ORIGINAL ARTICLE

MOTORCYCLE DELIVERYMAN'S PERCEPTIONS ON RIDING CONDITIONS

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ABSTRACT

Motorcyclists are particularly vulnerable when compared to large vehicles on the road. This study was conducted to gather feedbacks from motorcycle deliveryman regarding their riding conditions. A self-rated questionnaire was used to determine prevalence of riding symptom and its association with Whole Body Vibration and other associated factors among motorcycle deliveryman in Malaysia. A set of questionnaire was developed, pilot tested for its reliability and validity and distributed to 100 respondents. An interview was conducted after gathering the data from the respondents through the questionnaire. Survey findings show majority of the respondents preferred to ride according to the standard riding posture. Large majority of them agreed handlebar and foot peg/rest exposed them directly to the vibration. In addition, majority of them felt discomfort at the lower back and felt fatigue after long hours of riding. These findings are in-line with past studies regarding the road users.

Keywords*:Motorcycle, deliveryman, body part discomfort, vibration*

INTRODUCTION

Although motorcycle riding is a pleasure activity in the developed countries, however in Malaysia it is one of the main alternatives to commute particularly in the big city due to the traffic congestion. This characteristic is beneficial for parking, which is an important consideration in congested cities [1].

Nevertheless, motorcyclists are more exposed to whole body vibration and to improve safety, the vibration must be controlled, because the vibrations would reduce the ability of the rider's perception and reaction [2]. Vibration can cause the rider and passengers feet tired and can interfere with their riding concentration [3,4]. A motorcyclist tends to move more frequently when they feel discomfort while riding. However, due to constraints as opposed to cars, motorcyclists have limited movement. There are numerous studies on motorcyclist issues [5,6,7,8]. However, in Malaysia, the motorcyclist research is still at the budding stage. Hence, in view of limited resources available about the motorcyclist in Malaysia particularly deliveryman, this study will examine the riding conditions among motorcycle deliveryman and relate it with whole body vibration (WBV) and other risk factors. This study will provide a subjective assessment of rider conditions based on the feedback from selected respondents in Malaysia.

Motorcycle Deliveryman Roles

Motorcycle has been a great alternative among deliveryman, compared to the car or truck particularly to deliver small size commodities and documents in central business region [9,10].Normally, motorcycle deliveryman will be provided with box at the back and side of the motorcycle to storedocuments or commodities to be delivered to clients or customers.

The use of motorcycles for delivery purpose is perceived by the industry to be the best way of transportation [11].Due to its size, time and fuel saving, motorcycle has been used by majority of the industries that providing delivery services, such as post office, fast food shops, and grocery shop. As mentioned by Chung et al., the rapid service among the deliveryman is important[11]. The deliveryman has specific schedule need to be fulfill every day. This task required lots of travel activity on the road, even under the poor weather and bad road congestion.

METHODS

Development of Survey Questionnaire

The questionnaire was developed based on the requirements and problems faced in previous studies found in the literature [12,13,14]. The survey questionnaire consisted of four main sections: Section A-Demographic information, Section B-Favorite riding posture, Section C-Motorcycle Component that Exposed to Vibration, and Section D-Riding discomfort. For Section B, there are three favorite postures to be selected; A) knee angle: 67^0, forward lean: 37^0, B) knee angle: 80^0, forward lean: 7^0 and C) knee angle: 113^0, forward lean: 0^0 as depicted in Figure 1. These selected postures were adapted from past studies [10; 11]. Posture A shows the typical sport riding

posture, posture B shows the standard riding posture, while posture C shows the typical cruiser riding posture.

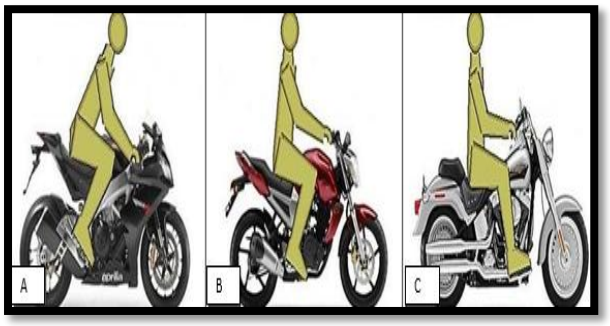

Figure 1- Three favorite riding postures

For Section C, the dichotomous scale (yes or no) was used to determine the respondents' rate of agreement to particular components. There are four main components that may be exposed to vibration in this survey questionnaire: i) handlebar, ii) foot peg and control, iii) motorcycle seat, and iv)helmet. Section D also used the dichotomous scale (yes or no) to determine the respondents' rate of agreement to particular symptoms. Table 1 shows symptoms that may appear during motorcycle riding.

Table 1 - Riding symptoms

No	Symptoms
1	Fatigue
2	High blood pressure
3	Migraine
4	Low back pain (LBP)

In addition, Section D also required the respondents to answer to the Body Part Discomfort form. This form was modified based on past studies [15]. There are twelve body parts for Section D; neck, shoulders, upper back, upper arms, low back, arms, wrist, buttock, thighs, knee, legs and feet. For this section, there are three main questions for each body part.

i) Discomfort frequency: This question used three scales; (1) Never, (2) Frequent, (3) Often.
ii) Discomfort rate: This question used three main scales; (1) A little discomfort, (2) Medium discomfort, (3) Very discomfort
iii) Ability to work when feel discomfort: This question used three main scales; (1) Not disturbing, (2) Quite disturbing, (3) Always disturbing.

Furthermore, the respondents are required to select on the right condition of the color change at the finger after riding. There are four colors in this part to be selected: i) white, ii) red, iii) blue and, iv) normal. The red, blue, and white fingers are related to Raynaud's phenomenon [16]. White is due to inadequate blood flow, blue is due to oxygen depleted in the tissues, and red is due to the blood comes rushing back when the hands warm up [16,17].

Expert Validation and Pre-test

The questionnaire was submitted to experts (university lecturers who are specialized in the ergonomics research field) to check for the appropriateness of the survey questionnaires structures, such as clarity of questions and the questionnaires contents. Based on feedback from ergonomics experts, the questionnaire was modified and subsequently was submitted to the selected motorcycle deliverymen for the pre-test purpose. The pre-test was performed to ensure the validation of the survey questionnaire. Based on the pre-test, the feedbacks from selected respondents were as expected (the respondent can easily understand the questionnaire and can answer the questions based on their working experience).

Distribution of Final Questionnaires

There were 100 respondents involved in this study. They are 90 postmen, 8 food deliveryman and 2 dispatch man. Prior to answering the questionnaire form, each respondent was given the detailed instructions on the questionnaire requirement. The time required to fill out the questionnaires is approximately 15 minutes.

Conducting an Interview

An interview was conducted with the selected respondents. Ten respondents were involved in this interview. This interview was performed to obtain general view about deliveryman's condition. In addition, the interview is purely based on the average collected findings from previous questionnaire in order to acquire clear and more information from them. Based on the interview, LBP is the common problem faced by the motorcycle delivery man after working in this field for 6 months. In addition, the respondent also experienced white finger after a long hours of riding but it is not categorized as critical yet.

RESULTSAND DISCUSSIONS

Respondents' Background

There were 100 male respondents (mean age: 30.17 years) involved in this study, which comprised of 97% Malay and 3% Indian. All respondents used motorcycles with automatic transmission while riding and majority of them ride motorcycles with engine capacity of 125 cubic centimeters. Table 2 shows the respondents' background regarding their work life. Majority of the respondents ride more than 21 kilometers (km) per day. In addition, 70% of the respondents experienced fatigue after two hours of riding. It is in line with the past studies that mentioned fatigue among road users always occurs after two hours of driving [12,18].

Table 2 - Respondents' information

Items	Sub items	Percentage (%)
Riding distance per day	<5 km	1
	5-10 km	1
	11-20 km	2
	21-50 km	47
	>50 km	49
When experience fatigue?	After 1 hour	14
	After 2 hours	70
	Others	16

Favorite riding posture

Sixty four percent of the respondents preferred to ride according to posture B, followed by posture C (22%) and posture A (14%) as depicted in Figure 1. In addition, 59% of the respondents aware on the importance of riding posture, while 14 % are unaware.

Motorcycle Component that Exposed to Vibration

Figure 2 shows the respondents' agreement on the components that exposed to vibration when riding. More than 80% felt vibration exposure at the handlebar (81%) and foot peg/rest (88%). Only 28% experienced the vibration coming from helmet. Basically, the respondents' felt the vibration coming from helmet because it is induced from shaking of the head when riding. In addition, the respondents felt vibration from choosing the wrong size of helmet and wearing the helmet in the improper way (e.g. do not fasten the helmet strap properly).

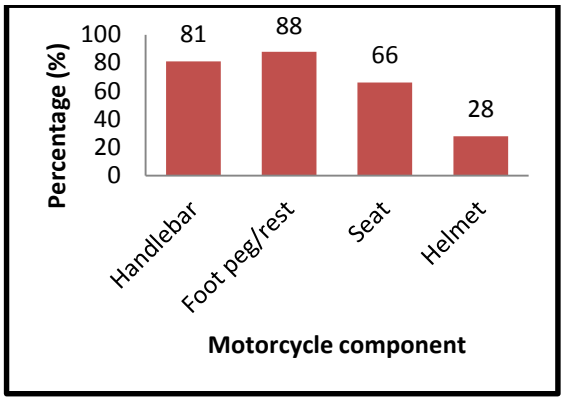

Figure 2 - Motorcycle components

Riding symptoms

Figure 3 shows the respondents' agreement of symptoms when riding. More than 70% of the respondents experienced fatigue and LBP when riding. Fifty seven percent (57%) experienced migraine and 13% experienced the high blood pressure. In addition, based on interview with selected respondents as mentioned earlier, the respondents also experienced white finger symptoms after long hours of riding.

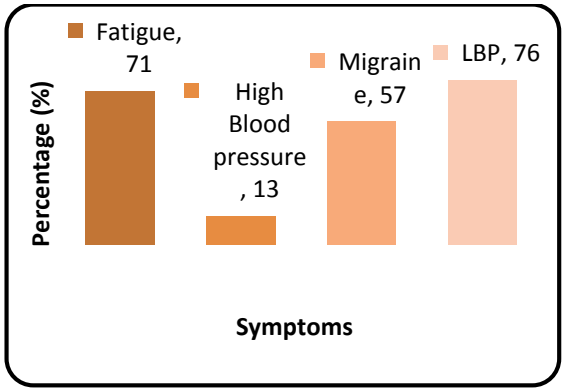

Figure 3 - Riding symptoms

Body Parts Discomfort

To summarize the findings in this part, 82% of the respondents always feel discomfort at the low back, followed by upper back (65%), wrist (55%), upper arm (54%), buttock (42%), and neck (33%). In addition, based on the color change when riding, 70% of the respondents mentioned they experienced normal color, 14% red color, 13% white color and 3% blue color.

Statistical Analysis

One way ANOVA was conducted on four variables (age, discomfort, job disruption, and fatigue level) to get the correlation between

them. Age was choose as one of the variable due to finding by one study conducted by Son et al. that found older people may demonstrate less performance while doing a task, as compared to younger people[19]. Based on the findings, there is correlation between the age level and the discomfort level. An individual will experience a lot of discomfort as he/she get older. Discomfort may occur due to long duration of riding with constrained space and riding posture. Low back discomfort is one of the common problems by most of the rider. As mentioned by Viano et al., low back pain and other disabilities issues are consequence of the aging process[20]. In addition, the analysis shows when someone feels discomfort, it will disrupt their job and may lead to fatigue.

CONCLUSIONS

The present study demonstrates the riding conditions based on the feedback from 100 deliverymen. From this study, it can be concluded that majority of the respondents preferred to ride in the standard riding posture. In 8 hours of normal working duration, majority of the respondents required to ride for more than 21 kilometers per day. In addition, 70% of the respondents experienced fatigue and LBP after long hours of riding. Furthermore, majority of the respondents always feel discomfort at the lower back, upper back, wrist, and upper arm. All this body parts are always in contact when riding the motorcycle. In the future, it is suggested to conduct a comparison study between the younger and older motorcycle deliveryman regarding their performance while working and find connection with suitable objective methods, such as heart rate and skin conductance.

REFERENCES

1. Ambroz, K. and Olaya, C. Wanted: Easy riders the aging of the German motorcycle rider population and its Implications on the motorcycle market, 2006.

2. Cossalter V., Doria A., Tognazzo M. On the response of rider body to motorcycle oscillations. *XX Congresso AIMETA*, Bologna, 12-15 September 2011.

3. Griffin, M.J. Handbook of Human Vibration. Elsevier, 1996.

4. Motorcycle Council of North South Wales. Fatigue. Retrieved from http://roadsafety.mccofnsw.org.au/a/50.html, 2006.

5. Walker, G. H., Stanton, N. A., & Young, M. S. The ironies of vehicle feedback in car design. Ergonomics 2006; 49(2), 161–179.

6. Haworth, N., & Rowden, P. Investigation of fatigue-related motorcycle crashes – Literature review (RSD0261). Report to Vic roads. Brisbane: The Centre for Accident Research & Road Safety, Queensland University of Technology, 2006.

7. Kee, S.S., Mohd Tamrin, S.B. and Goh Y.M. Driving Fatigue and Performance among Occupational Drivers in Simulated Prolonged Driving. Global Journal of Health Science 2010; 2(1): 167-177.

8. Ng, W. K and Selva, P. OSH Profile in the transport sector in particular commuting hazard. Retrieved from http://www.mtuc.org.my/osh_profile_transport.htm, 2003.

9. Sano, K., Minh, C. C., Wisetjindawat, W., & Sattayaprasert, W. A study on the behavior of delivery motorcycles in Bangkok. *Journal of the Eastern Asia Society for Transportation Studies*, 2005;6: 157–172.

10. Kieling, R. R., Szobot, C. M., Matte, B., Coelho, R. S., Kieling, C., Pechansky, F., & Rohde, L. A. Mental disorders and delivery motorcycle drivers (motoboys): a dangerous association. *European psychiatry : the journal of the Association of European Psychiatrists*, 2011;*26*(1): 23–27.

11. Chung, Y., Song, T.-J., & Yoon, B.-J. Injury severity in delivery-motorcycle to vehicle crashes in the Seoul metropolitan area. *Accident; analysis and prevention*, 2014, 62: 79–86.

12. Khamis, N.K., Deros, B.M., Nuawi, M.Z., and Omar, R.B. Driving fatigue among long distance heavy vehicle drivers in Klang Valley, Malaysia. *Applied Mechanics and Materials*, 2014; 663: 567-573.

13. Resnick, E. Motorcycle Ergonomics Simulator, Retrieved from cycle-ergo official website: http://cycle-ergo.com/, 2012.

14. Ma'rof, M.I.N. and N Ahmad, I. Proposed Standard Method for Motorcycle Nomenclature System. *Southeast Asian Network of Ergonomics Societies Conference 2012 (SEANES 2012)*, 2012.

15. Corlett, E. N. and Bishop, R.P. A technique for measuring postural discomfort. *Ergonomics* 1976; 9: 175-182.

16. MedicineNet. Raynaud's phenomenon. Retrieved from http://www.medicinenet.com/raynauds_phenomenon/page2.htm#what_conditions_have_been_associated_with_raynauds_phenomenon, 2004.

17. Arthritiesresearchuk. What are the symptoms of Raynaud's phenomenon?. Retrieved from http://www.arthritisresearchuk.org/arthritis-information/conditions/raynauds-phenomenon/symptoms.aspx, 2013.

18. MIROS. MCP 1/27: Kod Amalan Keselamatan dan Persekitaran untuk Sektor Pengangkutan. http://www.miros.gov.my/html/themes/MIROS/MIROS_pdf/research_reports/COP_Kod_Amalan_KeselamatanKesihatanPersekitaran_Sektor.pdf6, 2013.

19. Son, J., Mehler, B., Lee, T., Park, Y., Coughlin, J., & Reimer, B. Impact of cognitive workload on physiological arousal and performance in younger and older drivers. *Proceedings of the Sixth International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design*, 2011, pp. 87–94.

20. Viano, D. and Andrzejak, D., "Research Issues on the Biomechanics of Seating Discomfort: An Overview with Focus on Issues of the Elderly and Low-Back Pain," SAE Technical Paper 920130, 1992.