

Pre-Test				Post-Test			
1		23		1		23	
2		24		2		24	
3		25		3		25	
4		26		4		26	
5		27		5		27	
6		28		6		28	
7		29		7		28	
8		30		8		30	
9		31		9		31	
10		32		10		32	
11		33		11		33	
12		34		12		34	
13		35		13		35	
14		36		14		36	
15		37		15		37	
16		38		16		38	
17		39		17		39	
18		40		18		40	
19		41		19		41	
20		42		20		42	
21		43		21		43	
22		44		22		44	

Appendix H: Call for Volunteer

Call for volunteer

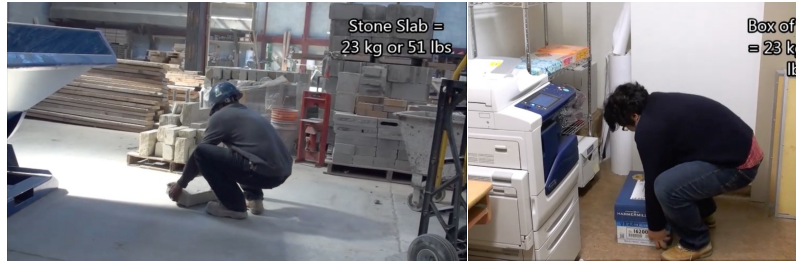
Back pain

I am looking for **Syrian refugee volunteer** participants for doing **20-30 minutes'** survey. These questions are about lifting and lowering objects I need your help to rate the questions based on causing lower back pain. At the end of the study, you will train to learn safe behavior.

Aim of this study is;

- Health and Safety at work
- Work compensation and benefits
- Learn protect lower back from injuries

In appreciation of your time, we will offer you a **\$10 coffee gift card**



Please contact me if you are willing to participate:

m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245	m.nazari323@gmail.com 905 923 4245
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Appendix I: Consent Form

Information for participants and consent form

A.2 Information for participants who are rating lifting video clips

A community-based pilot study assessing the work-related musculoskeletal risk perception among government- and private-sponsored refugees in Canada

You are invited to participate in a research study conducted by researchers at the University of Waterloo. The purpose of the study is to examine refugee risk perception of hazards in the workplace that can lead to musculoskeletal disorders (MSDs) and the effectiveness of a simple educational message.

If you decide to participate, you will be asked to complete a 30-40-minute survey that is completely anonymous. Survey questions focus on rating lifting and lowering videos that were previously recorded followed by an educational message midway through.

Participation in this study is voluntary. You may decline to answer any demographic questions by leaving them blank and you can withdraw at any time by not submitting your responses. All information you provide is considered completely confidential. Data collected during this study will be retained for up to 5 years in Dr. Philip Bigelow's locked office. Only the research team will have access. No personal identifying information will be collected. There are no known or anticipated risks from participating in this study.

In appreciation of your time, we will offer you a \$10 coffee gift card. We expect that approximately 100 individuals will take part in the study.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at (905-923 4245) or by email at (m.nazari323@gmail.com).

Participant information and consent form

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by Sonja Senthana, Roghiyeh (Mehrnaz) Nazari, Philip Bigelow, and Amin Yazdani at the School of Public Health and Health Systems at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES NO

Participant Name: _____ (Please print)

Participant Signature: _____

Witness Name: _____ (Please print)

Witness Signature: _____

Date: _____

Appendix J: Coding Framework and Four Major Themes

MSD Knowledge	The Importance of Training Increasing MSD Knowledge & Advice on Supervision	Message Clarity & Effectiveness	Barriers toward Changing attitudes & behaviors	
Lack of MSD knowledge	Getting used to the H&S Arrangement and Make it a Habit (retrieve the knowledge)	Msg Clarity & Simplicity	Institutional Barriers <ul style="list-style-type: none"> ➤ Safety Culture; Managers' pressure on speed of working and fatigue ➤ Expecting appreciation from refugees and not complaining ➤ Lack of Empowerment that results in Not Sharing H&S Concerns ➤ Feeling Vulnerable and Worrying about Losing a Job ➤ The Challenges of Cross-cultural Work Environments ➤ Lack of environmental support ➤ Sharing MSD Pain Only by Co-workers is The Routine ➤ Resent Favoritisms ➤ Working for Small Vs. Big Corporations; Working for Big Corporation seems More Advantageous ➤ Managers Attitudes Could Alter Whole 	1.1 Personal Barriers Regarding MSD/H&S <ul style="list-style-type: none"> ➤ Work Life Balance & Their Pressure Impact Attention to MSD ➤ Double responsibility (Either men or women) ➤ Resent Favoritisms

			<p>Systems Regarding H&S in Small Corporations</p> <ul style="list-style-type: none"> ➤ Precarious Work Environments and Safety Cultures ➤ Workers requires training about their rights and responsibilities towards MSD/H&S 	
<p>The Importance of Knowing Correct MSD Terminology & Preferably Easier Term</p>	<p>H&S Need Regular Supervision & Updates</p>	<p>Msg effectiveness</p> <ul style="list-style-type: none"> ➤ Msg was Not Fully Understandable ➤ Association and Persuasion Regarding Content of the Message and the Role of Environmental Factors ➤ Participants mindset (workplace culture) and Their Intake Msg ➤ Contextual or Common Thinking in the Workplace Were Seen as a Tendency 		<p>1.2 Common Attitudes & Behaviors of Participants</p> <ul style="list-style-type: none"> ➤ Lack of Self-efficacy ➤ Overload themselves to Prove Their Capability ➤ MSD Pain Undermined ➤ MSD is Natural Aging Procedure ➤ MSDs is not Confidently Sharable and Lack of Knowledge Play a Vital Role ➤ Compliance with H&S/MSD advice and Instruction were not Taken Part of Responsibility\ ➤ Exercise considered as an Extra Pressure on Body or Not Valued as a Priority ➤ Younger underestimate H&S Advice compare to Middle-Aged ➤ Mental pressure Correlations with MSD ➤ Avoiding Accident is the

				Priority Rather than Cumulative Trauma Disorders
Suffering from MSD While Anticipations Is Hard	Participants' H&S Suggestions			
Pessimistic about MSD Recovery	Generally, H&S Training Valued in General and MSD in Particular but it needs to be tailored based on target population characteristics			