

ANALYSIS AWKWARD POSTURE AT FOOD PRODUCTION ACTIVITY USING RULA ASSESSMENT

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Published online: 15 January 2018

ABSTRACT

If the workers continuously perform the activities throughout the working hours, they may experience prolonged standing which creates fatigue and causes an occupational hazard which includes slips and falls. The goal of this study was to identify awkward postures during food production activities. 40 workers with minimum of 1 year experience working in food production were involved. The comfort level was measured using Rapid Upper Limb Assessment and Computer-Aided Three-Dimensional Interactive Application software analysis, expressed in scoring level. Critical activities grilling meat, frying, dish cloth and wash utensil at food production contributed to high RULA score of 7. The specific working postures have to be identified among food production workers. This study can provide a preliminary data to determine the correct working postures for food production workers.

Keywords: working position; food production; awkward posture; RULA score, fatigue and standing.

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doi: <http://dx.doi.org/10.4314/jfas.v10i1s.44>

1. INTRODUCTION



Food production is a harmful workplace because there are various types of hazards which derive either from cooking utensils, raw materials, layouts or workers. Workers do various cooking activities during the 6 to 8 hours of performing tasks in the workplace. Standing is the most important work position used throughout the activities [1]. In addition, the workers also move from one station to another. This clearly shows that movements for long periods of time cause the slip and fall problems [2-4]. During working hours, food production workers need to perform their tasks according to schedules such as preparing raw material, cooking, washing utensils, preparing dishes, plates, servicing and delivering orders to clients. Food production is equipped with raw materials, cooking tools and different sizes of cooking utensil sets. A study found the number of hazards in food production are higher than other high-risks rooms [5]. Thus, an ergonomic approach is conducted on the relationship among human, equipment and the working environment for productive daily activities.

Awkward postures occur when joints are not in the neutral positions while tasks are being performed. While working, sometimes body work at surfaces that are too high which can affect several parts of the body. Employees may have to lift or bend their shoulders, elbows and arms (including hands and wrists) into uncomfortable positions to perform the tasks on higher surfaces.

Fig. 1 depicts 12285 incident cases in Accommodation and Food Services Activities in Malaysia which have been reported to SOCSO from 2009 until 2014 [6]. In total, 8910 cases reported in males compared with the cases in female which are 3375 cases. Hence, the Accommodation and Food Services Activities incidents had a uniform increase from 2009 to 2014. An average of 2048 cases occurs annually in Accommodation and Food Services Activities in Malaysia.

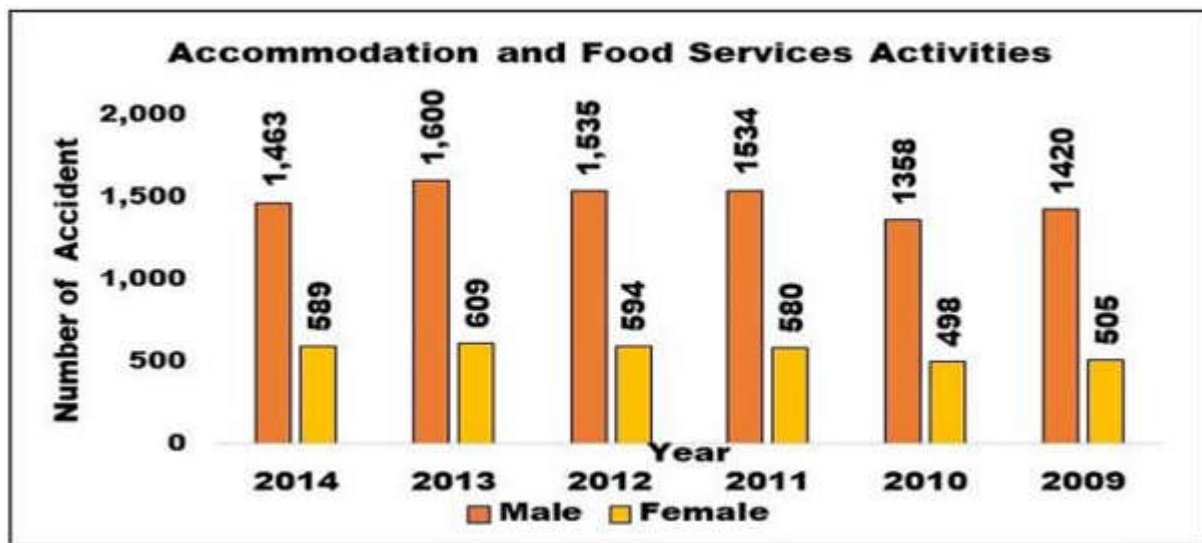


Fig.1. Number of accidents according to accommodation and food services activities

The annual report of SOCSO clearly shows that accommodation and food services workplace contributes to high potential and risk of hazardous accidents, causing harms to the employees. If employees are being careless or self-complacent on the safety rules or proper safety apparatus, they might be the victims of slip and fall incidents.

2. METHODOLOGY

This study started with an observation of critical food production activities at a food production, Kristal Restaurant in Polytechnic of Merlimau Malacca. It was selected based on the food production environment resemblance. There are four main departments namely delivery or service, cooking, dish clothing and utensils washing. Forty workers aged 19 to 25 years old with at least 1 year experience in food production activities were involved in the study. Furthermore, they spent more than 6 working hours during the observation.

Selected observations from different departments were recorded using a camera. Each repeated activity was recorded for 20-30 minutes. The data were analyzed using Rapid Upper Limb Assessment, RULA [7]. From the RULA data, the CATIA software produced the comfort level of working posture left and right side.

Table 1. Comfort level of RULA analysis

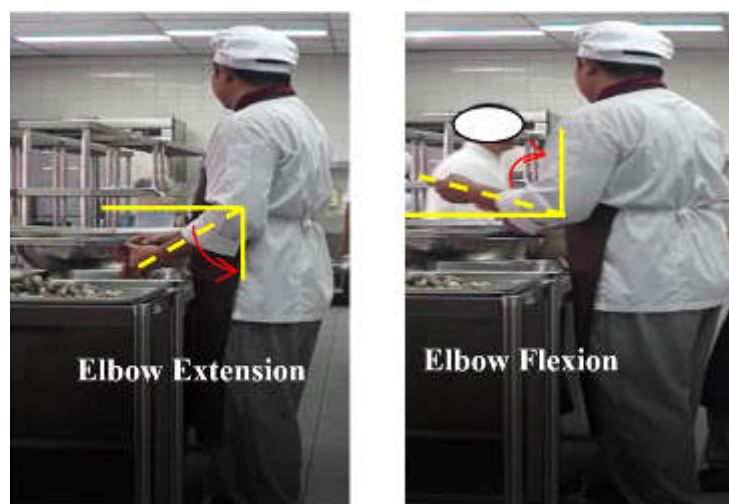
Score	Level of MSD Risk
1-2	Negligible risk, no action required
3-4	Low risk, change may be needed
5-6	Medium risk, further investigation, change soon
6+	Very high risk, implement change now

Table 1 shows the comfort level of RULA analysis which helps researcher to clarify the level of MSD risk [8]. For each RULA, score 6 and above will produce awkward postures for every department. These awkward postures were discussed for further improvement.

3. RESULTS AND DISCUSSION

The results of observation clearly showed that during working hours, the workers mostly work within extreme awkward postures or near extreme range of motion. Fig. 2-5 show the awkward postures while grilling meat, frying, dish cloth and utensil washing activities. There are four types of awkward postures during working activities such as elbow, wrist, shoulder and back postures.

Hence, the repetition when working in awkward postures contributes to stress on muscles and joints and finally leads to fatigue [9]. The hotel workers are exposed to extra hazards in view of generally longer working hours [10-11]. Another contributing element in the present discovery of intensive care is fatigue [12].



(a) Awkward elbow postures



(b) Awkward wrist postures



(c) Awkward shoulder postures



(d) Awkward back postures



Fig.2. Grilling meat activity



(a) Awkward elbow postures



(b) Awkward wrist postures



(c) Awkward shoulder postures



(d) Awkward back postures

Fig.3. Frying activity



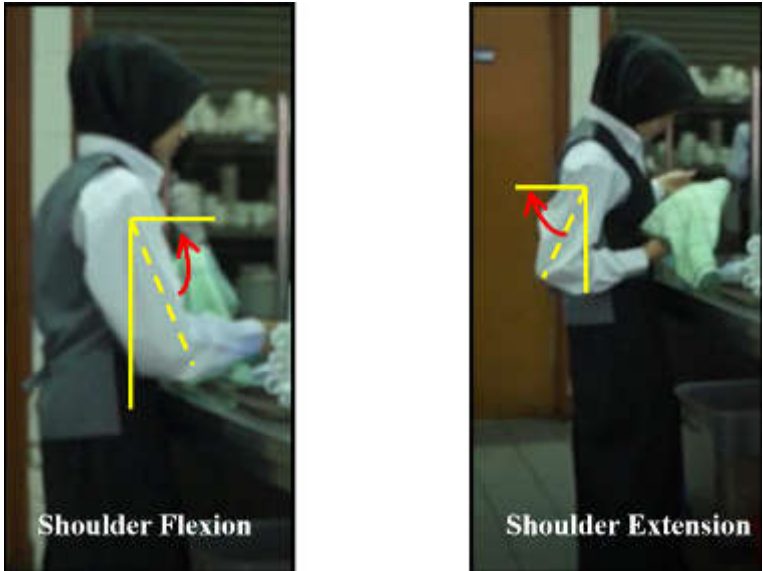
(a) Awkward elbow postures



(b) Awkward back postures



(c) Awkward wrist postures



(d) Awkward shoulder postures

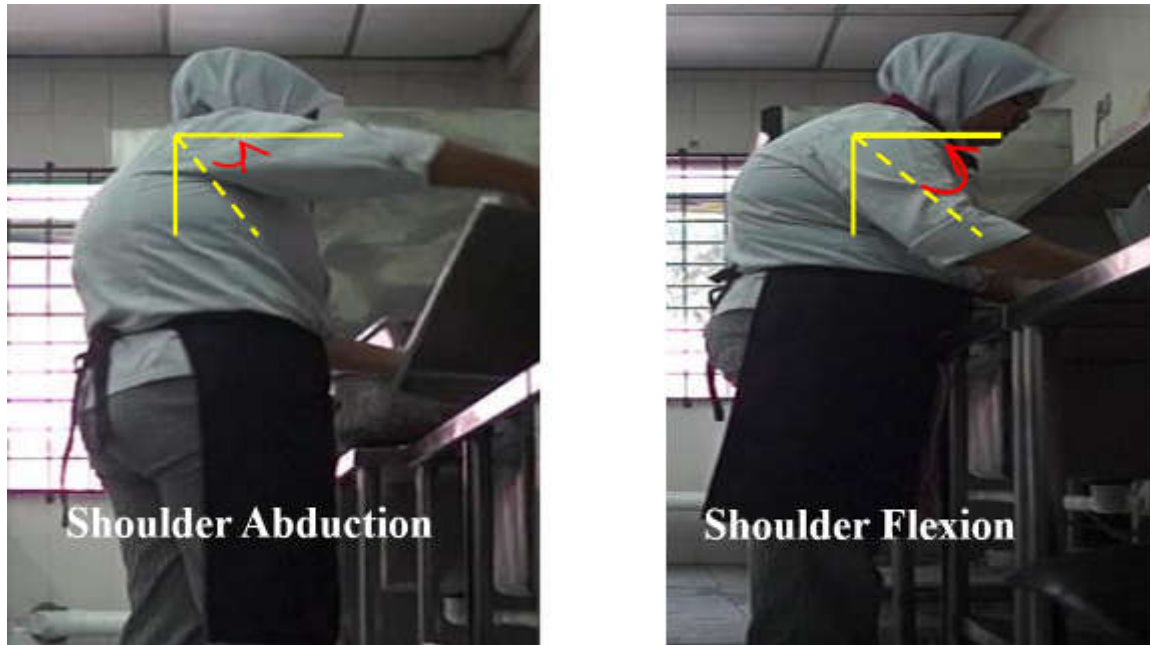
Fig.4. Dish cloth washing activity



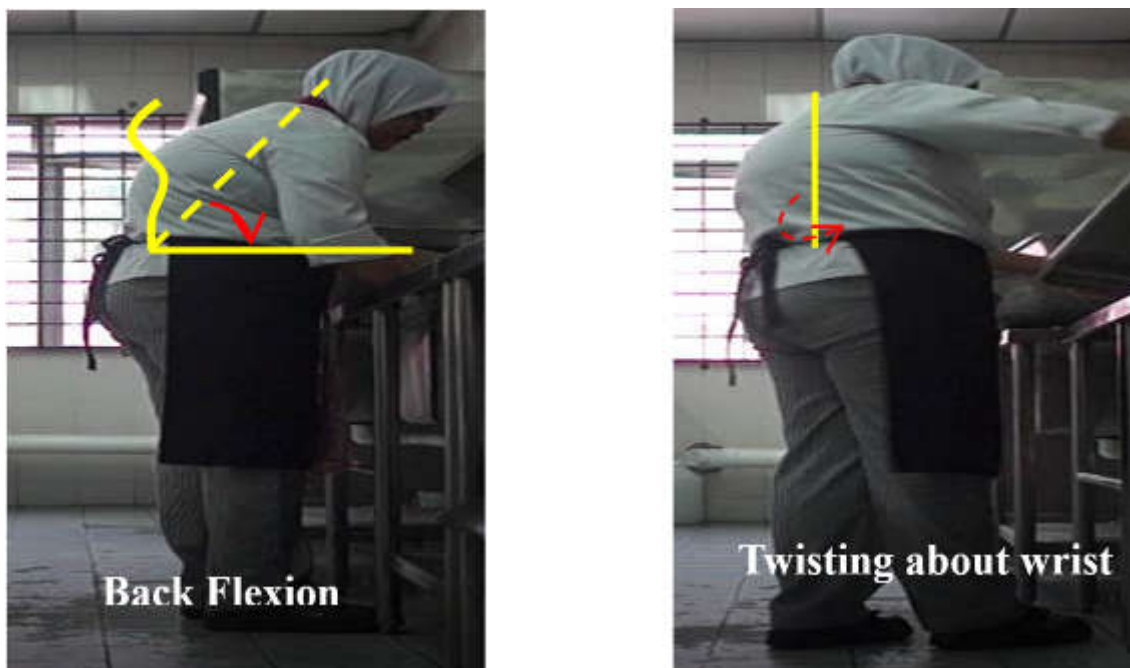
(a) Awkward elbow postures



(b) Awkward wrist postures



(c) Awkward shoulder postures



(d) Awkward back postures













Fig.5. Utensil washing activity

Table 2 shows the RULA score for each posture activity. Posture A is derived from a combination of the Upper Arm, Lower Arm, wrist and wrist twist. However, posture B refers to the neck, trunk and leg. The four activities mentioned earlier clearly produced awkward results for RULA score, which were 6 and 7 for posture A and B. Hence, these postures have potential in causing injuries to workers with prolonged positions.

Table 2. RULA employee assessment worksheet for critical posture activity

Details	Grilled Meat	Frying	Dish Cloth	Wash Utensils
Upper Arm	4	4	4	4
Lower Arm	3	3	3	3
Wrist	4	4	4	4
Wrist Twist	2	2	2	2
Posture A	6	6	6	6
Muscle	1	1	1	1
Force/ Load	0	0	0	1
Wrist And Arm	7	7	7	8
Neck	4	4	4	4
Trunk	3	4	4	4
Leg	1	1	1	1
Posture B	6	7	7	7
Neck, Trunk and Leg	7	8	8	9
Final Score	7	7	7	7

Table 3. Posture activity with RULA score

No.	Activity	Postures Activity	Left	Right	RULA Score
1	Grilled meat				7
2	Frying				7
3	Dish cloth				7
4	Wash utensils				7

Using RULA employee assessment worksheet, there are four identified posture activities with the critical RULA score of 7 which are shown in Table 3. In Table 3, CATIA software produced the left and right side to highlight the critical activities with RULA score of 7. The different colour shows the different RULA score number. But as discussed in Table 1, the standard score from NIOSH for comfort level of RULA analysis clearly states that red indicates the critical part of the body because it is considered a very high risk and the activity or posture should implement an immediate change. These activities should be investigated and the posture changed immediately. The activities were grilling meat, frying, dish cloth washing and utensils washing.

The results showed that working positions for food production workers were mostly standing and walking. They spent nearly 6 hours and above performing food production activities with different potentials of hazards. The findings of the research on work-related musculoskeletal disorders targeted among employees as chefs at the hotel or food production showed that employees demand for a work space and suitable cooking tools, so that cooking devices can ease the tasks [13]. The repetitive food production activities will produce discomfort and pain to human body and can also influence health [14].

The main cause of musculoskeletal danger to representatives or hotel workers is continuous motion, uncontrolled power and also unnatural and static postures, especially during food production activities such as cooking and dishwashing [15]. The injuries exceed 30% of occurrence during load lifting known as over-exertion which contributes to slip or trip factor [16-17].

Beside postures, working environment is also important to secure good health at the workplace. Some studies regarding the effectiveness of musculoskeletal disorders prevention disclose that in manufacturing industries, action should be done in analyzing hazards and work environment [18]. This study has been conducted in a food production area which is similar to hotel kitchen or manufacturing industry. The flooring condition which is wet and dry is the main factor contributing to slip and fall incidents at the workplace. The slips and falls occur due to obstacles, cords, uneven flooring, fluid contamination, stairs, ice or snow [19]. Besides, the design for plumbing drains is inappropriate. The sink, oven, fryer and back

vat are considered hazardous areas in the kitchen due to the likelihood of contamination by water and oily surface [20]. The cooking gas pipeline is inappropriate and exposed. The same design is applied to the location sink, dish washer and food production equipment at the same area. The wet and oily floor creates slip hazards. The slip accidents occur because of the floor surface contamination [21]. Contamination can be categorized as anything that ends up on a floor such as oil, water spill, food item and dust.

The best design of comfortable and pleasant working space can make the food production activities easy and enjoyable [22]. The concept of buddy system and skilled employees are useful for training new employees in food production activities [23]. This approach is useful and helpful in training. This concept will minimize motion in doing work activities and at the same time reduce or eliminate unnecessary repetitive works. Lack of awareness on use of time and labor saving devices and work simplification techniques add to more time and energy expenditure [24].

The combination of these factors has potential in causing slips and falls in the food production area. Working with bad postures creates fatigue and might lead to slip and fall incidents. Slips and falls in industry are expensive and affect human distress, causing fatalities, hence design on how to walk on slippery surfaces should be improved [25].

4. CONCLUSION

This study shows that working with prolonged standing at food production is considered to be bad posture for the human body. During working activities, workers perform their tasks in specified, awkward postures for prolonged working periods. There are four critical activities contributing to RULA score of 7 which are very risky and need immediate changes. Therefore, this study concludes that fatigue is influenced by work activities, working position and duration of awkward posture. Workers also report that lifting load must be below than 5 kg at the food production workstation. Everybody has his or her own distinct abilities and limitations. When an employee has experienced incidents or health condition problem, imbalance problem will easily occur. The combination of those factors will result in slip and fall incidents. Finally, those victims face permanent serious injuries which are fatal. If

workers body postures are used effectively, less energy is used and fatigue can thus be reduced. Good posture provides balance to the body and helps to provide support for the body and inner organs. It is important for staff to look after their own posture to avoid problems arising later in life. Shift work should be minimized to reduce prolonged standing which causes fatigue which in turn will trigger high potential for slip and fall incidence.

In short, this study can create awareness among food production industrial on proper working posture to avoid injury. Musculoskeletal disease will affect the daily life of them and some of the cases prevent workers from working due to back injury. Further study is necessary to identify the relationship between prolonged standing and fatigue during tasks that might impact highly on working posture due to slip and fall incidents. The study should be focusing on employees in food production environment to reduce error during data collection.

5. ACKNOWLEDGEMENTS

The authors would like to acknowledge the Ministry of Higher Education of Malaysia, the Universiti Teknikal Malaysia Melaka (UTeM) and Polytechnic of Merlimau Malacca for the permission and fruitful cooperation in this research.

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How to cite this article:

Syed Ali SA, Kamat SR, Mohamed SB. Analysis awkward posture at food production activity using rula assessment. *J. Fundam. Appl. Sci.*, 2018, 10(1S), 619-632.