

Reliability and Construct Validity of the Malay Version of the Cyclist Motivation Instrument (CMI)

Cheah W Lian ¹✉, Helmy Hazmi ¹, Emmanuel R Razali Lukas ², Irvy E Joannes ², Jaeverny H Berry ² and Luther Lim ²

Abstract

With increasing interest in cycling, there is a need to understand what motivates cyclists to cycle. The Cyclist Motivation Instrument (CMI) has been shown to be a valid and reliable instrument to measure the motivation factors elsewhere. The present study was to assess the reliability and construct validity of the Malay version of the Cyclist Motivation Instrument among cyclists in Kuching, Sarawak, Malaysia. A total of 180 cyclists consented to participate in the study and were given the Malay version of the CMI to complete. Back translation method was used to ensure the face validity of the questionnaire. Reliability was determined using Cronbach's alpha for internal consistency. Construct validity was assessed using exploratory factor analysis. The internal consistency for all components was satisfactory with Cronbach's alpha coefficients of 0.799 to 0.880 and therefore confirmed the adequacy of these components. Exploratory factor analysis using Principal Component Analysis with a Varimax rotation showed 32 items were loaded into six factors orthogonal solution with 67.8% of the variance. In conclusion, all components of CMI were found to be reliable and valid for determining factors motivating cyclists to cycle.

Keywords: Cycling, motivating factors, psychometric testing

✉ **Contact email:** wcheah@fmhs.unimas.my (CW. Lian)

¹ Department of Community Medicine & Public Health, Faculty of Medicine and Health Sciences, University Malaysia Sarawak

² Faculty of Medicine and Health Sciences, University Malaysia Sarawak

Received: 27 September 2013. Accepted: 24 June 2014.

Introduction

Cycling is a form activity of riding a bicycle for transport, recreation or sport. For many centuries, the bicycle has been an efficient means of transportation because of its ability to avoid traffic congestion, and it does not consume any fuel. Today, recreational cycling has become a popular health-enhancing physical activity. Statistics have shown that in country like Australia, ninety percent of the population aged 15 years or above are involved in recreational cycling in a non-organised capacity (Bell et al. 2006), and it is categorized as the fourth most popular physical recreation activity (Rissel et al. 2006). In Malaysia, a total of 15, 335 cyclists were recorded in year 2011 (Baikbike 2011). Cycling is an easy and low-impact activity that helps to reduce the risk of a range of health problem, notably heart disease and cancer - the leading preventable causes of premature death. Results from many epidemiological and experimental research supported that cycling has a positive impact on health. A longitudinal study among 30,640 subjects in Copenhagen found that those who did not cycle to

work has a higher mortality rate (39%) compared to those who did (Cavill et al. 2007). Another study also reported similar findings where a regular cyclist enjoyed a fitness level that is equivalent to being five to ten years younger (Tuxworth et al. 1986).

With the increased interest in cycling, there is a need to understand what motivates people to cycle and sustain their interest that will improve their health and wellbeing. One of the health behaviour theories that explain the motivation in cycling is the socio-ecological theory (Bronfenbrenner 1979). This socio-ecological framework emphasized the importance of understanding the social, physical and policy environment to explain the intrapersonal determinants of participation (Giles-Corti et al. 2005). Based on this theory, Brown and colleagues (2009) developed a new tool, the Cyclist Motivation Instrument (CMI) to understand these motivations, with the intention that the knowledge gained can help to develop training programmes to promote cycling in formal and informal environments.

The CMI is an instrument that incorporates social, cultural, economic and ecological factors associated with the motivation of cyclists who take cycling as serious leisure activity. It is a self-administered questionnaire of 39 items – social (11 items), embodiment (11 items), self-presentation (8 items), exploring environments (5 items) and physical health outcomes (5 items). As at the time of writing of this paper, there has been no translation done in the Malay language, nor has the Malay version of the CMI been



tested in Malaysia. Therefore the acceptability or validity on Malaysian is not known. The purpose of this study is to assess the reliability and construct validity of the Malay version of the CMI among cyclists in Kuching, Sarawak, Malaysia.

Materials and methods

Study design

This study was based on a cross-sectional study design aiming to validate the Malay version of CMI amongst cyclists in Kuching, the capital city of Sarawak. Based on 2010 census, Kuching has an estimated population of 681,910 people as reported by the Department of Statistics Malaysia, Sarawak Branch (Department of Statistics Malaysia 2010).

In Kuching, there are many formal and informal groups of cyclists. Some of these cyclists are registered with an association known as Sarawak Cycling Association. There is no official record on the number of registered or non-registered cyclists with any cycling associations. However, through informal conversation with the Sarawak Cycling Association, there are about 500 cyclists in Kuching with half the number who are considered 'regulars' or "seriously cyclers".

Sample size

Respondents were recruited through all the major cyclists' clubs (formal or informal), dedicated/professional bicycle shops and major local cycling competitions. Data were collected using the self-administered Malay versions of the CMI after written informed consent.

Questionnaire

The original CMI questionnaire consists of 39 items and all these items were selected for this study (Brown et al. 2009). The responses were based on a seven point Likert scale where a score of one does not correspond at all to the subject's feeling about cycling, a score of four corresponds moderately and a score of seven corresponds exactly. Mean scores were generated for each compartment, except for the socio-demographic characteristics. Higher scores signify better perceptions.

The process of translation involved the following: Firstly, two of the authors who were bilingual in both Malay and English each translated the questionnaire into Malay language separately. Following this, they synthesized and produced one common translation based on consensus. Once the translated version is done, another two translators who were totally blind to the original version translated the questionnaire back into the original language. A final meeting was held that involved the final two authors, the translators (forward and back translators), two invited cyclists to consolidate the versions of the questionnaire and develop the pre-final version of the questionnaire for field testing. A pilot study was conducted to check the face validity. The draft questionnaire was administered to a group of 20 cyclists to determine whether the questionnaire is being understood correctly in term of

Table 1. Socio-demographic characteristics of respondents (N=180)

Socio-demographic variable	Mean	(SD)
Age (years)	33.33	11.24
	Frequency (n)	Percent (%)
Gender		
Male	142	78.9
Female	38	21.1
Race		
Malay	90	50.0
Chinese	74	41.1
Others	16	8.9
Marital status		
Single	80	44.4
Married	100	55.6
Employment status		
Employed	129	71.7
Unemployed	51	28.3

Table 2. Cycling profile of participants (N=180)

Cycling profile	Frequency (n)	Percentage (%)
Types of cyclist		
Road biking	71	39.4
Off-road biking	39	21.7
Road & off-road biking	70	38.9
Regular speed of training (km/h)		
<20	26	14.4
21-25	38	21.1
26-30	36	20.0
31-35	40	22.2
36-40	28	15.6
>40	12	6.7

language. Only a minor modification was done on the draft questionnaire to produce its final version. This process took about one month to complete (from September to October 2012).

Data collection was carried during a period of five months from November 2012 to March 2013.

Ethics approval was obtained from the Medical Ethics Committee of University Malaysia Sarawak (reference number: UNIMAS/TNC (AA)-03.02/06-11 Jld. 2(31)).

Statistical analysis

Data were entered and analysed using SPSS version 19.0. Descriptive analysis such as mean and standard deviations, frequency and percentages for all variables were presented. For internal consistency, Cronbach's alpha was generated. Exploratory factor analysis (principal components with varimax rotation) was carried out to determine construct validity of the instrument. The significance level was set at .05, with a cut-off criterion for component loadings of at least .50 was used in interpreting the results.

Results

Socio-demographic Characteristics and Cycling Profiles of Participants

A total of 180 cyclists in Kuching participated in this study with the mean age of 33.33(SD=11.24) years. Male cyclists made up the vast majority of the total participants (78.9%). Malays accounted for half (50.0%) of the participants followed by Chinese which accounts for 41.1%. About 55.0% of the participants are married. The number of employed participants was higher (71.7%) than unemployed participants. Among

Table 3. Item-total correlations and Cronbach's alpha coefficients for the CMI scales

Scale	Item	Item-total correlation	Cronbach's alpha
Health-related factor	Q3 Environmental friendly	.735	.821
	Q5 Prevent injuries	.540	
	Q6 Set goals on health & fitness	.711	
	Q7 Feeling of exhilaration	.789	
	Q11 Can eat whatever like	.270	
	Q15 Feel refreshed & invigorated	.745	
	Q18 Removes stressful environments	.696	
Social	Q23 Stay free from lifestyle diseases	.713	.847
	Q19 Social activity	.733	
	Q34 Share same interest	.793	
	Q35 Allows to meet new people	.826	
	Q38 Socialising after /during ride	.696	
Peer support	Q1 Feel part of the group	.712	.880
	Q21 Presence of others is motivating	.670	
	Q22 Member of a cycling club	.684	
	Q28 Spend time with others with similar goals	.603	
	Q30 Like receiving encouragement from peers	.792	
	Q36 Cycling in club/store clothes allows sense of belonging	.766	
	Q37 It is a team sport activity	.789	
Transportation & facilities	Q2 Area is a great place to cycle	.572	.799
	Q13 It is an efficient form of transport	.788	
	Q20 To get to and from places	.783	
	Q32 Allow exercise and get to the places	.705	
Embodiment	Q9 Sensation of moving fast	.731	.819
	Q12 Competitive person	.740	
	Q14 Satisfaction from beating someone	.692	
	Q16 Confident any goal that is set	.651	
	Q26 Can do at any age	.592	
Self-presentation	Q27 Enjoy the simplicity of cycling	.582	.878
	Q4 Allows to test myself in competition	.760	
	Q8 Like others to think of me as being athletic	.860	
	Q33 Like others to think of me as a cyclist	.840	

the participants, 39.4% were road bikers, 21.7% were off-road bikers and the remainder engaged in both types of cycling. The range of regular training speed of most participants was 31km/h to 35 km/h (22.2%) and only 6.7% had at least more than 40 km/h training speed. Further information on the socio-demographic characteristics are presented in Table 1, and the cycling and health profiles of the respondents are presented in Table 2.

Reliability (internal consistency)

Table 3 shows the item-total correlations and Cronbach's alpha coefficients for all 32 items of the CMI scales. Values for all item-total correlations for health-related factor were found to be ranging from 0.270 to 0.789 indicating that each scale of the items had low to good correlation with other items under the subscale. As for the Social scale, all items showed to have good correlation with other items with a range of 0.733 to 0.826. Whereas, under peer support scale, similar pattern was found with all items showed good correlation with other items with 0.603 to 0.792. For transportation and facilities, the item-total correlation co-efficient shows good correlation with other items with a range of 0.572 to 0.788.

Construct validity

Table 4 presents the results of exploratory factor analysis using Principal Component Analysis (PCA) with a Varimax rotation. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was 0.896

(greater than 0.6) and the Bartlett's Test of Sphericity (BTS) was significant with $p < .001$, indicating the factorability of the correlation matrix was assumed.

Based on the Scree plot and eigenvalues greater than 1, only 32 of 39 items were loaded into six factors orthogonal solution. The solution accounted for 67.8% of the variance with the first factor explaining the greatest amount of variance (35.87%). No variables were found to be loaded on more than one factor. The rotation converged in 9 iterations.

A total of eight items were loaded on component 1, four items loaded on component 2, seven items loaded on component 3, four items loaded on component 4, six items loaded on component 5, and the final three items on the last component. The components were named based on the association of the items within the same component. Instead of the five items in the original questionnaire by Brown et al. (2009), the six items generated from this study were named health, social, peer support, transport and facilities, embodiment and self-presentation. The factor loading were found ranging from 0.501 to 0.837.

Discussion

This study has taken the preliminary steps in understanding the cyclists in Malaysia, a country with a diverse cultural background. Like any other "serious leisure" sports, cycling has gained popularity in Malaysia in the recent years. The sport itself has generated not only in terms of economic growth with an increased number of bicycle shops but also activities

Table 3. Item-total correlations and Cronbach's alpha coefficients for the CMI scales

Item	Factor 1 Health	Factor 2 Social	Factor 3 Peer support	Factor 4 Transport & facilities	Factor 5 Embodiment	Factor 6 Self-presentation
Cycling allows me to be environmentally friendly (Q3)	.727					
Cycling prevents me from developing injuries (Q5)	.619					
Cycling allows me to set new goals related to my health and fitness (Q6)	.765					
I enjoy the feeling of exhilaration after I have ridden my bike (Q7)	.788					
I cycle so I can eat whatever I like (Q11)	.837					
Cycling allows me to feel refreshed and invigorated (Q15)	.691					
Because cycling removes me physically from stressful environments (Q18)	.583					
Cycling allows me to stay free from 'lifestyle' diseases (Q23)	.573					
I consider cycling to be a social activity (Q19)		.534				
My fellow cyclists share the same interests as me (Q34)		.649				
Cycling allows me to meet new people (Q35)		.598				
I enjoy socialising after/during ride at a café or similar venue (Q38)		.607				
Cycling allows me to feel part of the group (Q1)			.504			
The presence of others motivates me to ride (Q21)			.501			
I need to be a member of a cycling club to meet my needs (Q22)			.617			
Cycling allows me to spend time with others who have similar goals (Q28)			.738			
I cycle because I like receiving encouragement from peers (Q30)			.638			
Cycling in club/store clothes allows me to feel part of something (Q36)			.547			
I cycle because it is a team sport activity (Q37)			.778			
My area is a great place to cycle (Q2)				.833		
I cycle because it is an efficient form of transport (Q13)				.763		
I cycle to get to and from places (Q20)				.786		
Cycling allows me to exercise and get to places at the same time (Q32)				.605		
I enjoy the sensation of moving fast whilst cycling (Q9)					.677	
I am a competitive person (Q12)					.660	
I get satisfaction from beating someone up a hill (Q14)					.746	
I am confident any goal I set myself in cycling I could achieve (Q16)					.525	
Cycling is an activity that you can do at any age (Q26)					.722	
I enjoy the simplicity of cycling (Q27)					.502	
Cycling allows me to test myself in competition (Q4)						.582
I like others to think of me as being athletic (Q8)						.791
I like others to think of me as a cyclist (Q33)						.731

in the form of competitions or leisure rides. Formal and informal cycling clubs/groups are established to create a community of cyclists that support their interest in this sport. As O'Connor and Brown (2007) indicated that cycling is a social activity that create and fulfill individual's needs whether in the form of social support, health, embodiment, self-presentation or transportation. The original social factor drew eleven items but only four items were loaded within the same component in this study. The other seven items were loaded into another component under peer support. The formation of buddy groups for cycling was found to be a strong source of social support in cycling (McAuley et al. 1994). Like any other physical activity in general, social support from friends and family helps to sustain the interest in the activity itself particularly in cycling where it involves fitness level and knowledge in bicycle maintenance. Peer influence was found to be able to enhance higher self-efficacy in stimulating cycling activity among recreational cyclists (de Geus et al. 2008). There is another new component: transport and facilities which drew four items. Besides being a serious leisure sport, the finding indicated cycling can be perceived as a form of transportation that allows people to move from one place to another. In most

developed countries, dedicated cycling paths are available in the city centers to encourage cycling as a form of transportation as it is more cost-effective, convenient and safe (Bonham et al. 2010; Bopp et al. 2012). Furthermore, it has health and exercise benefits (Gatersleben et al. 2007). However, in this study site, cycling infrastructure is still limited which explained why cycling as a form of transport is uncommon. Traffic conditions, motorist aggression and safety were some of the major reported concerns, consistent with other cities (Bonham et al. 2010; O'Connor et al. 2010).

Health, social, embodiment and self-presentation remain as the same component in this study. Under health component, three additional items were drawn compared to the original five items. Like most physical activity and leisure sport, cycling helps to improve health and fitness level. It also helps cyclists to escape from their stressful environment and subsequently maintaining a healthy lifestyle. This finding is consistent with Brown et al. (2009). Embodiment as indicated by Brown et al. (2009) is a diverse set of items that give a form to ideas that are usually not in the physical manner. In this study, respondents expressed their sensation of moving fast, being competitive, having satisfaction of doing better, being suitable for all ages, and the simplicity of cycling as a form of embodiment. Whereas, in self-presentation, cyclists gain favourable social impression (Leary, 1992), enhanced status (Smith, 2000), admiration and respect (Thornton et al. 1995) through the three items drawn from this study.

The internal consistency for all components was satisfactory with Cronbach's alpha coefficients of 0.799 to 0.880 and therefore confirmed the adequacy of these components. All components were found to be consistent with the original questionnaire by Brown et al. (2009), except for health related factors where the Cronbach's alpha was higher (0.821 vs 0.63).

A major limitation of our study was the recruitment of the respondents in this study was done through cyclists clubs, bicycle shops, cycling rides and competitions. Thus the random selection of samples was compromised. Nevertheless, within the study periods, we were able to capture majority of the cyclists in Kuching into this study. We acknowledge that there is a gender bias in the sample size selection with response rate from female respondents of 21.1%. This is not uncommon as studies done in other countries reported as female participation in cycling was as low as 12% (Brown et al., 2009), 7.2% (Thornton et al. 1995).

In conclusion, this study supported that all the components of CMI were reliable and valid for determining factors motivating cyclists to cycle. To generate a more comprehensive finding, a larger sample with the use of more sophisticated data analysis such as confirmatory factor analysis and convergent validity would be ideal. As this instrument was originally derived from the socio-ecological theory, the participation of this serious leisure sport depends on the different needs, goals and cultural background of

individuals. Therefore, it is important that interpretation of the finding should be based on different sub-cultural group within the cycling population.

Acknowledgment

We would like to thank all the respondents who participated in this study.

Conflict of interest

There were no conflict of interest relevant to this manuscript.

References

1. Australian Bureau of Statistics (2007) Participation in sports and physical recreation 2005-2006. AST, Canberra, ACT
2. Baikbike (2011) How many cyclist are there in Malaysia? Available at <http://www.baikbike.com/baikbike-reports/>
3. Bell AC, Garrard J, Swinburn BA (2006) Active transport to work in Australia: is it all downhill from here? *Asia-Pacific journal of public health/Asia-Pacific Academic Consortium for Public Health* 18(1):62
4. Bonham J, Koth B (2010) Universities and the cycling culture. *Transp Res Part D – Transp Environ* 15(2):94-102
5. Bopp M, Kaczynski AT, Besenyi G (2012) Active commuting influences among adults. *Prev Med* 54:237-241
6. Bronfenbrenner U (1979) *The Ecology of Human Development*. President and Fellows of Harvard College, United State of America
7. Brown TD, O'Connor JP, Barkatsas AN (2009) Instrumentation and motivations for organised cycling: the development of the cyclist motivation instrument (CMI). *Journal of Sports Science and Medicine* 8(2):211-218
8. Cavill N, Davis A (2007) Cycling and health what's the evidence. Available at <http://www.ecf.com/wp-content/uploads/2011/10/Cycling-and-health-Whats-the-evidence.pdf>
9. de Geus B, de Bourdeaudhuij I, Jannes C, Meeusen R (2008) Psychosocial and environmental factors associated with cycling for transport among a working population. *Health Education Research* 23(4):697-708
10. Department of Statistic Malaysia . 2011. Population Distribution and Basic Demographic Characteristics. Available at : http://www.statistics.gov.my/portal/download_Populasi_files/census2010/Taburan_Penduduk_dan_Ciri-ciri_Asas_Demografi.pdf
11. Gatersleben B, Appleton KM (2007) Contemplating cycling to work : attitudes and perceptions in different stages of change. *Transp Res Part A – Policy Prac* 41(4):302-312
12. Giles-Corti B, Timperio A, Pikora T (2005) Understanding physical activity environmental correlates: increased specificity for ecological models. *Exercise and Sport Science Reviews* 33(4):175-181
13. Leary MR (1992) Self-presentation processes in exercise and sport. *Journal of Sport and Exercise Psychology* 14:339-351
14. McAuley E, Courneya KS, Rudolph DL, Lox CL (1994) Enhancing exercise adherence in middle-aged males and females. *Prev Med* 23:498-506

15. Naing L, Winn T. Sample size calculation for studies of internal consistency reliability (Cronbach's alpha). Available at: http://www.kck.usm.my/jpm/index.php?option=com_docman&task=cat_view&gid=42.
16. O'Connor JP, Brown TD (2007) Real cyclists' don't race: informal affiliations of the weekend warrior. *International Review for the Sociology of Sport* 42(1):83-97
17. O'Connor JP, Brown TD (2010) Riding with the sharks: serious leisure cyclist's perceptions of sharing the road with motorists. *J Sci Med Sports* 13(1):53-58
18. Rissel C, Garrard J (2006) Cycling for active transport and recreation in Australia: Status review and future directions. *World Transport Policy & Practice* 13(1):49-63
19. Smith SL (2000) British nonelite road running and masculinity – a case of “running repairs”? *Men and Masculinities* 3(2):187-208
20. Thornton EW, Scott SE (1995) Motivation in the committed runner: correlations between self-report scales and behaviour. *Health Promotion International* 10(3):177-184
21. Tuxworth W, Nevill A, White C, Jenkins C (1986) Health, fitness, physical activity and morbidity of middle-aged factory workers. *British Journal of Industrial Medicine* 43:733 -775