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To cite this article: Muhammad Fareez Ahmad Zuhaidi and Mohd Nasrull Abdul Rahman 2017 IOP Conf. Ser.: Mater. Sci. Eng. 226 012028

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Risk factors of the upper limb disorders among cashiers in grocery retail industries: A review

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Abstract. Cashiers have been appointed as one of top ten occupations in developing musculoskeletal disorders (MSDs) particularly on the upper limb. Many of the workers are still in high risk injury due to incorrect workstations and lack of employee education in basic biomechanical principles. Normally, cashiers are exposed in several risk factors such as awkward and static postures, repetition motion and forceful exertions. Thus, cashiers in supermarket are considered at risk from developing upper limb disorders (ULDs). This review evaluates selected papers that have studied risk factors of the upper limb disorders among cashiers in grocery retail industries. In addition, other studies from related industry were reviewed as applicable. In order to understand risk factors of the upper limb disorders among cashiers, it is recommended that future studies are needed in evaluating these risk factors among cashiers.

1. Introduction
Cashiers have been appointed as one of top ten occupations in developing musculoskeletal disorders (MSDs) [1]. Grocery store managers and employees have put their brains and efforts in reducing occupational injuries and illnesses [2]. Unfortunately, many of the workers are still in high risk injury due to imprecise workstations and lack of employee education in terms of basic biomechanical principles [3].

Several risk factors such as awkward and static postures, repetition motion and forceful exertions may arise the risk of injury [2]. The risk of injury is greater based on the duration, frequency and magnitude of the workers’ work activities [4]. Generally, cashiers’ jobs require them to use low force to move goods repeatedly from one side of the checkout to the other where this action is described as a light and repetitive manual material handling (MMH) task [5].

Cashiers in supermarket are considered at risk from developing upper limb disorders (ULDs) [6]. Cashiers usually experience ULDs as they tend to reach repetitively and stretch awkwardly to handle goods [7]. In addition, a study conducted by Grant & Habes explained that cashiers handling the laser scanner may be at risk from developing ULDs [8]. Their work usually involves ULDs as cashiers tend to be on their feet while handling customer purchases [9]. Their actions which are scanning and bagging goods lead them to experience mostly sprains and strains, as well as wrist, finger and leg injuries.
2. Risk Factors among Cashiers in Grocery Retail Industries

According to European Agency for Safety and Health Work (EU-OSHA), supermarket work can be physically demanding as workers are at risk from back and upper limb disorders [10]. The biggest factor in contributing to these disorders is due to risk factors such as awkward and static postures, lifting and pushing, repetition and forceful exertions. Other studies acquired that repetition, overload, awkward positions or some combinations are also some factors related to injuries of the human body [11]. From time to time, cashiers do suffer from cumulative trauma disorders which is a growing problem based on several studies [12-13]. The main risk factors from the developing disorders are reported to be prolonged exposure to repetitive bending/twisting movements at work [14]. Apart from grocery industries, mould manufacturing industries also acquire almost the same risk factors among their workers such as repetitive tasks, uncomfortable work postures and excessive work without breaks [15]. Further research findings from several reviews of risk factors of the upper limb disorders among cashiers in grocery retail industries can be referred in Table 1.

<table>
<thead>
<tr>
<th>AUTHOR</th>
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<tbody>
<tr>
<td>Barbieri et al</td>
<td>Symptoms and upper limb work-related musculo-skeletal disorders among 173 supermarket cashiers</td>
<td>Cashiers in supermarket are considered at risk from developing upper limb disorders (ULDs).</td>
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<td>(2013)</td>
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<td>Clarke (2003)</td>
<td>Workplace Injuries and Illnesses in 2001</td>
<td>Their work usually involves ULDs as Clarke (2003) explained that cashiers tend to be on their feet while handling customer purchases. Their actions which are scanning and bagging goods lead them to experience mostly sprains and strains, as well as wrist, finger and leg injuries.</td>
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<tr>
<td>Cook &amp; McGill</td>
<td>Spinal shrinkage during repetitive controlled torsional, flexion and lateral bend motion exertions</td>
<td>In general, cashiers tends to acquire back pain due to involvements of combining flexion, lateral inclination and rotation movements.</td>
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<td>(2001)</td>
<td></td>
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<tr>
<td>Rodacki et al</td>
<td>The effect of handling products of different weights on trunk kinematics of supermarket cashiers</td>
<td>Not to mention, repetitive movements by the cashier might be potential in developing injuries.</td>
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<tr>
<td>(2006)</td>
<td></td>
<td>Not only that, activities such as grasping product, scanning and packaging goods will become risky if the weight of the product is heavy.</td>
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<tr>
<td>Shinnar et al</td>
<td>Survey of ergonomic features of supermarket cash registers</td>
<td>Unfortunately, many of the workers are still in high risk injury due to imprecise workstations and lack of employee education in basic biomechanical principles.</td>
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<td>(2004)</td>
<td></td>
<td>Not to mention, repetitive movements by the cashier might be potential in developing injuries.</td>
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2.1. Awkward Postures
Cashiers are among the workers who experience awkward posture as they tend to reach goods across a conveyor which would deviate the shoulder from its neutral position. Experiencing awkward posture can be tiring to the muscles and stressful to the joints if performed repetitively [16]. Based on several studies, supermarket cashiers have a high prevalence of work-related musculoskeletal disorders [17-21]. The main risk factors are mainly due to physical work conditions such as awkward postures [5, 22-23] and psychosocial environment [17, 19]. Everyday cashiers have to reach repetitively and stretch their arm awkwardly to handle goods and these actions may lead to ULDs [7]. Moreover, they also experience awkward posture by leaning over the counter to reach goods and twisting their upper trunks as these would lead to injuries or sprain or strain [24]. Some actions such as twisting and bending the wrist to scan, reaching too far for the goods and twisting to face the customers can all lead to pain and injury [25]. Awkward postures is considered worse if the work tasks involve repetitive motions and forceful exertions [26].

2.2. Repetition Motion
According to Workplace Safety and Health Council (WSHCOUNCIL), repetitive movements can become harmful if the same action is done quickly and too often in a matter of time [27]. Employee who work as a cashier is one of the common workers that frequently perform repetitive movements during working [28-30]. Repetitive movements are common in professions involving conveyor belts and cash register [29-30]. In a survey from Statistics Sweden, 93% of the supermarket cashiers are reported performing physically monotonous and repetitive work for at least half of their work time [31]. In fact, cashiers’ work can be repetitive and hand intensive especially when the EAN-codes of a large number of groceries need to be turned towards the scanner [32]. Studies explained that cashier’s tasks can be painful as they involve reaching, scanning, keying, grasping items and lifting heavy items with one hand [25]. These tasks are done over and over repeatedly all day long which can cause injuries to muscles and joints. Generally, repetitive movements which act as a work-related musculoskeletal disorders are still high in prevalence among grocery store workers [28, 33-35].

2.3. Forceful Exertions
Forceful exertion is one of the risk factors experienced by the cashiers. Cashiers tend to lean and reach the goods up the conveyor which this actions require them to use force on the hand [36]. In addition, WorkSafe explained that size, shape and weight of the objects handled by the cashiers can affect the usage of force [37]. Items such as heavy boxes, cartons of cans and shopping bags require the cashiers to use high force on the hand which can seriously bring an injury. Moreover, cashiers tend to grasp items with one hand. They perform activities such as reaching, scanning, and grasping item by pinching with fingers and lifting with one hand. It is bad as these actions are done day by day and with the usage of forceful motions according to Schwarzenegger [25].

3. Upper Limb Disorders (ULDs) among Cashiers in Grocery Retail Industries
Normally, cashiers are at risk of these serious musculoskeletal disorders, repetitive stress injuries and cumulative trauma disorders [18, 38-39]. Checkout cashiers tend to suffer from ULDs commonly in the shoulder, neck, hand and arm regions [17, 39-40]. As shown in Figure 1, cashiers have a high prevalence of low back pain, followed by neck, wrist/hand, shoulders, knee and elbow in the last 6 months and 7 days.
Actually, ULDs has been recognized as a leading cause of work-related disability within developed countries [41] where supermarket cashiers are known to be at risk from developing MSDs [21]. Reports of upper limb musculoskeletal disorders and discomforts are genuinely high where cashiers in supermarket industry perform repetitive and light manual material handling tasks such as scanning and handling products [5]. A study explained that nowadays, cashiers’ work conditions have been received minimal attention plus specific measures are not being taken for preventing work-related injuries [42]. The work is monotonous and cashiers are often exposed to manual handling tasks such as lifting goods of different weight. Not only that, activities such as grasping product, scanning and packaging goods will become risky if the weight of the product is heavy [43]. Figure 2 and 3 show some examples the upper limb disorders among cashiers in grocery industries.

Figure 1. Prevalence (%) of musculoskeletal discomfort in different body parts in the last 6 months and 7 days

3.1. Carpal Tunnel Syndrome (CTS)

This CTS is known to the general population and proved to be work-related due to some several factors such as repetitiveness, force and awkward postures [14, 44-46]. In 1994, CTS has reached its epidemic proportions which is comprised of 40.8% of all upper extremity repetitive motion disorders as reported by Bureau of Labor Statistics. As CTS commonly involve the wrist and hand, supermarket cashiers are the usual workers affected and they are likely to adapt CTS as their job involves repetitive movements and forceful exertions of the upper limb [18]. However, other studies have different perception as the development of CTS was mostly due to repetitive bending or twisting of the hands or wrists at work [14]. A review found out 38 primary reports that frequent usage of vibrating tools can enhance the risk of having CTS [47]. The risk is claimed to be higher when workers repetitively flex and extend their wrist especially when dealing with forceful grip.
3.2. Shoulder Pain
Usually, shoulder pain such as rotator cuff syndrome and shoulder tendinitis affect supermarket workers [19]. A study reported that 37-56% of the cashiers faced regular pain in the upper extremity which mostly due shoulder pain [8]. Discomfort and pain in the shoulder, neck and upper extremities are reported with increased frequency in repetitive work [48]. Based on several studies, acquiring shoulder pain is most likely due to working with arms above the shoulder level and other awkward postures such as trunk flex forward, hard-arm vibrations, pushing and pulling and carrying loads [49-53]. Moreover, other risk factors such as awkward positions, twisted and bent positions, work with the arms raised to shoulder level, repetitive work and handling heavy weights may lead to upper limbs disorders especially shoulder problem [54-62]. In addition, operations such as typing and packing maybe the cause of developing ULDs [63]. Normally, cashiers tend to work in a seated position. Little do they know that working in a seated position uses great shoulder abduction which would cause more stress on the shoulder joints and neck [5]. This may be the cause why cashiers frequently experienced upper limb disorders in the neck and shoulder [64-67].

3.3. Back Pain
Supermarket cashiers are likely to be at risk-population for MSDs [21]. The injury becomes more serious as cashiers adapt a high prevalence of back problems with a percentage of 77.0% cases [68]. A study reported that cashiers have a high prevalence of back pain particularly the lower back [13]. Back pain is common among cashiers as studies have claimed that mostly back disorders are due to axial twisting, lateral bending and awkward postures [69-71]. In addition, tasks that involve combining flexion, lateral inclination and rotation movements have been proven to be one of the main factors in acquiring back problems [72]. Normally, cashiers perform their work with the use of trunk rotation movements that involves twisting, bending and reaching for items which can affect the back [73]. Other than cashiers, baggers and stock handlers are also some of the main workers tend to have back injuries during working [36].

4. Conclusion
In conclusion, the identification of risk factors and upper limb disorders (ULDs) are basically based on the review that have been conducted among cashiers in grocery retail industries. The common risk factors experience by the cashiers are awkward posture, repetition motion, forceful exertions and prolonged sitting. Each factors have its own relation with body parts region. These risk factors are the cause for cashiers developing ULDs such as carpal tunnel syndrome (CTS), shoulder pain and back pain. These risk factors can be vital as it can give serious injuries which would lead to ULDs if safety measure is not taken action immediately. Further studies should be focused on the appropriate working postures in order for the cashiers to handle their work efficiently.

Acknowledgement
This paper was partly sponsored by the Centre for Graduate Studies UTHM.

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