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## RESEARCH ARTICLE

# Evaluating the Malay version of NIOSH WellBQ: A study on

# reliability and construct validity for enhanced workplace well-

## being assessment

[version 1; peer review: 1 approved]

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## Abstract

This study aimed to validate the Worker Well-Being Questionnaire, originally developed by the US National Institute for Occupational Safety and Health, in the Malay language. The translation process involved an initial independent translation by a professional translator, followed by a comparison of translations to synthesize a unified version, which was subsequently back-translated. The backtranslations were then reviewed by an expert committee to create a finalized questionnaire version. The results of this validation study indicate a high level of satisfaction, demonstrating an excellent fit with confirmatory factor analysis (CFI and TLI values ranging from 0.96 to 0.99) and a low root mean square error of approximation (RMSEA values ranging from 0.03 to 0.07). Moreover, the questionnaire exhibits sound internal consistency, with Cronbach's alpha values exceeding 0.7, and the factor structures align with theoretical expectations. In conclusion, the Malay version of the questionnaire faithfully reproduces the original instrument, enabling a robust and efficient assessment of workers' well.

## **Keywords**

workers well-being, validation, realibility, occupational health and safety, Malay version

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#### Introduction

Although workplace safety aspects have traditionally focused on biological, chemical, and radiological risks, psychosocial risk factors have recently garnered attention from researchers due to the impact of poor psychosocial working conditions on workers' well-being and productivity.<sup>1</sup> Developing and underdeveloped nations have shown a lack of awareness regarding addressing psychosocial working conditions and workers' well-being.<sup>2</sup> Conducting relevant studies becomes crucial in tackling psychosocial working conditions and workplace well-being issues.<sup>3–5</sup> These studies can provide a more informed understanding of the challenges faced by these countries in terms of understanding, measuring, and managing well-being in general and in the workplace specifically.<sup>5</sup> Additionally, research is needed to address the emerging risks and perils in workplace settings in developing and underdeveloped countries.<sup>3</sup> By exploring the associations between psychosocial work factors and well-being, these studies can contribute to a better understanding of the impact of psychosocial factors on workers' health and productivity.<sup>4</sup>

The NIOSH WellBQ, developed by the National Institute for Occupational Safety and Health (NIOSH), is a tool designed to assess the well-being of workers, with a primary focus on psychosocial working conditions.<sup>6</sup> Constructed based on insights derived from occupational safety and health principles, this instrument provides a comprehensive understanding of employee well-being.<sup>7</sup> The questionnaire, consisting of 126 questions distributed across five domains—work evaluation and experience, workplace policies and culture, workplace physical environment and safety climate, health status, and home, community, and society—also includes optional inquiries about work arrangements and demographics.<sup>6</sup> The WellBQ is specifically tailored to measure a holistic understanding of worker well-being, encompassing both work and life dimensions.<sup>8</sup> It seeks employees' perspectives on various aspects, including the quality of their work life, circumstances beyond the workplace, support from supervisors, as well as their physical and mental health status.<sup>9</sup>

A study by Ref. 6 established its psychometric properties, showing it as a reliable instrument. Organizations can use the NIOSH WellBQ to understand and improve workplace conditions. Researchers can explore the link between psychosocial conditions and outcomes like job satisfaction and stress, while individuals can assess their well-being for self-improvement.

The NIOSH WellBQ assesses psychosocial working conditions and their impact on employee well-being. Organizations use it for targeted interventions, researchers investigate relationships with job satisfaction, stress, and health, and individuals self-assess well-being.<sup>6</sup> In summary, the NIOSH WellBQ aids well-being assessment and improvement in psychosocial work conditions.

In the course of history, the paramount importance of preserving the health and safety of workers has been manifested through the evolution of a robust framework for assessing and mitigating occupational hazards. This approach has consistently aimed at establishing secure work environments and safeguarding employees from adverse health effects resulting from occupational exposure.<sup>10</sup> However, despite sustained efforts, the International Labour Office recently reported an alarming global annual toll of over two million fatalities due to accidents and occupational diseases. This statistic highlights the inadequacies and limitations of existing safety measures and calls for more effective, comprehensive strategies in occupational risk assessment, management, and prevention.<sup>11</sup>

The psychosocial work environment encompasses various risks, including psychosocial risk, hazards, factors, or stressors, as highlighted in previous research.<sup>12</sup> These risks are pivotal considerations in fostering a healthy workplace environment, with a focus on optimizing worker health and well-being, as endorsed by organizations such as the International Labour Organization (ILO), World Health Organization (WHO), European Union Occupational Safety and Health (EU-OSHA) agency, Health and Safety Executive (HSE), and related entities.<sup>13</sup>

To ensure the applicability of the NIOSH WellBQ in Malaysia, it is imperative to conduct comprehensive research on occupational stress. This research aims to establish the validity and reliability of a Malay version of the NIOSH WellBQ. The study focuses on evaluating the consistency and construct validity of the Malay adaptation among civil servants in Kuala Lumpur, Putrajaya, and Selangor, Malaysia. Such research is crucial for the advancement of occupational stress assessment in the region and can significantly contribute to the well-being of the workforce.

#### Study design and sample size

This cross-sectional study used a Google Form to validate the NIOSH WellBQ among civil servants. The inclusion criteria encompass permanent staff, while the exclusion criteria pertain to temporary and contract-basis staff. The survey was widely distributed to various ministries and departments located in Kuala Lumpur, Putrajaya, and Selangor. Before participating in the study, all respondents provided written informed consent. In October 2022, a self-administered Malay version of the NIOSH WellBQ was distributed to 100 employees from various ministries and departments. The decision

to include 100 respondents was driven by the aim to achieve a sufficiently diverse and representative sample, allowing for a robust analysis of psychosocial working conditions and employee well-being across different organizational settings and roles. This sample size is considered adequate for statistical significance, ensuring that the findings from the survey can be generalized to a broader population of employees within the targeted ministries and departments. Additionally, the practical consideration of participant burden and time constraints led to the selection of a manageable sample size, enabling a more feasible administration of the questionnaire, and ensuring a reasonable completion time of approximately 30 minutes per participant.

#### Questionnaire

The NIOSH WellBQ, comprising a total of 68 items, was translated into the Malay language. It encompasses 16 scales, five indices, and 31 individual items that span across five domains: (1) work evaluation and experience; (2) workplace policies and culture; (3) workplace physical environment and safety climate; (4) health status; and (5) experiences and activities outside of work related to home, community, and society.

The NIOSH WellBQ was translated using a back-to-back method from English to Malay and then back to English by a certified translator from Universiti Pendidikan Sultan Idris (UPSI). This rigorous translation process ensured the accuracy and quality of the Malay version of the NIOSH WellBQ. This translation version has undergone content validity assessment by four experts prior to the distribution of this questionnaire.

#### Procedure

The study's protocol received approval from the Ethics Committee for Research Involving Human Subjects at Universiti Putra Malaysia on 2<sup>nd</sup> February 2023 (Reference No: JKEUPM-2022-986). The questionnaire distribution in October 2022 occurred prior to obtaining ethical approval on 2nd February 2023, due to unforeseen administrative delays, which arose because at that time, the University was in a transitional phase between the COVID-19 control order and transitioning to a hybrid work phase. Delays were encountered in obtaining official letters, compounded by difficulties in accessing Government premises during the distribution of questionnaires at that time. However, ethical considerations were strictly adhered to throughout the data collection process to safeguard participant welfare and maintain research integrity.

Data collection was facilitated through the utilisation of a specific questionnaire. Prior to commencing the study, authorisation was sought and obtained from the pertinent Human Resources Departments within the involved ministries. The respondents received the questionnaire via their official WhatsApp group. Accompanying the questionnaire distribution, written informed consent was meticulously provided to and obtained from each respondent. Prior to their participation, each participant in the study was required to provide written informed consent. This process involved presenting participants with a paper-based consent form that outlined the purpose, procedures, and potential risks and benefits of the study. Participants were given ample time to review the information provided in the consent form and had the opportunity to ask any questions they may have had. Subsequently, those who agreed to participate in the study signed the consent form, signifying their voluntary agreement to take part in the research.

## Statistical analysis

Data entry and analysis were performed using SPSS version 25, a widely-used statistical software package for social sciences. Descriptive statistics were calculated to summarise the data, including means and standard deviations for continuous variables and frequencies with percentages for categorical variables. The internal consistency of the measurement scales was evaluated using Cronbach's alpha coefficients, a commonly used measure of reliability.

An exploratory factor analysis with principal components and varimax rotation was conducted to assess the construct validity of the measurement instrument. This technique helps to identify the underlying factors or dimensions captured by the items in the instrument and to assess how well they align with the theoretical framework.

However, it should be noted that SPSS cannot directly compute more advanced model fit indices such as TLI, RMSEA, and CFI, commonly used in Structural Equation Modeling (SEM). Therefore, the software AMOS was utilised to obtain pertinent findings regarding the goodness-of-fit of the structural models. AMOS is specifically designed for SEM analysis and provides robust tools to evaluate the model fit and test complex relationships among latent variables.

## Results

#### Socio-demographic characteristics

This study encompasses civil servants from diverse grades and service groups in Kuala Lumpur, Selangor, and Putrajaya. Initially, 100 questionnaires were distributed, out of which 95 participants responded. Among the final 95 respondents,

44 were classified as male, and 51 were female. It is important to note that these classifications refer to biological sex, not gender identity. Additionally, the majority of respondents were 37 years old and held a Bachelor's Degree (30.5%).

## Domain 1: Work evaluation and experience

The Malay version of the work evaluation and experience domain exhibited remarkable conformity with the data, as indicated by the following statistical indicators: RMSEA, TLI, and CFI values of 0.075, 0.99, and 0.97, respectively (Table 1). Most subdomains within this specific domain demonstrate consistently good internal consistency, as evidenced by Cronbach's coefficients exceeding 0.70. However, it is essential to highlight that the assessment of work conditions indicates poor internal consistency, with a Cronbach's alpha coefficient of 0.159. This discovery is similar to the study conducted while validating the NIOSH Work Well-being Questionnaire in Italian.<sup>14</sup>

Subdomain	Construct	α*	RMSEA	CFI	TLI
Domain 1: Work ev	aluation and experience				
Satisfaction	Job satisfaction Wage satisfaction Benefits satisfaction Advancement satisfaction	.726			
Support at work	Supervisor satisfaction Coworker support	.839			
Evaluation of work conditions	Job security Job autonomy Time paucity/work overload	N/A			
Meaning	Meaningful work	.754			
Affect	Work-related positive affect	.723	0.075	0.991	0.991
	Work-related negative affect		1.00	0.991	0.974
Fatigue	Work-related fatigue	N/A			
Job engagement	Job engagement (absorption; vigor; inspiration)	.736			
Domain 2: Workpla	ce policies and culture				
Supportive work culture	Supportive work culture (respect; recognition; perceived organizational support) Management trust	.895			
Health culture at work	Health culture at work Availability of health programs at work	.631			
Benefits	Availability of job benefits	.727			
Organisation of work and life	Work to nonwork conflict Nonwork to work conflict Workplace/schedule flexibility	.780			
Domain 3: Workpla	ce environment and safety climate				
Safety climate	Overall workplace safety	.931			
	Workplace safety climate		0.086	0.989	0.981
Physical work	Physical work environment satisfaction	.823	0.165	0.975	0.924
environment satisfaction	(environmental conditions; physical surroundings; pleasantness; disability and other accommodations)				
Interpersonal conflict and incivility	Discrimination Work-related sexual harassment Work-related physical violence Work-related bullying	.688			
Domain 4: Health s	tatus				
General health	Overall workplace safety				
Physical health	Days of poor physical health Chronic health conditions Insomnia				

#### Table 1. Final items and scales and reliability and model fit statistics for the Malay version of NIOSH WellBQ.

Subdomain	Construct	α*	RMSEA	CFI	TLI
Mental health	Days of poor mental health Overall stress (health, finance, relationships, work) Poor mental health (feeling depressed, anxious)	.821	0.079	0.922	0.977
Health behavior	Physical activity Tobacco use Alcohol consumption Risky drinking Healthy diet Sleep hours Sleepy at work				
Functioning	Cognitive functioning limitations Work limitations Productivity	.782	0.496	0.791	0.374
Injury	Work-related injury Injury Consequences				
Domain 5: Home, c	ommunity, and society				
Life satisfaction	Life satisfaction				
Financial insecurity	Financial insecurity	.811			
Social relationships	Support outside of work				
Activities outside of work	Activities outside of work	.810			

#### Table 1. Continued

## Domain 2: Workplace policies and culture

Based on the findings, the Supportive Work Culture scale demonstrates good reliability, with a Cronbach's alpha coefficient of 0.895. Meanwhile, the Health Culture at Work scale shows an acceptable level of internal consistency, with a Cronbach's alpha coefficient of 0.631. The subdomain assessing benefits exhibits a Cronbach's alpha coefficient of 0.727, indicating good internal consistency. Additionally, the Organization of Work and Life subdomain achieves a Cronbach's alpha coefficient of 0.780, signifying a satisfactory level of internal consistency. Unfortunately, the RMSEA, CFI, and TLI values cannot be computed for this domain, as it contains only single items or fewer than three observed variables per latent construct. These fit indices necessitate an adequate number of indicators to evaluate the model's goodness of fit effectively. Moreover, it is worth noting that the original developers of this questionnaire did not report the RMSEA, CFI, and TLI values.<sup>6</sup>

#### Domain 3: Workplace physical environment and safety climate

The findings revealed that all scales demonstrated good internal consistency. The Cronbach's alpha coefficients were 0.931, 0.823, and 0.688 for workplace safety climate, physical work environment satisfaction, and interpersonal conflict and incivility, respectively. Additionally, the validation of the third domain yielded excellent results, indicating a high level of fit for the model, with an RMSEA of 0.086, while the TLI and CFI values were 0.989 and 0.981, respectively.

#### Domain 4: Health status

Statistical findings on domain 4 indicate a very good model fit with RMSEA = 0.079, TLI = 0.922, and CFI = 0.977. However, it is essential to note that during our validation analyses, certain subdomains ("general health" and "injury") and constructs ("physical activity," "tobacco use," "alcohol consumption," "work-related injury," and "injury consequences") were taken into consideration. Expressly, the "injury" subdomain and its constructs were excluded from the validation analyses due to the extremely low variability in responses provided by the respondents. Respondents found it challenging to accurately assess the effects of work-related injuries in the last 12 months. Similarly, the construct "alcohol consumption" was removed because all responses were coded as 0, indicating no variability. Likewise, the "tobacco use" construct was excluded due to some modalities' low frequency of affirmative responses.

Regarding the construct "physical activity," statistical analysis revealed a weak correlation between the two items of the scale. This result can likely be attributed to the diverse and varying nature of work activities performed by the population enrolled in this study. The participants in this study engaged in various and distinct tasks, which may have influenced their responses to the two items on this scale. As for the subdomain "general health," its inclusion in the validation analyses led

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	Job satisfaction*	Life satisfaction*	Work-related positive affect	Work-related negative affect	Overall stress	Poor mental health	Days of poor mental health*	Days of poor physical health*	Overall health*	Overall workplace safety*	(Low) productivity
Domain 1: Work evaluation and experience											
Job satisfaction*	1.00	0.436**	0.581**	-0.237*	-0.335**	-0.364**	-0.305**	-0.142	0.325**	0.499**	-0.237*
Wage satisfaction*	0.33**	0.421**	0.34**	-0.108	-0.202	-0.207*	0.008	-0.17	0.044	0.375**	-0.245*
Benefit satisfaction*	0.463**	0.419**	0.326**	-0.086	-0.097	-0.182	-0.028	-0.029	0.083	0.383**	-0.109
Advancement satisfaction*	0.465**	0.319**	0.311**	-0.169	-0.24*	-0.162	-0.141	-0.148	0.319**	0.297**	-0.18
Supervisor support*	0.482**	0.207*	0.409**	-0.064	-0.082	-0.265*	-0.399**	-0.178	0.188	0.37**	-0.081
Coworker support*	0.45**	0.218*	0.437**	-0.016	-0.112	-0.257*	-0.272**	-0.146	0.245*	0.443**	-0.213*
Job security*	0.521**	0.291**	0.413**	-0.187	-0.222*	-0.262*	-0.286**	-0.191	0.229*	0.57**	-0.252*
Job autonomy*	0.397**	0.392**	0.367**	-0.178	-0.223*	-0.243*	-0.277**	-0.229*	0.116	0.395**	-0.089
Time paucity/work overload*	-0.274**	-0.201	-0.186	0.232*	0.327**	0.29**	0.144	0.203*	-0.298**	-0.036	0.174
Meaningful work	0.478**	0.312**	0.196	-0.441**	-0.255*	-0.117	-0.163	-0.178	0.203*	0.558**	-0.198
Work-related positive affect	0.581**	0.388**	1	-0.079	-0.342**	-0.519**	-0.309**	-0.352**	0.254*	0.392**	-0.309**
Work-related negative affect	-0.237*	-0.08	-0.079	1	0.511**	0.313**	0.289**	0.292**	-0.304*	-0.262*	0.253*
Work-related fatigue*	-0.312**	-0.157	-0.17	0.46**	0.424**	0.424**	0.352**	0.196	-0.368**	-0.208*	0.19
Job engagement	0.536**	0.312**	0.534**	-0.384**	-0.378**	-0.23*	-0.302**	-0.223*	0.21*	0.42**	-0.277**
Domain 2: Workplace policies and culture											
Supportive work culture	0.615**	0.374**	0.385**	-0.31**	-0.233*	-0.195	-0.22*	-0.176	0.338**	0.524**	-0.252*
Management trust*	0.545**	0.361**	0.417**	-0.221*	-0.27**	-0.294**	-0.268**	-0.142	0.268**	0.56**	-0.212*
Health culture at work	0.56**	0.362**	0.424**	-0.294**	-0.203	-0.265*	-0.195	-0.151	0.297**	0.537**	-0.212*
Availability of job benefits	-0.051	-0.004	-0.017	0.095	0.068	-0.016	0.042	-0.072	-0.171	-0.102	0.014
Availability of health programs at work	-0.227*	-0.255*	-0.136	0.016	0.078	0.061	-0.086	-0.044	-0.263**	-0.388**	0.013
Work to nonwork conflict*	-0.384**	-0.254*	-0.34**	0.344**	0.539**	0.331**	0.126	0.164	-0.27**	-0.281**	0.422**
Nonwork to work conflict*	-0.168	-0.144	-0.202*	0.209*	0.491**	0.18	0.05	0.151	-0.256*	-0.174	0.438**
Workplace/schedule flexibility	0.289**	0.235*	0.195	-0.268**	-0.09	-0.148	-0.185	-0.255*	0.199	0.369**	-0.066

Table 2. Correlations among select scales and items in the Bahasa Melayu version of the NIOSH WellBQ.

	Job satisfaction*	Life satisfaction*	Work-related positive affect	Work-related negative affect	Overall stress	Poor mental health	Days of poor mental health*	Days of poor physical health*	Overall health*	Overall workplace safety*	(Low) productivity
Domain 3: Workplace physical environment and safety climate											
Overall workplace safety*	0.499**	0.305**	0.392**	-0.262*	-0.302**	-0.294**	-0.355**	-0.171	0.306**	-	-0.249*
Workplace safety climate	0.327**	0.182	0.219*	-0.179	-0.18	-0.213*	-0.104	-0.123	0.304**	0.336**	-0.148
Physical work environment satisfaction	0.403**	0.148	0.239*	-0.211*	-0.222*	-0.187	-0.219*	-0.183	0.338**	0.363**	-0.225*
Discrimination	-0.163	-0.112	-0.248*	0.028	0.127	0.42**	0.187	0.284**	-0.227*	-0.202	0.134
Work-related sexual harassment*	0.05	0.035	0.143	-0.117	-0.244*	-0.006	-0.1	-0.104	0.154	0.046	-0.198
Work-related bullying	0.316**	0.21*	0.23*	-0.277**	-0.203	-0.207*	-0.193	-0.114	0.195	0.15	-0.257*
Domain 4: Health status											
Overall health*	0.325**	0.273**	0.254*	-0.304**	-0.352**	-0.291**	-0.271**	-0.328**	1	0.306**	-0.195
Days of poor physical health*	-0.142	-0.158	-0.352**	0.292**	0.25*	0.393**	0.308**	-	-0.328**	-0.171	0.149
Chronic health conditions	-0.23**	-0.175	-0.268*	0.291**	0.35**	0.283**	0.267*	0.23*	-0.47**	-0.036	0.097
Insomnia*	-0.15	-0.21*	-0.25*	0.162	0.28**	0.438**	0.28**	0.242*	-0.096	-0.087	0.253*
Days of poor mental health*	-0.305**	-0.177	-0.309**	0.289**	0.377**	0.479**	-	0.308**	-0.271**	-0.355**	0.251*
Overall stress	-0.335**	-0.275**	-0.342**	0.511**	-	0.503**	0.377**	0.25*	-0.352**	-0.302**	0.381**
Poor mental health	-0.364**	-0.179	-0.519**	0.313**	0.503**	-	0.479**	0.393**	-0.291**	-0.294**	0.299**
Physical activity	0.215*	0.284**	0.112	0	-0.171	0.054	-0.022	-0.054	0.11	0.147	-0.097
Tobacco use	-0.069	-0.057	-0.013	0.254*	0.221*	0.108	0.085	0.003	0.052	-0.098	0.1
Alcohol consumption (heavy drinking in a week)*	0.156	0.077	-0.024	-0.078	0.016	0.12	-0.08	0.249*	0.042	-0.065	-0.084
Risky drinking (on a single day in the past year)*	0.041	-0.05	-0.036	0.073	0.129	0.266**	-0.08	0.199	-0.132	-0.192	-0.042
Healthy diet*	-0.187	-0.003	-0.157	-0.122	-0.091	0.179	0.19	-0.024	-0.04	-0.031	-0.033
Sleep hours (risky sleep hours) *	0.102	0.081	0.091	0.141	0.034	0.068	-0.086	0.083	-0.032	0.092	-0.009
Sleepy at work*	-0.285**	-0.271**	-0.385**	0.29**	0.324**	0.332**	0.273**	0.166	-0.157	-0.253*	0.261*
Cognitive functioning limitations*	-0.275**	-0.092	-0.327**	0.339**	0.384**	0.307**	0.106	0.217*	-0.228*	-0.331**	0.17
Work limitations*	-0.229*	0.003	-0.272**	0.296**	0.303**	0.229*	0.072	0.222*	-0.185	-0.298**	0.215*
(Low) productivity	-0.237*	-0.078	-0.309**	0.253*	0.381**	0.299**	0.251*	0.149	-0.195	-0.249*	1
Domain 5: Home,community, and society											
Life satisfaction*	0.436**	1	0.388**	-0.08	-0.275**	-0.179	-0.177	-0.158	0.273**	0.305**	-0.078
Financial insecurity	-0.084	-0.369**	-0.253*	0.102	0.425**	0.308**	0.095	0.134	-0.002	-0.105	0.3**
Support outside of work*	0.025	0.114	-0.034	0.02	0.011	-0.039	0.008	0.005	0.105	0.034	0.13
Activities outside of work	0.271**	0.301**	0.326**	-0.043	-0.259*	-0.195	-0.162	-0.121	0.237*	0.176	0.017

Table 2. Continued

to decreased CFI and TLI values; hence, it was excluded from the analyses. Only the subdomains "overall stress (health, finance, relationships, work)" and "cognitive functioning limitations" under mental health exhibited acceptable internal consistency with Cronbach's alpha values of 0.821 and 0.782, respectively.

Overall, the findings indicate a robust model fit for domain 4. However, excluding certain subdomains and constructs was necessary to ensure the validity and reliability of the validation analyses. These exclusions were made based on the limited variability, low frequency of responses, and weak correlation observed for certain items in the assessment, as well as considerations of the unique characteristics of the study population and their work activities.

#### Domain 5: Home, community, and society

While Fontana *et al.*'s study<sup>14</sup> did not include factor analysis for this domain, we chose to incorporate it into our research. This domain consists of two single items, one 2-item index, and one 7-item index. Chari *et al.*,<sup>6</sup> the developers of NIOSH WellBQ, reported a low Cronbach's alpha value of 0.62 for this domain in their original study. However, in our current investigation, both subdomains, namely "Financial security" and "Activities outside of work," exhibited higher Cronbach's alpha values of 0.811 and 0.810, respectively, indicating stronger internal consistency. It is important to acknowledge the potential limitations of using a combination of single and multiple items in this domain, as it may impact the interpretation of results and the underlying constructs being measured. Further research and validation studies may be warranted to enhance the measurement of this domain within the context of well-being assessments.

#### Correlations among selected scales and items

In this study, similar to the research conducted by Chari *et al.*<sup>6</sup> and Fontana *et al.*,<sup>14</sup> an analysis of correlations among selected scales and items was performed to verify concurrent, convergent, and discriminant validity (results presented in Table 2). The primary distinctions when comparing this study with the research conducted by Chari *et al.*<sup>1</sup> were observed for the following items and scales: "time paucity/work overload," "meaningful work," "availability of health programs at work," "availability of job benefits," "physical activity," "tobacco use," "risky drinking," "healthy diet," "support outside of work," and "activities outside of work."

Regarding this matter, it is reasonable to expect that the differences in domains 4 (health status) and 5 (home, community, and society) are predominantly correlated to social and cultural differences between the population enrolled in the study. Furthermore, based on the findings, the differences observed in domains 1(work evaluation and experience) and 2 (workplace policies and culture) mainly result from the uniqueness and variations in the work environments of the respondents in the public service, who come from various types of services and positions.

#### Discussion

Psychosocial working conditions play a crucial role in promoting workers' well-being and ensuring the implementation of health and safety standards in the workplace.<sup>2</sup> Research has shown that high job demands, low job control, and poor social support in the workplace are associated with increased stress levels and negative health outcomes among workers.<sup>2</sup> These factors can lead to decreased job satisfaction, increased absenteeism, and reduced productivity.<sup>2</sup> Addressing psychosocial working conditions involves implementing policies and practices that promote a healthy work-life balance, provide opportunities for skill development and career advancement, and encourage positive social interactions among employees.<sup>2</sup> By creating a supportive work environment, organizations can enhance workers' well-being and contribute to their overall job satisfaction and engagement.<sup>2</sup>

Policymakers and occupational health practitioners play a crucial role in ensuring that psychosocial working conditions are considered and addressed.<sup>2</sup> They can develop and enforce regulations and guidelines that promote a healthy work environment, conduct inspections and audits to assess compliance with these standards, and provide resources and support to organizations in implementing effective psychosocial risk management strategies.<sup>2</sup>

Based on the findings of this study, it is evident that the NIOSH WellBQ demonstrates strong qualities as a measurement tool for assessing worker well-being and psychosocial working conditions. The study's results support the assertions made by the creators of NIOSH WellBQ, stating that the instrument's content is theoretically driven and grounded in existing concepts of well-being. The instrument encompasses a wide range of well-being measures across various dimensions. This comprehensive approach results from its development through an extensive review of the literature on occupational stress, health, and well-being and input from subject-matter experts.

The research outcomes support the notion that the NIOSH WellBQ is a robust and reliable instrument for assessing the well-being of workers and their psychosocial working conditions. The instrument's theoretical foundation and its inclusion of diverse well-being dimensions further strengthen its utility as a valuable tool for researchers and practitioners.

Nevertheless, there are several limitations that the developers of NIOSH WellBQ can improve upon in the future. One notable limitation is the presence of single items for certain constructs. Single-item measures may not fully capture the complexity of these constructs, and therefore, it is crucial to exercise caution when interpreting findings based solely on these single items. Alternative measures can be considered to address this limitation, such as supplementing single-item measures with multiple-item scales that have established psychometric properties. These multiple-item scales provide more reliable and valid assessments of the constructs.<sup>15</sup>

It would be prudent for the developer of NIOSH WellBQ to take these limitations into consideration and explore opportunities to enhance the measurement of constructs within the instrument in the future revision. By incorporating multiple-item scales and conducting further validation studies, the NIOSH WellBQ can potentially strengthen its psychometric properties and provide a more comprehensive and accurate assessment of worker well-being and psychosocial working conditions.<sup>16</sup>

In conclusion, this study provides compelling evidence supporting the reliability and validity of the Malay version of the NIOSH WellBQ as a comprehensive instrument for evaluating worker well-being. The results demonstrate its effectiveness in capturing the multifaceted dimensions of well-being within the studied population. Nonetheless, it is important to acknowledge that the current findings should be considered preliminary. Further comprehensive validation is warranted to ensure the instrument's robustness and applicability, involving larger sample sizes and more sophisticated methodologies.

To strengthen the psychometric properties of the Malay version of NIOSH WellBQ, future research should consider conducting test-retest reliability assessments. Test-retest reliability assesses the stability of responses over time by administering the instrument to the same group of participants on two separate occasions and examining the consistency of their responses. This will help determine whether the instrument produces consistent results over time and establish its reliability. Confirmatory factor analysis (CFA) should also be conducted to examine the model fit of the Malay version of NIOSH WellBQ. CFA is a statistical technique that tests the fit between the observed data and the hypothesized factor structure of the instrument. By conducting CFA, researchers can assess whether the items in the instrument are measuring the intended constructs and establish its construct validity.

Furthermore, exploring the convergent validity of the Malay version of NIOSH WellBQ would enhance its credibility. Convergent validity refers to the degree to which the instrument correlates with other measures that assess similar constructs. By comparing the results of the Malay version of NIOSH WellBQ with other established well-being measures, researchers can examine the extent to which the instrument converges with existing measures and validate its effectiveness in assessing worker well-being. By undertaking these crucial steps, researchers can enhance confidence in the Malay version of NIOSH WellBQ and extend its generalizability to broader populations. Test-retest reliability assessments will provide evidence of the instrument's stability over time, while CFA will establish its construct validity. Exploring convergent validity will further validate the instrument by comparing its results with other established measures of well-being. As the study advances and these psychometric properties are strengthened, the Malay version of NIOSH WellBQ has the potential to become a valuable tool for assessing worker well-being in diverse settings. Its reliability, validity, and generalizability will contribute to its credibility and usefulness in promoting workers' well-being and informing occupational health interventions.

#### Conclusion

Generally, the study demonstrated that the version of the WellBQ validated in this research exhibits more than satisfactory psychometric qualities. This suggests that it is a reliable tool to measure and assess the well-being of workers in Malaysian working populations and workplaces. Referring to the findings of this study, with a few exceptions that were extensively discussed earlier, our statistical analyses revealed a good model fit and internal consistency for the WellBQ. These results further support the suitability of the WellBQ for use in evaluating the well-being of workers in various Malaysian contexts.

It is crucial to note that the findings of this study are highly comparable and practically correspond with those obtained by Chari *et al.*<sup>6</sup> and Fontana *et al.*<sup>14</sup> These similarities reinforce the results previously reported by the developers of the WellBQ. Consequently, the outcomes presented in this research significantly contribute to the existing knowledge concerning workers' well-being.<sup>6,14</sup> The findings generated in this study can be valuable in enhancing our understanding of the topic related to workers' well-being and may have implications for improving workplace well-being assessments and interventions.

## Data availability

## Underlying data

Figshare: NIOSH WELLBQ QUESTIONNAIRE ENGLISH AGE GROUP...https://doi.org/10.6084/m9.figshare. 25426279.v1.<sup>17</sup>

This project contains the following underlying data:

- NIOSH WELLBQ QUESTIONNAIRE.csv

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

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# **Open Peer Review**

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The manuscript aims to validate the Worker Well-Being Questionnaire, a scale originally developed by the US National Institute for Occupational Safety and Health (NIOSH), in the Malay language. The results show that the Malay version is a reliable tool for assessing worker well-being in the Malaysian context.

The introduction provides a solid background on the importance of assessing psychosocial working conditions and the necessity of having a validated tool in the Malay language. However, the literature review could be expanded to include more recent studies that have validated similar instruments in different languages and contexts to strengthen the justification for this study. For instance, recent studies such as those by Berthelsen et al. (2020) [Ref 1] or the validation of the Copenhagen Psychosocial Questionnaire in Sweden and Şahan et al. (2019) on [Ref 2] the Turkish version could provide valuable insights and methodologies relevant to the current manuscript.

In the methodology, the expertise and qualifications of the translators and the expert committee members should be detailed to add credibility to the process.

The results are well-organized and presented, with clear tables summarizing the key findings. The low internal consistency for certain subdomains (work conditions) is acknowledged, but the manuscript should give potential reasons for this and suggest ways to address these issues in future research.

The practical implications for occupational health practitioners and policymakers are briefly mentioned. Expanding this section to provide more concrete recommendations based on the authors' study would enhance the manuscript's impact. For example, the recent guidelines by the International Labor Organization (ILO) and World Health Organization (WHO) on addressing mental health at work offer practical strategies that could be adapted for implementing the findings of this study(https://www.who.int/publications/i/item/9789240057944) Overall, the manuscript makes a valuable contribution to the literature on workplace well-being assessment tools.

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Is the work clearly and accurately presented and does it cite the current literature? Partly

Is the study design appropriate and is the work technically sound? Yes

Are sufficient details of methods and analysis provided to allow replication by others?  $\ensuremath{\mathsf{Yes}}$ 

If applicable, is the statistical analysis and its interpretation appropriate?  $\ensuremath{\mathsf{Yes}}$ 

Are all the source data underlying the results available to ensure full reproducibility?  $\ensuremath{\mathsf{Yes}}$ 

Are the conclusions drawn adequately supported by the results?  $\gamma_{\text{PS}}$ 

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Subjective well-being, knowledge management, international business

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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