New Trends and Issues Proceedings on Humanities and Social Sciences

Volume 4, Issue 1 (2017) 226-231

ISSN 2421-8030
www.prosoc.eu
Selected Papers of 9th World Conference on Educational Sciences (WCES-2017) 01-04 February 2017 Hotel Aston La Scala Convention Center, Nice, France

Validity of backs tool in assessing low back pain among Nurses in Malaysia

Wan Nor Arifin [a*], Department Community Medicine, Faculty of Medical Sciences, USM Health Campus, University of Malaysia, 16150, Kelantan, Malaysia.
Izani Uzair Zubair [b], Department Community Medicine, Faculty of Medical Sciences, USM Health Campus, University of Malaysia, 16150, Kelantan, Malaysia.
Mohd Ismail Ibrahim [c], Department Community Medicine, Faculty of Medical Sciences, USM Health Campus, University of Malaysia, 16150, Kelantan, Malaysia.
Mohd Nazri Shafei [d], Department Community Medicine, Faculty of Medical Sciences, USM Health Campus, University of Malaysia, 16150, Kelantan, Malaysia.

Suggested Citation:
Arifin, N. W., Zubair, U. I., Ibrahim, I. M. & Shafei, N. M. (2017). Validity of backs tool in assessing low back pain among nurses in Malaysia. *New Trends and Issues Proceedings on Humanities and Social Sciences.* [Online]. 4(1), pp 226-231. Available from: www.prosoc.eu

Selection and peer review under responsibility of Prof. Dr. Jesus Garcia Laborda, University of Alcala, Spain.

Abstract

"Back Apparatus: Collaboration between UKMMC with SOCSO" (BACKS) Tool is a Malay-language questionnaire that was developed to assess work-related chronic low back pain (LBP) in Malaysia. This study provided internal structure evidence of construct validity of BACKS Tool among nurses in Malaysia. A cross-sectional study involving 1290 nurses in six public hospitals in Penang, Malaysia was conducted. Job demands sub-scale consists of two factors namely Physical Demand (5 items) and Psychological Demand (9 items). The data was analyzed by confirmatory factor analysis (CFA). The analysis showed two- and one-factor models fit the data equally good (CFI and TLI>0.9, RMSEA<0.08, SRMR<0.08) with good composite reliability. However, the two-factor model showed poor discrimination between the Physical Demand and Psychological Demand factors (r=0.944). Although the discrimination could be justified based on the content of the items, it is recommended to consider combining the factors into a single factor in future studies.

Keywords: BACKS Tool; confirmatory factor analysis; internal structure; public hospital nurses; validity.

* ADDRESS FOR CORRESPONDENCE: **Wan Nor Arifin**, Department Community Medicine, Faculty of Medical Sciences, USM Health Campus, University of Malaysia, 16150, Kelantan, Malaysia.
E-mail address: wnarifin@usm.my / Tel.: (6) 09 767 6825

1. Introduction

"Back Apparatus: Collaboration between Universiti Kebangsaan Malaysia Medical Centre (UKMMC) with Social Security Organization (SOCSO)" (BACKS) Tool is a Malay-language questionnaire that was developed to assess work-related chronic low back pain (LBP) in Malaysia (Zhueng, 2014). The questionnaire was developed based extensive systematic review and in-depth interview, followed by a validation study by quantitative analyses (Zhueng, 2014).

Studies have shown that nurses experience a higher prevalence of LBP as compared to other hospital workers (Corona et al., 2004). This can be attributed their tasks in ward, which include lifting heavy loads, working in awkward postures, transferring patients from beds and operating hazardous equipments (Bejia et al., 2005; Bos, Krol, van der Star & Groothoff, 2007; Landry, Raman, Sulway, Golightly & Hamdan, 2008). Thus, the focus of this study was among the population of nurses in Malaysia.

This study provided internal structure evidence of construct validity of BACKS Tool in a sample of public hospital nurses in Malaysia. This validation study formed a part of a baseline study on the prevalence and associated factors of LBP among the nurses prior to the development of an education module for the nurses with LBP.

2. Method

2.1. Study setting and participants

A cross sectional study was conducted between April 1 to July 30, 2016, involving nurses in six public hospitals in Penang, Malaysia. Stratified random sampling was employed to select the sample from a list of identified nurses from the public hospitals including three district hospitals and three tertiary hospitals. Those who were pregnant, having back pain on clinic follow-up and contract staffs were excluded from this study.

The selected nurses were contacted personally and explained about the study. Informed consent were obtained from those who opted to be involved in the study. A set of questionnaire, including the BACKS Tool, was given to each participant for self-administration.

This study received ethical approval from Research Ethics Committee (Human) of University Sains Malaysia (USM/JEPeM/15090308) and National Medical Research Review of Malaysia (NMRR-15-1668-27637). The approval to use the BACKS Tool was obtained from Centre for Collaborative Innovation, Universiti Kebangsaan Malaysia.

2.2. BACKS tool

BACKS Tool is a self-administered questionnaire, consisting of five sections: A. Socio-demography, B. Work environment. C. Pain visual scale. D. Back pain in a year. E. Oswestry Disability Index questionnaire. The questionnaire is scored based the total score of a number of questions from section A, B and C. The total score is used to categorize the respondent into work-related and non work-related back pain. The questionnaire has a sensitivity of 62.7% and specificity of 94.5% for the detection of work-related back pain (Zhueng, 2014).

Of relevance to the present study was the job demands sub-scale (section B, question 7) of the questionnaire that contributes to the total score, which consists of two factors namely Physical Demand (5 items) and Psychological Demand (9 items). Each item was rated on a 5-point Likert-type scale (1 = s*angat tidak bersetuju* [*strongly disagree*], 2 = *tidak bersetuju* [*disagree*], 3 = *tidak pasti* [*unsure*], 4 = *setuju* [*agree*], and 5 = *sangat setuju* [*strongly agree*]). These two factors were considered for factor analysis because of the unobserved nature of the factors that requires special attention to their construct validity.

In the previous validation study among workers aged 20 to 60 years old, it reported factor loadings of 0.479 to 0.832 (Physical Demand) and 0.870 to 0.899 (Psychological Demand), and Cronbach's alpha

values of 0.914 (Physical Demand) and 0.968 (Psychological Demand) (Zhueng, 2014). However, in the study, the exploratory factor analysis indicated one-factor solution, suggestive of a combined factor (physical and psychological) instead of the theoretically proposed two factors. The developer maintained the two-factor solution in the scoring of the questionnaire.

2.3. Statistical analysis

Internal structure evidence of validity is provided by factor analysis and reliability (Cook & Beckman, 2006). In this study, the data was analyzed by confirmatory factor analysis (CFA) and composite reliability estimation using Raykov's rho (Raykov, 2001). The data analysis was performed in R version 3.3.2. lavaan version 0.5-22 (Rosseel, 2012) and semTools version 0.4-14 (Jorgensen et al., 2016) R packages were used for CFA and Raykov's rho respectively.

CFA was performed to evaluate the measurement models of the job demands sub-scale. Two measurement models were evaluated: two-factor model (Physical Demand and Psychological Demand factors) and one-factor model (Physical and Psychological Demands combined factor). Model fit assessment was done using the following fit indices as recommended by Brown (2015) with their respective cutoff values (Brown, 2015; Schreiber, Nora, Stage, Barlow, & King, 2006): χ^2 $p > 0.05$, comparative fit index (CFI) and Tucker-Lewis fit index (TLI) ≥ 0.95, RMSEA and its upper 90 percent confidence limit ≤ 0.08, and SRMR ≤ 0.08.

Model revisions were considered based on factor loadings, modification indices (MIs), standardized residuals (SRs) and theoretical justification. Items with factor loadings < 0.4 were considered for removal (Stevens, 2009). Parameters with SR ≥ |2.58| and MI ≥ 3.84 (Brown, 2015) were given attention for possible changes in the model specifications. The addition of correlated error terms between the items was considered if it could be justified based on the theoretical ground (e.g. similarly worded items [Brown, 2015]). Multicollinearity between factors is present when correlation, $r > 0.85$ (Brown, 2015). For comparison of nested models, scaled difference in χ^2 test for nested models was applied (Brown, 2015). For comparison of non-nested models, the Akaike information criterion (AIC) and Bayesian information criterion (BIC) were used. A model with the lowest AIC and BIC values was considered to fit the data better as compared to the alternative model (Brown, 2015). For the reliability assessment, composite reliability values ≥ 0.7 was considered good (Hair, Black, Babin, & Anderson, 2009).

3. Results

A total of 1290 nurses completed the questionnaire. CFA by robust maximum likelihood estimation was applied because the data was not normally distributed at multivariate level. The originally proposed two-factor and one-factor models fit poorly (Table 1). The analysis showed two-factor and one-factor models fit the data equally good (Table 1) after the addition of five correlated error terms (Table 2). The standardized factor loadings and composite reliability values of these models are presented in Table 3.

Table 1. Fit indices of two-factor and one-factor models

Models	χ^2_{robuxt} (df), p	χ^2_{diff} (df), p^a	CFI_{robust}	TLI_{robust}	$RMSEA_{robust}$ (90% CI)	SRMR	AIC	BIC
Two-factor (original)	1255.74 (76), <0.001	-	0.769	0.723	0.125 (0.119, 0.131)	0.078	47837.50	48059.48
Two-factor	451.56 (71), <0.001	477.40 (5), <0.001	0.929	0.909	0.072 (0.065, 0.078)	0.055	46773.64	47021.43
One-factor (original)	1254.64 (77), <0.001	-	0.767	0.725	0.125 (0.119, 0.131)	0.078	47848.46	48065.28
One-factor	466.26 (72), <0.001	449.30 (5), <0.001	0.926	0.907	0.072 (0.066, 0.079)	0.055	46791.54	47034.18

Note. CFI = comparative fit index; TLI = Tucker-Lewis Fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

[a]Scaled difference in χ^2 test for nested models.

Table 2. Correlated error terms

Models	Correlated error terms	Standardized correlations[a]
Two-factor	7a ↔ 7b	0.518
	7a ↔ 7c	0.455
	7b ↔ 7c	0.479
	7g ↔ 7i	0.227
	7l ↔ 7m	0.497
One-factor	7a ↔ 7b	0.514
	7a ↔ 7c	0.446
	7b ↔ 7c	0.467
	7g ↔ 7i	0.213
	7l ↔ 7m	0.507

[b]All *p*-values were < 0.001.

Table 3. Factor loadings and construct reliability

Models	Factors	Items	Standardized factor loadings[b]	Composite reliability[c]
Two-factor[a]	Physical Demand	7c	0.536	0.680
		7f	0.682	
		7g	0.582	
		7l	0.591	
		7m	0.540	
	Psychological Demand	7a	0.419	0.818
		7b	0.542	
		7d	0.650	
		7e	0.645	
		7h	0.598	
		7i	0.481	
		7j	0.641	
		7k	0.681	
		7n	0.562	
One-factor	Physical and Pyschological Demands	7a	0.424	0.853
		7b	0.546	
		7c	0.520	
		7d	0.651	
		7e	0.637	
		7f	0.660	
		7g	0.562	
		7h	0.596	
		7i	0.481	
		7j	0.631	
		7k	0.674	
		7l	0.576	
		7m	0.530	
		7n	0.557	

[a]Correlation between Physical Demand and Psychological Demand factors, $r = 0.944$, $p < 0.001$. [b]All *p*-values were < 0.001. [c]Raykov's rho coefficient.

4. Discussion

The CFA showed that both two-factor and one-factor models fit the data equally good after the model revisions by adding five correlated error terms to the model specifications (Table 1 and Table 2) based on RMSEA and SRMR fit indices. Both models were also considered to have acceptable fit to the data based on robust CFI and TLI because the values were slightly below the recommended cutoff values of

0.95. Although the models did not fit the data based on robust χ^2, it is not used as the sole fit index in this study because χ^2 is known to be inflated by sample size and hypothesis testing based on it is too stringent (Brown, 2015), thus the rest of the fit indices were given higher weightage to decide on the fitness of the models. The addition of the correlated error terms were justifiable because questions 7a, 7b, 7c, 7g, and 7i ("Tugas saya..." ["My work..."]), as well as 7l and 7m ("Saya selalu..." ["I always..."]) were similarly worded.

Despite having a good model fit, the two-factor model showed multicollinearity between the factors (r = 0.944), which indicated an overlap between the factors. Therefore, there was poor discrimination between the Physical Demand and Psychological Demand factors based on the analysis. This supported the one-factor model as a better alternative to the two-factor model. However, the discrimination could be justified based on the content of the items in the factors.

The composite reliability of the factors based on Raykov's rhos in both models were good (Table 3). Although it was observed that Raykov's rho = 0.680 for the Physical Demand in the two-factor model, the value was acceptable because it was slightly below the cutoff value of 0.7. The rest of the Rayko's rho values were above the cutoff value of 0.7.

5. Conclusions and recommendations

This was the first study providing validity evidence of BACKS Tool based on confirmatory factor analysis. In this study, it was found that both two-factor and one-factor models fit the data equally good. The composite reliability values of the factors in both models were also good. However, the two-factor model showed poor discrimination between the Physical Demand and Psychological Demand factors. Although the discrimination could be justified based on the content of the items, it is recommended to consider combining the factors into a single factor in future studies.

References

Bejia, I., Younes, M., Jamila, H. B., Khalfallah, T., Salem, K. B., Touzi, M. & Bergaoui, N. (2005). Prevalence and factors associated to low back pain among hospital staff. *Joint Bone Spine*, *72*(3), 254-259.

Bos, E., Krol, B., van der Star, L. & Groothoff, J. (2007). Risk factors and musculoskeletal complaints in non-specialized nurses, IC nurses, operation room nurses, and X-ray technologists. *International Archives of Occupational and Environmental Health*, *80*(3), 198-206.

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed). New York: The Guilford Press.

Cook, D. A. & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: theory and application. *The American Journal Of Medicine, 119*, 166-167.

Corona, G., Amedei, F., Miselli, F., Padalino, M. P., Tibaldi, S. & Franco, G. (2004). Association between relational and organizational factors and occurrence of musculoskeletal disease in health personnel. *Giornale italiano di medicina del lavoro ed ergonomia*, *27*(2), 208-212.

Hair Jr., J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2009). *Multivariate data analysis* (7th ed). Upper Saddle River, NJ: Pearson Prentice-Hall.

Jorgensen, T. D., Pornprasertmanit, S., Miller, P., Schoemann, A., Rosseel, Y., Quick, C. & Longo, Y. (2016). semTools: Useful tools for structural equation modeling [PDF document]. Retrieved from https://cran.r-project.org/web/packages/semTools/semTools.pdf on 1 April 2017.

Landry, M. D., Raman, S. R., Sulway, C., Golightly, Y. M. & Hamdan, E. (2008). Prevalence and risk factors associated with low back pain among health care providers in a Kuwait hospital. *Spine, 33*(5), 539-545.

Raykov, T. (2001). Estimation of congeneric scale reliability using covariance structure analysis with nonlinear constraints. *British Journal of Mathematical and Statistical Psychology, 54*, 315-323.

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software, 48*(2), 1-36.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A. & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research, 99*(6), 323-338.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed). New York: Rouledge.

Zhueng, T. J. (2014). *BACKS Tool: Tool to discriminate work-related chronic back pain among employees* (Unpublished doctorate thesis). Malaysia: Universiti Kebangsaan Malaysia.