

Workplace Assessment and Ergonomic Designing of Checkstand

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Abstract : In retail supermarket industry checkout operators play pivotal role in the system by performing repetitive light manual material handling tasks while scanning and handling products which involves select, grab, lift, orientate, move and place of various articles at checkout points along with static work posture irrespective of sitting/standing workstation which result in high risk of musculoskeletal disorders, unsafe posture, muscle fatigue and other discomforts such as back pain, disc pressure, reduced circulation, pregnancy related problem etc among the operators. Thus placing it among the top 12 WMSDs (Work Related Musculoskeletal Disorders) contributing industries in the world. However studies suggest that poor checkstand design can significantly impact working posture and result in development of work related injuries and ergonomically designed checkstand may reduce the occurrence of certain awkward posture, extreme motions, muscle loading conditions and work related injuries and result in higher comfort, performance and improved satisfaction among operators. The paper throws light on occupational demands and hazards encountered by checkout operators and how ergonomically designed workstation can help in reducing the risk associate with the checkstand job and suggesting a study on checkout operators in Indian context.

1 Introduction

Retailing 2015 confirms that the retail industry is becoming more complex and changing at an ever-increasing speed. Retailing is undergoing a transition with the rise of supermarkets. Supermarkets have been through a great deal of evolution, from the birth of the chain store concept in the early 1900's where the products were fetched by an assistant from shelves behind the merchant's counter as indicated by the customers what they wanted to the recent size of the Supermarkets where one shops pushing the trolley and putting things in it and then paying for the goods at the checkout. Though the advancements have been made from labor intensive as well as slow shopping process to self-help and prompt shopping experience, still the crucial role in this structure is played at the checkout points by the checkout operators.

The checkout operations in supermarket can differ considerably between stores however the work of checkout operator includes handling a large number of items each working day. The job of the checkout personnel comprises operating till system, scanning items of different size and weight which customer has chosen, weighing and pricing certain items such as fruits and vegetables, using special tools to remove security tags, processing



loyalty cards, coupons and vouchers, informing customer about promotional activities, answering their queries and taking payment from them.

2 Objectives

1. The objective of the research paper is to bring in light on:
2. Various job facets of checkout operators engaged in Supermarkets.
3. Numerous problems associated with checkstand activities faced by operators.
4. Impact of checkstand designing on checkout operator's productivity.
5. Designing a study on checkout operators which devise to decline the overall cost of checkout operators by reducing checkstand activities through ergonomically designed workstation.

3 Statistics regarding checkout operators across the world

The grocery industry is often termed as jobs engine. The Bureau of Labor Statistics (2014) reported 3.4 million employees engaged in supermarkets as cashiers at grocery stores earning an hourly mean wage of just \$10.37 and an annual mean wage of only \$21,570.

The BLS Survey of Occupational Injuries and Illnesses (SOII) ranked grocery stores as one of the nine industries having 100,000 or more injury and illness cases in 2000. These nine industries accounted for 29 percent of the 5.6 million cases reported for all private industry that year. The grocery store industry's injury and illness rate for total recordable cases were 8.4 per 100 full-time workers in 2000, compared with rates of 5.9 for all retail trade and 6.1 for private industry as a whole. Approximately 187,400 total injury and illness cases were recorded for grocery stores during the same year, with more than half (54 %) involving cases without lost workdays. Of the 86,000 cases that did involve lost workdays, 55,000 required workers to miss one or more days of work, while 31,000 required workers to be restricted to light duties or to work a shortened schedule. During this period, the rate for cases involving days away from work decreased while the rate for cases with days of restricted work increased. As with the injury and illness rates, similar trends occurred in both retail trade and private industry as a whole. The data may suggest that the type of injuries or illnesses that workers are sustaining are becoming less severe, or that organisations are making more effort to reassign workers to other duties through either transitional work or modifying work environments in lieu of days off from work. About 96 percent of the grocery store cases occurring in 2000 were classified as occupational injuries; the remaining 4 percent were illnesses. Repeated trauma cases accounted for 73 percent of the total number of illness cases in the industry, considerably higher than the proportion for all retail trade industries with around 50 %. Repeated trauma includes carpal tunnel syndrome and other motion-related disorders and usually involves the hand, wrist, elbow and shoulder.

Although comprehensive information on the severity and costs of MSD among operators globally does not exist, various government agencies provide statistics on the prevalence of MSD associated with checkout work. The UK Health and Safety Executive (HSE 1996) reported that a percentage of cashiers who experienced work loss in 1 year were due

to problems associated with the low back (32%), wrist (28%), neck (21%) and shoulder (21%). In the USA, the grocery industry is ranked fourth highest in number of cases of disorders associated with repeated trauma [6]

4 Occupational hazards associated with the job of checkout operators

According to data compiled by the Bureau of Labor Statistics, checkstand work at grocery stores rank fifth among all industries in number of repetitive stress injuries. Job of checkout operators is associated with repetitive motions and number of factors increases the risk of musculoskeletal injury and other manual handling injuries to checkout operators. These include: size, shape and weight of objects, which are moved/handled by checkout operators, including the force applied when handling awkward or heavy articles, such as boxes, cartons of cans and shopping bags; attempts taken to drag the product across the scanner before the bar code registers; awkward movements, such as twisting, bending and over-reaching, particularly in combination with handling articles and shopping bags; sitting or standing while holding the body in a fixed position for long durations; and Individual characteristics such as age, gender, physical dimension, pregnancy and any disabilities or other conditions a person may have to exaggerate the condition.

The most common contributing factors to occupational injuries for checkout operators are poorly designed checkout workstations and unsafe systems of work which significantly impact their working posture. Generally, injuries sustained by checkout operators are sprains/strains of joints and adjacent muscles, with the majority of injuries being located in the lower back, followed by wrist, shoulder injuries etc.

Checkstand work in grocery stores has been ranked among top 12 industries for contributing non traumatic soft tissue disorders of the neck, back and upper extremities [23]. These injuries are commonly known as musculoskeletal injuries or musculoskeletal disorders [7]. Several studies conducted on Checkout Operators (sitting and standing) report problems associated with musculoskeletal disorders [5, 14, 15, 27]

Checkout operators are at great risk of MSDs due to repetitive nature of work required to be carried for whole shift. WMSDs have been recognised as a serious problem worldwide. In Australia, according to available workers compensation statistics, about 59% of all injuries/disease cases are related to musculoskeletal disorders [2]. In 2011, MSD cases range 387,820 and account for 33% of all worker injury and illness cases reported by BLS; while in Britain, the total number of MSD cases in 2013-14 was 526 000 out of a total 1 241 000 for all work-related illnesses as per Labor Force Survey (LFS). Largest number of discomforts confronted by cashiers/checkout operators was found in lower back (31%), neck (25%), shoulders (24%) and buttocks (22%) which lead MSDs mainly due to the poor posture maintained by operators while carrying out checkstand activities at poorly designed workstation for long duration of time [16].

Also checkout operators who use electronic scanner appear at high risk for upper extremity MSDs [9]. Besides few studies mention that checkout operators can handle 500



to 1000 grocery items per hour- the equivalent of 6000 pounds of goods in a typical shift and spend upto 45-50% of the customers transaction time in scanning or handling products, considered as manual material handling (MMH) which accounts for one of the main reasons behind carpal tunnel syndrome and cumulative trauma disorder amongst the population [12]. Other factors which have been found to increase the risk of injury/harm to the health of checkout operators is static work posture. Posture has been defined as the alignment of body segments at a particular time [8] which is responsible for the hazards related with Seated Posture such as low back pain [11] and greater disc pressure [1] while foot and leg swelling, reduced circulation, varicose veins and lower extremity discomfort have been shown to occur in both sitting and standing posture [19, 22].

5 Significance of Checkstand Design in maintaining occupational hazards of checkout operators

The content of the checkstand work and design of job is generally believed to have a direct impact on workers' comfort and possibly the development of work related injuries [26]. Decades ago, the supermarket checkout counter wasn't a dangerous place to work. But ever since supermarkets turned to productivity-boosting electronic scanners, the number of injuries has risen dramatically. Nevertheless shunning ergonomic principles while designing workstation brings inefficiency and pain to the workforce.

An ergonomically deficient workplace not only enhances the above stated problems but can also lead to physical and emotional stress, low productivity and poor quality of work [3, 4]. Ergonomically designed checkstand accounts on curtailing extreme postures and motions of its operators without any kind of loss in productivity [27].

Similar kind of information reveals that a workstation should be laid out in such a way that it minimizes the working area while carrying out the operations so that the worker exercises shorter motions and expends less energy which helps in reducing fatigue. However ergonomically designed fully adjustable assembly workstation results in 29% higher productivity compared to non-ergonomically designed fixed height assembly workstation [17]. Working posture of employees involved in manual material handling at assembly line has been assessed by using OWAS and workstation has been designed which has result in improvement of harmful postures [10]. It has been observed that ergonomically modified checkout workstation reduces the risk of injuries among operators, particularly problems associated with lateral bending of trunk; also it has been found responsible for reduced postural stress and fatigue among them [18]. Nonetheless, ergonomically designed workstation results in 27% higher operators' performance and 41% improved satisfaction of workers [20].

Thus checkout workstations in the retail industry should be designed, planned and operated so as to reduce the exposure of checkout operators to hazards resulting in musculoskeletal injuries. Several factors can increase the risk of injury or harm to health to checkout operators.

6 Conclusion

Hence it can be concluded that checkout operators cope with a lot of Physical stress during operational hours at the workplace due to various factors which instigate workload. Although variety of researches has been conducted in developed nations regarding checkout work while limited number of studies have taken place in India which is a developing nation, where the inclination is more towards utilizing the physical labors than adopting mechanization. In addition to that there are no existing ergonomic guidelines and regulations for the workforce engaged in this occupation within the country which compel supermarket employees to carry out checkout activities for long duration of hours without appropriate reimbursement and standardised tools thus allowing workstation to aggravate physiological discomforts and disorders associated with neck, shoulder, upper limb, back, lower limb and feet. Therefore the study has been devised to reduce the overall cost of the checkout by reducing the load experienced by operators during checkout activities and by ergonomically designing the workstation for them.

The study is proposed to be conducted in various supermarkets situated in Bhopal (India) on the sample which comprises checkout operators engaged in checkstand activities for minimum 6 months of their working tenure. 250 subjects will be selected for the need assessment. Out of 250 subjects, 60 subjects will be taken for further analysis. From these 60 subjects, 30 subjects will be placed in the experimental group and the rest 30 in the control group, selected randomly. Research has been designed in Four Phases i.e. Load assessment, Designing checkout workstation ergonomically, Administration of prototype workstation in field and Analysis of Proposed Workstation to Existing Workstation.

Phase I will concentrate on the Load Assessment through assessing External Load which encompass the forces entail on operators due to peripheral situations acting in the proximities, will be evaluated through Environment (Physical and Organizational) and workplace Design, Internal Load i.e. stress imposed on operator's body during work at biochemical level by assessing Posture, Muscle Tension, MSDs and Fatigue and Task where the workload experienced by the checkout operators while working. After assessing the loads confronted by the checkout operators, the study will enter into Phase II where Designing of an Ergonomic Workstation for checkout operators will take place followed by Phase III where administration of prototype workstation in the field would take place and after intervention the proposed workstation will be assessed as per External, Internal and Task Load. Lastly, Phase IV comprises Analysis of prototype workstation in comparison to the existing workstation in terms of External, Internal and Task Load handled by checkout operators. The emphasis of ergonomically designed workstation will be to ensure that the design complements the strengths and abilities of operators and minimizes the effects of their limitations and the occupational hazards, rather than force the operators to adapt poor designs and expect higher productivity. Thus we can say that Ergonomics is concerned with making the workplace as efficient, safe and comfortable as possible without compromising the efficiency of the workers. It has been hypothesised that the Ergonomic Redesigned Checkstand will reduce certain awkward postures, static muscle loading, fatigue, injuries, WMSDs and other discomforts among operators.



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