Ergonomic Assessment of the Working Conditions of Checkout Counter Cashiers in a Grocery Store in the Philippines

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ABSTRACT

In most grocery stores in the Philippines, the checkout counter cashiers are standing throughout their shift. They are also subjected to repetitive tasks and awkward postures. This study aims to investigate the working conditions of the cashiers in one of the groceries in the country. In particular, the perceived pain of each worker was determined using Cornell University Musculoskeletal Discomfort Questionnaire (CMDQ). Rapid Entire Body Assessment (REBA) was conducted to evaluate their postures and identify the level of risk of developing musculoskeletal disorders (MSD). The perceived pain and the risk level were then tested for correlation using Spearman’s rho; however, it was found out that no significant correlation exists. Furthermore, relevant workstation measurements were gathered and compared against the anthropometric measurements of the cashiers. Results showed that much can be done on their workstation to improve man-machine interaction and to mitigate the risks of MSD.

Keywords: Cashiers’ working conditions, ergonomic assessment, grocery store cashiers in the Philippines

1. Introduction

According to a study conducted by the Philippine Statistics Authority (PSA), there was a 101% increase in the number of occupational disease cases in the country from 2011 to 2013. Types of occupational diseases include neck-shoulder pain, carpal tunnel syndrome, and back pain among others. In addition, according to the same source, it was revealed the service workers, shop and markets sales persons constitute the fourth largest occupation group with 12.7% of the total number of employed workers. Among those in this industry are checkout counter cashiers.

In particular, checkout counter cashiers in the Philippines are standing throughout their entire shift. These conditions, coupled with non-ergonomic workplace measurements, increase the risk of them developing several work-related musculoskeletal disorders (WMSDs).

Work-related musculoskeletal disorders (WMSDs) are types of disorders that affect different parts of the body that are associated with movement, including the upper limbs, lower limbs, and back. These affect the different structures of the body such as tendons, joints, muscles, and nerves and are primarily caused or aggravated by work-related activities (Nunes & Bush, 2012).

WMSDs bring about a lot of harmful effects. People who experience these disorders suffer mentally and physically and are faced with the possibility of permanent, partial, or total disability. On the other hand, companies are also affected in the form of increased costs due to compensation and medicine, training of new workers, loss of production, decrease in productivity, and employee absenteeism. Because of these, WMSDs are considered to be a major occupational safety and health issue.

At present, minimal efforts have been made on ergonomic assessment on the workplace conditions of grocery stores especially in the Philippines despite the ubiquity of such a business form in the country.
This study aims to assess the workplace conditions of a grocery store in the Philippines in terms of the musculoskeletal health risks accompanying the work-related tasks of their cashiers.

The focused grocery store has five female cashiers who work for six days a week, each being a 10-hour workday with a two-hour break. Their major tasks include barcode scanning, reaching for items, operating the cash register, getting a bag, and bagging. All of these tasks were performed while standing.

2. Method

The main objective of this study is to perform an ergonomic assessment on the working conditions of the checkout counter cashiers of the chosen grocery store. Specifically, this study aims to:

1. Collect cashiers’ personal and working information such as age, weight, and number of months spent working as a cashier;
2. Determine cashiers’ perceived pain due to work-related tasks using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ);
3. Perform postural analysis among the major tasks performed using Rapid Entire Body Assessment (REBA);
4. Test the correlation of cashiers’ personal and working information to CMDQ scores, and REBA scores;
5. Collect cashiers’ anthropometric measurements and compare them with the corresponding workstation measurements to be able to evaluate the coherence of man-machine interactions.

3. Results

The focused grocery store employs an all-female cashier group with age ranging from 21 to 33 years old. Table 1 shows the summary of the cashiers’ personal and working information, which were then used for further analyses.

| Cashier | Age | Weight (kg) | No. of Months Working as a Cashier |
|---------|-----|-------------|-----------------------------------|
| 1       | 33  | 50          | 20                                |
| 2       | 25  | 60          | 1                                 |
| 3       | 21  | 48          | 3                                 |
| 4       | 22  | 44          | 18                                |
| 5       | 32  | 50          | 78                                |

Table 1 Summary of cashiers’ personal and working information: Age, Weight, and Number of Months spent working as a cashier

The results of the CMDQ show that the neck, thighs, and feet are the body regions that ranked the highest in terms of prevalence of musculoskeletal discomfort (five out of five workers). These were followed by the shoulders, upper and lower back, upper arms, lower legs, and hips/buttocks with four workers out five experiencing discomfort. Three workers experienced discomfort in the knees and two in the wrists and forearms. The results were consistent with that of the researchers’ general observation of the cashiers’ workplace. The presence of discomfort in the thighs and feet could be due to the cashiers’ need to work in a standing position. On the other hand, the discomfort in the neck can be attributed to the fact that they often need to look down when operating the cash register, particularly when placing and getting money, and when scanning items.

Table 2 shows the specific CMDQ scores per body region as answered by each cashier.

| Cashier | Neck | Shoulder | Upper back | Upper arm | Lower back | Forearm | Wrist | Hips / Buttocks | Thigh | Knee | Lower Leg |
|---------|------|----------|------------|-----------|------------|---------|-------|-----------------|-------|------|----------|
| 1       | 7    | 0        | 7          | 3         | 7          | 0       | 0     | 0               | 7     | 0    | 7        |
| 2       | 20   | 30       | 30         | 10        | 6          | 4.5     | 10    | 6               | 3     | 3    | 3        |
| 3       | 5    | 5        | 1.5        | 3.5       | 1.5        | 1.5     | 0     | 1.5             | 1.5   | 1.5  | 1.5      |
| 4       | 1.5  | 7        | 1.5        | 1.5       | 0          | 0       | 0     | 0               | 0     | 0    | 0        |
| 5       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |
| 1       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |
| 2       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |
| 3       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |
| 4       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |
| 5       | 1.5  | 1.5      | 0          | 1.5       | 1.5        | 0       | 0     | 1.5             | 3     | 3    | 3        |

Table 2 CMDQ scores per body region per cashier
Table 3 shows the average REBA score of each task. The composition of the total time per transaction is dependent on the number of items bought by the customer. Roughly speaking, the time spent getting a bag and operating the cash register does not change significantly while those of barcode scanning, reaching, and bagging are directly proportional to the number of items. Coincidentally, these tasks also produce higher REBA scores compared to the other two. This puts them even more at risk due to the longer duration of time spent doing the tasks.

Table 3 REBA score per task

| Task                      | Ave. REBA score | MSD Risk Involved |
|---------------------------|-----------------|-------------------|
| Barcode scanning          | 8-9             | High              |
| Reaching for items        | 6-8             | Medium to High    |
| Operating the cash register | 1-3           | Negligible to Low |
| Getting a bag             | 5-7             | Medium            |
| Bagging                   | 5-8             | Medium to High    |

Information on cashiers’ demographics, CMDQ scores and the REBA scores tested for correlation. Results of the correlation tests were summarized in Tables 4 and 5.

Table 4 Correlation between CMDQ scores and age, weight and no. of months working

| Factors               | Spearman’s Rho | p-value |
|-----------------------|----------------|---------|
| Age                   | -0.1           | 0.873   |
| Weight                | 0.6667         | 0.219   |
| No. of months working | -0.7           | 0.188   |

Table 5 Correlation between CMDQ scores and REBA score per task

| Tasks                      | Spearman’s Rho | p-value |
|----------------------------|----------------|---------|
| Barcode Scanning           | 0.289          | 0.638   |
| Reaching for items         | 0.264          | 0.668   |
| Operating the cash register | 0.447         | 0.45    |
| Getting a Bag              | 0.354          | 0.559   |
| Bagging                    | 0.205          | 0.741   |

A significance level of 0.05 was used in determining the significance of the correlation between the CMDQ score and the other factors. The positive value of Spearman’s rho for the weight factor shows that as the weight of the cashier increases, so does the degree of perceived pain. On the other hand, the negative value for the factor of months signifies that, as the length of time spent working as a cashier increases; the degree of perceived pain decreases. The weak correlation between the CMDQ and REBA scores shows that the cashiers failed to identify the risk involved in their daily tasks.

Although values other than zero were obtained for Spearman’s rho, the p-values denote that a conclusion regarding the correlation of the CMDQ score to the factors tested cannot be reached for a significance level of 0.05.

The workstation of the cashiers was also analyzed in comparison with their anthropometric measurements. Based on the data gathered as shown in Table 6 and Figure 1, the monitor height is above the eye level of all the workers, forcing them to slightly tilt their head upward when checking prices and other information. The cigarette shelf is also placed above the counter, 159 cm above the ground. This requires the cashiers to reach upward, lean forward, and tiptoe to get a cigarette pack whenever a customer asks for one. This occurs several times a day according to the workers. Another part of their workstation is the bag dispenser or the bag well. Having seen that all of the cashiers find the need to bend just to get bags, it can be said that the bag well is placed at a level that is lower than what is appropriate for the workers.

Table 6 Anthropometric measurements of cashiers (in cm)

| Body segments       | Anthropometric Measurements |
|---------------------|-----------------------------|
|                     | Minimum | Maximum |
| Shoulder to fingertip| 62      | 67      |
| Elbow to fingertip  | 39      | 41      |
| Wrist to fingertip  | 16      | 18      |
| Eye height          | 137     | 147     |
| Shoulder height     | 120     | 129     |
| Elbow height        | 89      | 101     |

The width of the counter was also measured and compared with each of the cashiers’ maximum reach. As shown in Figure 2, there is a region in the counter area that is unreachable for the cashier standing in an erect posture. That is, they have to lean forward to be able to reach items that are outside the shaded regions.
The risk as to how the tasks are done and the anthropometric measurements differ among the subjects. This can be supported by the varying REBA scores among the cashiers. Hence, it can be said that the tasks can be standardized in such a way that it will yield a lower REBA score than the original.

Additionally, workplace measurements that are off when juxtaposed with the anthropometric measurements of the cashiers put a weight on the MSD risks as these tend to result in cashiers performing tasks in awkward body positions such as trunk bending and reaching. Thus, a more coherent man-machine system could also help mitigate the risks of postural MSD.

### 4. Conclusion

Rapid Entire Body Assessment results for each task show a maximum range of 8-9. This value indicates that the cashiers are at high MSD risk, which suggests that further investigation and implementation of change of methods are necessary.

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