

# Variation of sitting and standing position at beverage packing factories

*by* Renny Septiari

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## Variation of sitting and standing position at beverage packing factories

R Septiari, Pratikto, B S Purnomo and P T Ishardita

Mechanical Engineering Department, Brawijaya University, Malang, Indonesia

rennyseptiari@gmail.com

**Abstract.** This was preliminary study in granting the variation sitting and standing position at two different factories in the habit of packing process. The duration of time and pattern of sitting and standing was proposed based on this study to the two beverage packing factories in which the packing process of the drinks with the sitting and stand pattern. Determination of fatigue was by the heart rate, the length of time that showed productivity, job burnout was performed at 6 operators for 4 hours at each firm. The purpose of this study was to assess the pattern of time sitting and standing or walking postures of which may cause fatigue and also observe productivity based on the duration of packing from the variation of sitting, standing, and sitting-standing.

### 1. Introduction

In the marketing or distribution process of products, the packing process becomes a major instrument for the processed products. Packing itself is an attempt to organize and measure the product in a certain packaging according to certain the size and shape. A sitting position in work is done all the time and for a long time results can increase employee packing work discomfort [1]. Most of these employees work all the time with the same style [2], where they spend an average of more than 8 hours per day on the job.

Packing work carried out at a beverage company located in the Kudus area of Central Java belongs to one of the repetitive and monotonous works. Where during the work time the activity is to enter the cup drinks into the dos-dos that have been provided with a sitting position. This activity takes place continuously for one shift work that is 7 hours. Repeated activities performed on average the feeling of boredom and fatigue will appear after they work  $\pm$  2-3 hours, this is known by the decreasing level of packing speeds made by operators. Therefore, people who pack the products have a variety of shapes and types according to product type, size, shape, economical and tastes of the consumers. In the event of repeated packing process, it is common to cause back pain easily. This pain is often experienced by workers in the range of 75% up to 85% [3]. The symptom of back pain might be caused by several factors in the industrial world. In the beverage packing industry by using paper carton is still done manually. This is not done with the automation machine for it is still done by human power or manual; the costs incurred by the company can be more economical.

Packing the beverage means doing repetitive work and monotonous onset may lead back pain that indicates fatigue [4]. The tasks of packing the beverage is done by sitting can lead back pain. There is also the use of the foot as a support stand is often the case when there is no possibility for visual control in progress, such as when a motion made between the accelerator and the brake pedal of a car



[5]. This activity may cause fatigue as well. The process itself, the activity is done by either standing or sitting beside the conveyer where glasses of drinks may run over conveyer toward the workers packing. Then the workers will take the beverage one by one for the next set in the boxes having been provided.

In Pati, Central Java, Indonesia, there are two beverage packaging factories. Both factories have a different tradition of packing. For Factory A whose products are favored by children in Indonesia, the beverage packing process is done while standing. Instead, Factory B which also produces competitor product from Factory A, the beverage packing process is done while sitting. Repetitive and monotonous task is done by standing or sitting position and performed for nearly an 8 hours work shift reduced by one hour for a break.

In this research, various treatments were employed. The treatments were given by combining the packing process while sitting and standing. This study was expected to give recommendation for the factories of an efficient packing process and may increase productivity of the factories

## 2. Research method

The study was conducted in two beverage packing factory in Pati, Central Java, Indonesia. Research was conducted on the operator of both factories. Data were obtained for seven hours. The data obtained were in the form of the number packed boxes, heart rate, and level of fatigue due to the job. For the data related to the number of packed boxes was the amount collected boxes during 4 working hour of the operator. The 4 working hour was used since it was adjusted to the position change of work that was being tested at the time the research was being conducted. It was expected that outcome of packed boxes for 4 hours may represent the overall performance of each operator packing during working hour.

The data related to the heart rate were obtained from the calculation of the heart rate at the six operators, and for the work fatigue data were obtained by questionnaire given to the six operators.

Rating the level of work fatigue was based on Likert's scale with the following assumptions:

1 = No	3 = Often
2 = Sometimes	4 = Always

The results of the work fatigue level were based on the answer choice of each worker which was the most preferred among proposed 17 questions. The chosen number was the presentation of the most common fatigue experienced by the workers ranged between 60% to 100%.

The change of the heart rate indicates the change of workload. The heart rate of each operator was taken after they had performed the work in accordance with the change of position that had been set. For the duration of action following the change in the time schedule was for 4 hours. Heart rate data were taken due to the changes that occurred in each operator.

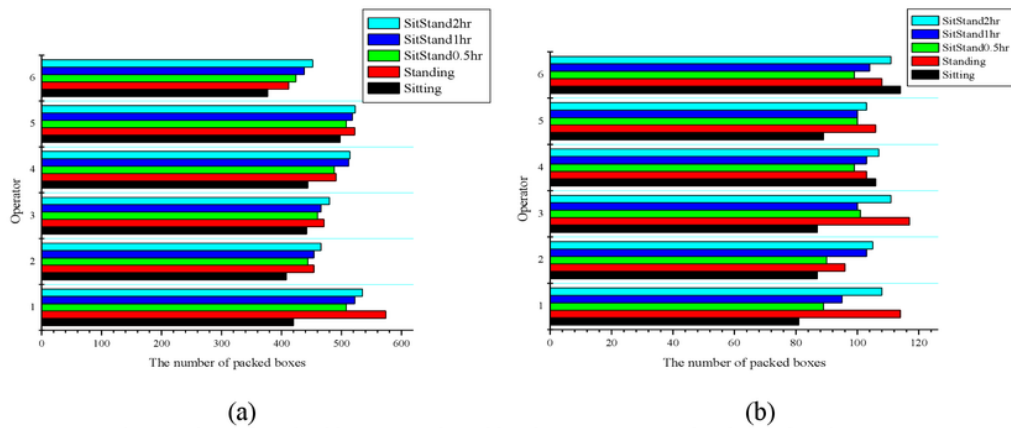
## 3. Findings

The findings of this research is explained in the following subsections.

### 3.1. Number of boxes

Based on figure 1(a) and figure 1(b), it is known that an increasing number of boxes packed after a given treatment sitting-standing. At the Factory A, the operator had the habit of standing, while for Factory B the operator was accustomed to sitting. As it is presented in figures 1(a) and figure 1(b), there was increased number of boxes packed while variation sitting-standing position for both operators at the Factories A and B. Work while prolonged sitting may cause inconvenience working position against given time [6]. Sitting position is the position where the feet are not weighed down with body weight and a stable position during work. Adjustment posture with an increasing frequency throughout the working day is used to reduce discomfort during work [7]. The variation sitting-standing may provide comfort condition to the operators, so that it may improve their work performance [8]. In addition, the productivity can be assessed in various ways, one of them is with the

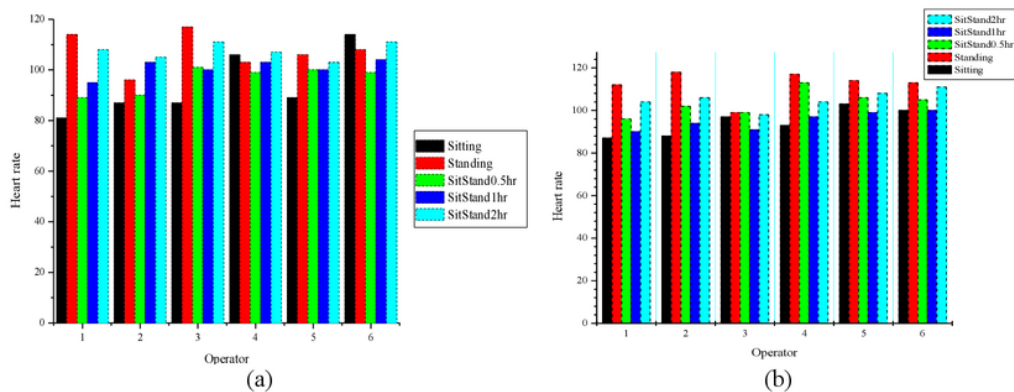
quality of work produced [9]. In the packing process, it can be assessed from the number of boxes having been packed by the workers. For variation sitting-standing was out of the habit of the operators is believed to make increase in productivity compared with if their position was monotonously either sitting alone or standing alone. This position will provide relaxation for the body of the operators, especially on the coccyx and spine [10].



**Figure 1.** The number of packed boxes produced by the operators at the time of various treatments at (a) Factory A and (b) Factory B.

### 3.2. Heart rate

Based on figure 2(a) and figure 2(b), it was shown that the variation of the sitting-standing position gave lower heart rate of the workers. If someone feels the workload is high, and then the change in heart rate will also happen which is beating faster. Sitting and standing positions have become the habit of the operators in each factory. The change of position habit will cause discomfort in work [11]. There was a decrease in heart rate in the sitting-standing position variation, where it was known that work fatigue is synonymous with an increase in heart rate [9]. At work habits where the operator only either sits or stand during the working hour may be risky to the health of your back. This is due to manual handling, repetitive movements, twisting and bending, often lifting and whole body vibration [3]. Variations of the sitting-standing will reduce repetitive movements, giving relaxation and vibration for the whole body.

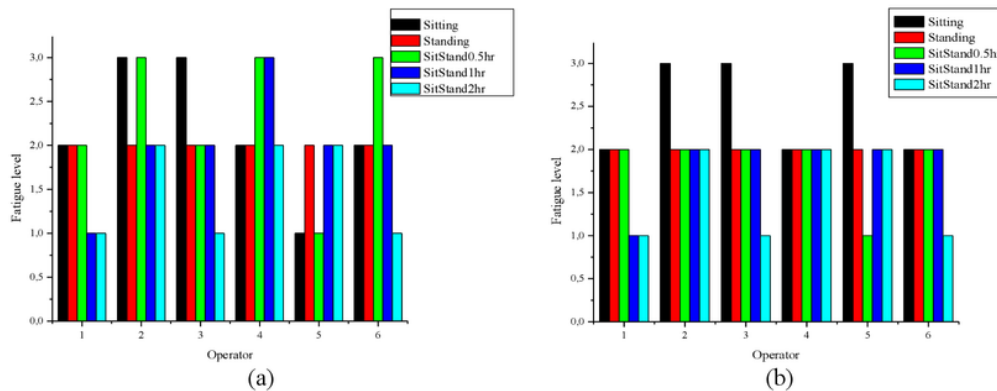


**Figure 2.** Heart rate during the various treatments at the (a) Factory A and (b) Factory B.



### 3.3. Fatigue level

Figure 3(a) and figure 3(b) showed the fatigue level based on interviews with the operators. The treatment of variation sitting-standing position may reduce work fatigue felt by the operators. This study showed the tendency of inconvenience of working in one position only either sitting or standing alone. Monotonous and repetitive position may lead into the inconvenience [12]. In other words, one position either just sitting or standing is likely more to inconvenience. In the case of beverage packing process, the inconvenience is likely to occur due to fatigue on the wrist and hand muscles. In addition, either only sitting or standing would easily cause spinal shrinkage [11]. Analysis of the posture for each body movement and variation can give detailed calculation of the level of fatigue due to the one static position.



**Figure 3.** Fatigue level of various treatments at the (a) Factory A and (b) Factory B.

### 4. Conclusion

Variation of sitting-standing position gives increased productivity as it was shown from the number of boxes packed at the two factories. The boxes were produced in a sitting-standing position for two hours. There was a decrease in heart rate with the variation of sitting-standing position. Variation of sitting-standing position may lower the levels of fatigue and heart rate experienced by the operators. The initial assessment of this variation may proceed to the calculation of the change in position by the angle formed from the packing tasks.

### References

- [1] Fenety A and Walker J M 2002 Short-term effects of workstation exercises on musculoskeletal discomfort and postural changes in seated video display unit workers *Phys. Ther.* vol 82 issue 6 pp 578–89
- [2] Brown W J, Miller Y D and Miller R 2003 Sitting time and work patterns as indicators of overweight and obesity in Australian adults *Int. J. Obes.* vol 27 issue 11 pp 1340–6
- [3] Boos N and Aebi M 2008 *Spinal disorders : fundamentals of diagnosis and treatment* (Berlin, Heidelberg: Springer)
- [4] Chan A H S and Chan K W L 2010 Three-dimensional spatial stimulus–response (S–R) compatibility for visual signals with hand and foot controls *Appl. Ergon.* vol 41 issue 6 pp 840–8
- [5] Hoffmann E R 1991 Accelerator-to-brake movement times *Ergonomics* vol 34 pp 277–87
- [6] Callaghan J P, Gregory D E and Durkin J L 2010 Do NIRS measures relate to objective low back discomfort during sedentary tasks? *Int. J. Ind. Ergon.* vol 40 issue 2 pp 165–70
- [7] Haynes S and Williams K 2008 Impact of seating posture on user comfort and typing performance for people with chronic low back pain *Int. J. Ind. Ergon.* vol 38 issue 1 pp 35–46

- [8] Vink P, Konijn I, Jongejan B and Berger M 2009 Varying the office work posture between standing, half-standing and sitting results in less discomfort *International Conference on Ergonomics and Health Aspects of Work with Computers (EHAWC 2009)* pp 115–20
- [9] Husemann B, Von Mach C Y, Borsotto D, Zepf K I and Schambacher J 2009 Comparisons of musculoskeletal complaints and data entry between a sitting and a sit-stand workstation paradigm *Hum. Factors* vol 51 issue 3 pp 310–20
- [10] Roelofs A and Straker L 2002 The experience of musculoskeletal discomfort amongst bank tellers who just sit, just stand or sit and stand at work *Ergonomics* vol 14 issue 2 pp 11-29
- [11] Zhang L, Helander M G and Drury C G 1996 Identifying factors of comfort and discomfort in sitting *Hum. Factors J. Hum. Factors Ergon. Soc.* vol 38 issue 3 pp 377–89
- [12] Ebara T, Kubo T, Inoue T, Murasaki G, Takeyama H, Sato T, Suzumura H, Niwa S, Takahashi T, Tachi N and Itani T 2008 Effects of adjustable sit-stand VDT workstations on workers' musculoskeletal discomfort, alertness and performance *Ind. Health* vol 46 issue 5 pp 497–505

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