Dominant Factors That Effecting The Working Position Change On Beverage Packing Employment

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Abstract. Work done by standing requires a lot of energy compared to sitting. Because the standing position is an alert attitude performed by the body both physically and mentally, so that the work activities carried out are faster, stronger and more thorough. Prolonged health problems related to standing position are discomfort of lower extremities and fatigue, swelling of lower extremity, back pain and fatigue throughout the body. The purpose of this study is to determine the dominant factors and the influence of the variables tested on changes in working position and the fatigue level that occurs. The analysis results with the assist of the SmartPLS program show that the dominant factor of each influential variable was work shift variable, the dominant indicator was the time of morning shift packing speed, the workload variable was the heart rate, and the physical work environment variable was air condition. While the variables that most influence the level of fatigue was changes in working positions that have a positive and significant effect.

Keywords: working position, work shift, workload, physical environment, fatigue.

1. Introduction

Work carried out in a standing position as in the beverage packing section is a work that involves physical work that is quite tiring. In which the standing position is an alert attitude performed by the body both physically and mentally, so that the work activities are faster, stronger and more thorough. In the packing process, an operator performs his activities in a static position throughout the working time (Brown et al., 2003, Thorp et al., 2009). The working position that is performed by standing is suitable for work that requires a lot of sideways, downward, and upward movements (Hasegawa, et al., 2001). Some health problems related to standing position that are prolonged are discomfort of lower extremities and fatigue, swelling of lower extremities, back pain and fatigue throughout the body (Chester et al., 2002).

Static behavior at work indicates the risk of diseases such as obesity, diabetes, some cancers and deaths from various cases (Duncan and Mummery, 2005, Blanck et al., 2007, Hamilton et al., 2008,
Moradi et al., 2008, Katzmarzyk et al., 2009, Straker and Mathiassen, 2009, Ekblom et al., 2010, Van Uffelen et al., 2010, Owen et al., 2010, Healy et al., 2011, Reiff et al., 2012)

Glass beverage packing work is one of the jobs that are classified as repetitive and monotonous (Septiari et al., 2018), because the same activity is done more than once in the process of completing the product. Even though the workforce is not too much in doing this work, the workload felt by the workers feels bigger because the routine is completed every day and there is no variation in work. Static work attitudes over a long period of time lead to more complaints on the musculoskeletal system. Static and repetitive work can cause fatigue and boredom.

Today many health and safety authorities recognize that the risk for neck and shoulder problems not only arises from work with a high physical burden, but also from low but repetitive energy output with low work variations (Straker and Mathiassen, 2009). As in the beverage packaging industry, many jobs are done by standing, sitting and monotonous along with repetitive work so it feels boring. The result of this boredom causes discomfort and fatigue in the work so that it can lead to decreased productivity. Discomfort in body position, high work repetition and great effort (Roman-Liu et al., 2004) are some of the things that can trigger fatigue (Traugakos, 2007).

To reduce the feeling of discomfort and fatigue due to monotonous and repetitive work therefore a combination of sitting and standing working positions are given. This is done so that the level of fatigue and discomfort can be eliminated. From this research, the dominant factors that influence the changes combination in working position in the packing process will be determined. It is expected that from these factors the reasons that cause discomfort from the work can be known which in turn can be reduced or eliminate, in order that work performance can be increased by the combination of changes in working position given.

2. Theoretical framework

2.1 Workload
Workload is an effort that must be taken out by someone to fulfill the demand of the job. Workload is the size/portion of the limited operator capacity needed to do certain work. As for capacity here is the ability possessed by someone.

2.2 Work Fatigue
Work fatigue according to Tarwaka (2004) is a protection mechanism to avoid further damage, so that recovery happens after rest. Work fatigue according to AM. SugengBudiono (2003) is a condition accompanied by a decrease in efficiency and needs in work.

2.3 Physical work environment
Exposure to the physical environment is one aspect that can cause disruption to the work environment and can affect the conditions of each operator. With a comfortable work environment, it is expected to improve employee performance optimally and productively without any disruption and anxiety when performing packing activities.

2.4 Smart PLS
Partial Least Square (PLS) is a family-based regression method introduced by Herman O.A Wold for the creation and construction of models and methods for social sciences with predictive-oriented approaches. PLS has the assumption that free research data is distributed (Distribution Free), meaning that the research data does not refer to one particular distribution (e.g. normal distribution). PLS is an alternative method of Structural Equation Modeling (SEM) which can be used to overcome the problem of relationships among complex variables but the size of the data sample is small (30 to 100), given that SEM has a minimum data sample size of 100 (Hair et al, 2010).
3. Research Methodology

3.1 Variable identification

| Variable                  | Definition                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Work shift                | Work shift used in this study is morning and afternoon work shifts seen from the time of packing speed used. This is used to see the differences that arise between packing activities performed in the morning and evening.                                                                                                                                                |
| Workload                  | Workload is measured from the average rate of heart rate that occurs during the packing process and the average oxygen consumption used.                                                                                                                                                                                                   |
| Physical work environment | The measurement of the physical work environment uses a questionnaire consisting of 11 questions divided into 5 groups, namely Air Condition (X), Noise (Y), Vibration (Z), Lighting (V), and Spatial Planning (W). Assessment of the physical environment using a Likert scale with the assumption: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = totally agree. |
| Work fatigue              | For fatigue level measurement, use the Job Fatigue Feeling Questionnaire (KAUPK2) which will be given to each packing operator. Assessment of fatigue level uses a Likert scale with the following assumptions: 1 = No; 2 = Sometimes; 3 = Often; 4 = always. As for the results of the fatigue level is the choice answer of each operator, the most selected of the 17 questions asked are divided into 4 groups, namely concentration (A), physical fatigue (B), anxiety (C), and working motivation (D). |

From the variables used in Table 1, the following hypothesis can be formulated:

H1: Work shift affects the work position
H2: Workload affects work position
H3: Physical environment influences work position
H4: Work position affects the fatigue level

Based on these hypotheses, the model or construct of this research is as shown in Figure 1.

![Figure 1. PLS Model Flow Chart](image)

4. Indicator Determination

Based on the variables identification from Table 1. Then the measuring indicator can be determined as in Table 2.
Table 2. Independent Variables and Dependent Variables

| Independent Variables | Indicators                  |
|-----------------------|-----------------------------|
| Work shift            | X11 Time of morning shift packing speed |
|                       | X12 Time of day shift packing speed |
| Work load             | X21 Average heart rate       |
|                       | X22 Average oxygen consumption|
| Physical work environment | X31 Air condition            |
|                       | X32 Noise                    |
|                       | X33 Vibration                |
|                       | X34 Lighting                 |
|                       | X35 Spatial planning         |

| Dependent Variables   | Indicators                  |
|-----------------------|-----------------------------|
| Work position         | Y11 Sitting position only   |
|                       | Y12 Stand up position only  |
|                       | Y13 Seated and standing position alternately |
| Fatigue level         | Y21 Concentration           |
|                       | Y22 Physically tired        |
|                       | Y23 Anxiety                 |
|                       | Y24 Work motivation         |

5. Results and Discussions

Table 3. Outer Loading

| Indicator | Outer Loading |
|-----------|---------------|
| X11       | 0.918         |
| X12       | 0.852         |
| X21       | 0.959         |
| X22       | 0.765         |
| X31       | 0.935         |
| X32       | 0.821         |
| X33       | 0.854         |
| X34       | 0.932         |
| X35       | 0.814         |

From table 3, it can be explained that the most dominant indicator as a reflection of the work shift variable was the time indicator of the morning shift packing speed with the outer loading value of 0.918 which means the indicator contribution to the variable latent value was 91.8%. For the variable workload indicator the most dominant was the heart rate with a value of 0.959, and the physical work environment with the most dominant factor was the air condition with a value of 0.935.

Table 4. Outer Weight

| Indicators | Outer Weight |
|------------|--------------|
| Y11        | 0.478        |
| Y12        | 0.496        |
| Y13        | 0.197        |
| Y21        | 0.348        |
| Y22        | 0.402        |
| Y23        | 0.327        |
| Y24        | -0.072       |
From table 4, it can be explained that the data in the table shows that the outer weight value of all indicators has a positive value indicating the indicator positive contribution to the measurement of work position variables. While the fatigue level variable data shows that the outer weight value of all indicators has a positive value indicating the positive contribution of indicators on the measurement of the fatigue variable level, except for working motivation which indicates a negative contribution to the fatigue level which means working motivation does not affect the fatigue level.

### Table 5. Test Results of Standing Position Direct Influence

| Path                                | Path Coefficient | P Value | Explanation |
|-------------------------------------|------------------|---------|-------------|
| Work shift → Work position (Y1)     | 0.914            | 0.361   | Not significant |
| Workload → Work position (Y1)       | 1.699            | 0.090   | Significant |
| Physical environment → Work position (Y1) | 2.263           | 0.024   | Significant |
| Work position → Fatigue level (Y2)  | 14.238           | 0.000   | Significant |

**Figure 2** Path Diagram of Standing Position Hypothesis Test Results

The direct effect of work shift on working position was positive and not significant with the path coefficient magnitude of 0.914 and p value of more than 0.1. The direct effect of workload on work position was positive and significant with the path coefficient magnitude of 1.699 and p value of less than 0.1. The direct effect of the physical environment was positive and significant with the path coefficient amount of 2.263 and p value of less than 0.1. The direct effect of work position on the fatigue level was positive and significant with the path coefficient amount of 14.238 and p value of less than 0.1. As shown in Figure 2.

### 6. Conclusions

In the working position performed by standing, dominant factors that influence the physical work environment which has a positive and significant effect with path coefficient value is higher than the workload which is equally positive and significant. The physical work environment of a workplace is very influential on one's performance because if the existing work atmosphere does not support, then the expected comfort is impossible to obtain in working, causing someone to work in a state of
anxiety and insecurity. This is what causes work performance to decrease in order that the output obtained is not optimal.

7. References
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