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Mohd Hasnun Arif Hassan
Mohd Nadzeri Omar
Nasrul Hadi Johari
Yongmin Zhong *Editors*

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Preface

Technological advancements have significantly benefited humans. Technology has led to the development of ergonomic tools and equipment that improve human comfort, reduce strain, and enhance overall productivity. From adjustable office chairs to ergonomic keyboards, these innovations promote proper posture and reduce the risk of musculoskeletal disorders. When it comes to road safety, technology has played a pivotal role in saving lives and preventing accidents. Advanced driver assistance systems (ADAS) equipped with sensors, cameras, and artificial intelligence algorithms help detect potential hazards, warn drivers, and even intervene if necessary. In the realm of sports technology, advancements have revolutionized training methodologies and performance analysis. Athletes now have access to wearable devices that monitor their biometric data, providing insights into their physical condition, performance metrics, and injury prevention. Further, technological advancements have led to sophisticated tools and methods for studying the human body's mechanics and movement. High-speed cameras, force sensors, and motion-tracking systems enable researchers to gain deeper insights into human locomotion, joint mechanics, and muscle activation patterns. These findings help design better prosthetics, rehabilitation programs, and ergonomic solutions tailored to individual needs.

The "Unlocking Human Potential: The Future of Human Engineering" symposium seeks to delve into the cutting-edge field of human engineering, exploring the possibilities of augmenting and optimizing human capabilities through advancements in science, technology, and design. This symposium brings together experts from various disciplines to discuss and showcase innovative approaches, methodologies, and ethical considerations in the realm of human engineering. From neuroenhancement to prosthetics, cognitive augmentation to genetic engineering, this symposium aims to stimulate insightful discussions and inspire the creation of a future where human potential knows no bounds.

Pekan, Malaysia — Mohd Hasnun Arif Hassan

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About the Editors

Dr. Mohd Hasnun Arif Hassan earned his first degree in Mechanical Engineering from the Technische Hochschule Bingen, Germany, in 2010. During the final year of his undergraduate study, he was offered a scholarship by Universiti Malaysia Pahang (UMP) to pursue a Master's degree in Mechanical Engineering at the University of Malaya in Kuala Lumpur, which he graduated with distinction in 2012. After that, he embarked on his Ph.D. journey at UMP where he studied about the head injury sustained by soccer players due to heading manoeuvre. He completed his Ph.D. study in 2016 and then continued to serve UMP as a senior lecturer. His research interests include finite element modelling of the interaction between human and sports equipment, instrumentation of sports equipment, and injury prevention particularly with regards to sports and traffic accidents. His work aims to apply engineering principles in sports not only to enhance the performance of an athlete but also to prevent injuries.

Dr. Mohd Nadzeri Omar received the B.Eng. (Hons) and Ph.D. degrees from RMIT University, Melbourne, Australia, in 2013 and 2017, respectively. He is a senior lecturer with the Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang. He is also attached to the Human Engineering Research Group which focuses on research, development, and innovations in human-centered technology and products. His research interests include soft tissue modelling, sports technology, biomechanical engineering, and mechatronics.

Dr. Nasrul Hadi Johari obtained his Ph.D. in Biofluid Mechanics from Imperial College London, United Kingdom. He is currently a senior lecturer at the Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang. Dr. Johari's research activities include computational modeling of blood flow, tissue mechanics, and mass transport in the cardiovascular system, with applications ranging from evaluating the hemodynamic performance of medical devices to predict the outcome of endovascular interventional procedures. He is also interested in computational and experimental modeling of the interaction between human and sports equipment particularly in improving training aid systems and injury prevention.

Dr. Yongmin Zhong is currently an Associate Professor with the School of Aerospace, Mechanical and Manufacturing Engineering, at RMIT University, Australia. His research interests include computational engineering, haptics, soft tissue modeling, surgical simulation, aerospace navigation and control, intelligent systems, and robotics.

Developing a Survey Tool to Measure Psychosocial Risk and Work Performance at a Workplace

Nuruzzakiyah Mohd Ishanuddin, Hanida Abdul Aziz, and Ezrin Hani Sukadarin

Abstract This paper aims to develop a survey tool for psychosocial risk and work performance in the manufacturing industry in Malaysia. A cross-sectional study was conducted among 258 respondents from the manufacturing plant. The validity and reliability of a set questionnaire adapted from the Copenhagen Psychosocial Questionnaire (COPSOQ III), NIOSH Generic Job Stress Questionnaire and Individual Work Performance Questionnaire (IWPQ 1.0) instruments were tested using Exploratory Factor Analysis (EFA) and reliability analysis. The results showed that the originated ten construct measures of psychosocial risk factors and work performance were reduced into eight construct measures understudy after conducting factor analysis by Principal Component Analysis as a dimensional reduction method. This current study is essential to explore the presence of psychosocial risk factors that underlying in the manufacturing industry which might affect worker performance and well-being. Also, for future research purposes, this study can be utilised as the main tool to explore the psychosocial risk factors and work performance in other sectors.

Keywords Exploratory factor analysis · Psychosocial risk factors · Work performance

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1 Introduction

The Rapid changes in industrial technology concerning elevated demands in production and resources lead to automation of machinery—more advanced systems being implemented in the plant has led to new types of risk, such as psychosocial risk—generated from the organisational working environment, which negatively impacts the mental health of worker [1, 2]. Nowadays, automation has taken over most manufacturing jobs in the plant. Global development in technology consecutively, alteration in the psychosocial work environment and work intensity could not be avoided as the enhancement corresponds with current technologies and demands [3, 4]. In Malaysia, the manufacturing sector is one of the most significant contributors to the country's revenue. Department of Occupational Safety and Health (2018) [5], Malaysia, reported across five years from 2015 until 2019 that the manufacturing sector had the highest number of occupational accidents compared to the other sectors. Working in the manufacturing sector exposes workers to many types of physical and mechanical hazards. At least to know that workers are emotionally drained and mentally exhausted from working for long, laborious working hours [6, 7]. Working in a manufacturing plant makes psychosocial risk an unseen hazard [8].

The emergence of psychosocial risk should not be seen as less priority over other types of hazards. Lately, studies regarding psychosocial and mental health aspects in work settings have arisen due to the adverse effect that has been latent over the years, especially in the working community [9–11]. Extensive research and management should be considered to ensure the safety and well-being of the workers [12]. Psychosocial risk is determined as the potential psychosocial hazards to cause harm to the workers [13, 14]. While psychosocial risks at work refer to the specific aspects of work design and organisation and management of work, also the social context can result in negative physical, psychological and social outcomes such as violence and high job demand [15]. Determination of psychosocial risk can enhance the well-being of workers and improve the working environment. One study suggested that controlling psychosocial hazards may prevent an accident at work [16]. To investigate the emergence of psychosocial risk, the psychosocial work environment, which includes the organisational aspect that incorporates the work nature needs to be in consideration.

One of the indicators of inadequate safety at work is the multiple occurrences of accidents at work. An increasing number of mental health problems at work with relatively detrimental consequences follow concerning major mental health issues at work [17]. This issue leads directly to the deterioration of the work performance of the workforce and organisation revenue [18]. The presence of risk at the workplace might interrupt workers' performance and organisational productivity since performance at work is measured through the competency and proficiency of the job task performed at work. Performance at work has been a significant measure in occupational health studies [19]. Eurofound and European Agency for Safety and Health at Work in 2014 reported that work performance also related to psychosocial risk factors other than adverse health outcomes. A poor working environment with psychosocial risk exposes workers towards mental health deterioration and compromises work performance and productivity [18, 20, 21]. Another study found that psychological risks such as negative work behaviour can influence work performance in terms of technicality central to the job [22].

Psychosocial stressors encompass a few organisational aspects at the workplace were outlined by the World Health Organization (WHO), Health and Safety Executive (HSE), European Agency for Safety and Health at Work and the International Labour Organization (ILO) to govern the mental health well-being of the workers adequately [2, 6, 23, 24]. Some of the risk factors emphasised by these agencies include job demand, interpersonal relationships at work, job control, career development and others. The Malaysian government also took the initiative by using law enforcement to improve workplace safety and health (OSHA 1994). This law embodied the fact that every workplace ensures the safety and well-being of the workers at the workplace. Globally, psychosocial risk is becoming an issue concerning safety health and public health practitioner [25]. Obvious impacts on the working population include poor performance, unreliable decisions, impaired judgement, accidents, missed deadlines and increased costs in business [26]. Other than that, in terms of work performance wise, it can cause low motivation and commitment, a dispute among colleagues, human error and poor decision-making skills [27]. Lack of awareness among developing and underdeveloped countries contributes to harming workers' health [28]. Active prevention to manage the intangibility of this type of risk is essentially vital.

This paper intends to present the process of developing a survey tool of psychosocial risk factors and work performance in a manufacturing plant. The aforementioned dimensional construct of psychosocial risk will be determined. Then, using the first-generation statistical analysis technique—Principal Component Analysis (PCA)—a more robust study construct is designed. Finally, the paper discussed the result of the analysis.

2 Material and Method

A pilot study was conducted before the actual data collection and the instrument was found reliable (Cronbach alpha = 0.729). During the pilot study, the electronic questionnaire version was distributed to the workers, and the constructed questionnaire was tested in terms of reliability. After improving the comprehension of the questions and suitability of the work context in that particular plant, the questionnaire set is ready to distribute for actual data collection. Respondents in this study are the workers working in one selected manufacturing plant. A purposive sampling technique has been employed in distributing the survey questionnaires to respondents in a manufacturing plant. Inclusion criteria include mental health workers with at least 1 year of working experience. While exclusion criteria include using any prescribed medication and illicit drug usage. The questionnaires were printed and distributed directly to the respondent during a training organised by the plant. Workers selected for this study were asked for voluntary participation, with participation being taken as consent. The consent form was given before the workers answered the questionnaire. An explanation about the survey was given prior to completing the survey. Upon completion, a total of 267 completed questionnaires were returned and yielded a response rate of 95%. There are a total of 650 workers in the plant. The sample size representative of the workers in this study is 242. It is determined based on Krejcie and Morgan's sample size determination table. Krejcie and Morgan's sample size calculation was based on $p = 0.05$ where the probability of committing a type I error is less than 5% or $p < 0.05$.

The questionnaire was adapted from the Copenhagen Psychosocial Questionnaire (COPSOQ) [29], the NIOSH Generic Job Stress Questionnaire (NGJSQ) [30] and Individual Work Performance Questionnaire (IWPQ) [19]. A set of questionnaires was formed from 3 different questionnaires. The questionnaire is administered to all of the respondents. This questionnaire consists of 3 main parts. Part A consists of demographic questions, including gender, age, nationality, marital status, educational level, departments, years of working and health status-related questions. Part B of the questionnaire consists of 7 psychosocial risk factors: interpersonal relationships at work, job demands, job control, career development, environment and equipment, job content and role in the organisation. While part C consists of questions related to the work performance of the workers which are task performance, contextual performance and counterproductive work behaviour. There are items total of 63 questions which included 10 factors in this study before conducting PCA.

Data from the questionnaires were keyed in manually and before that it was coded into different values for each of the responses. For example, 1 = always, 2 = often, 3 = sometimes, 4 = seldom and 5 = never. A reliability analysis was conducted and the instrument was found to be reliable. Data were examined for normality using the Kolmogorov–Smirnov test. The validity of the questionnaire was analysed using EFA by PCA to reduce the constructed measure into more accurate and precise measurements to investigate psychosocial risk factors and work performance in the manufacturing industry.

3 Results and Discussions

3.1 Reliability Analysis of the Instrument

Internal consistency of the instrument using Cronbach Alpha value indicated the reliability of the items used to measure the factors under study. To determine the instrument's internal consistency, Cronbach Alpha for each psychosocial risk factor and work performance factor were analysed. Table 1 shows the internal consistency total of 10 factors included in this study. From Table 1, job control, environment and equipment, job content and role organisation have low Cronbach's alpha values with $\alpha = 0.618$, $\alpha = 0.634$, $\alpha = 0.596$ and $\alpha = 0.608$ respectively. Job content

Table 1 Research construct and Cronbach's alpha value

Psychosocial risk factors	Cronbach's alpha value	No of items
Interpersonal relationships at work	0.796	4
Job demand	0.747	12
Job control	0.618	6
Career development	0.836	4
Environment and equipment	0.634	8
Job content	0.596	6
Role in organisation	0.608	5
Work performance factors	Cronbach's alpha value	No of items
Task performance	0.915	5
Contextual performance	0.902	8
Counterproductive work behaviour	0.904	5

had the lowest value among all, with $\alpha = 0.596$. One of the assumptions regarding low alpha value is due to the low number of items for the factors [31]. Besides, low Cronbach's alpha can also indicate that the questions administered to the respondents are interpreted differently in which there is a need for improvement of the more understandable context of the questions. Interpersonal relationships at work and job demand had acceptable Cronbach's alpha values with 0.796 and 0.747, respectively.

While the career development factor had a good Cronbach's alpha value of 0.836, Cronbach's alpha scores between $\alpha = 0.60$ and $\alpha = 0.70$ could be considered borderline, but in general, they did not consider poor [32]. Task performance, contextual performance and counterproductive work behaviour factors all had excellent Cronbach's alpha values with 0.915, 0.902 and 0.904, respectively. The excellent Cronbach's alpha value indicated that the respondents agree or disagree on the items collectively for work performance factors. This is supported by Hoekstra et al. [33], the preferable score or answer for each participant, it has to produce the same result when the questionnaire is once again administered under the same test conditions, which is referred to as the high reliability of the score test. Thus, some of the instruments used in the current study show relatively acceptable Cronbach's alpha value, and some need appropriate improvement.

3.2 *Demographic Data*

From Table 2, most of the respondents are male, which encompasses 89.5%, and the rest are female, contributing only 10.5% of the respondents. The majority of the respondents that joined in this study are 26–35 years old age group (69%). This was followed by 16–25 years and 36–45 years with 14.7% and 13.2% respectively. The minority age group of the respondents is the 46–65 years age group with a

Table 2 Demographic information of the respondents

Demographic	Items	Frequency (N = 258)	Percentage (%)
Gender	Male	231	89.5
	Female	27	10.5
Age	16–25 years	38	14.7
	26–35 years	178	69
	36–45 years	34	13.2
	46–65 years	8	3.1
Nationality	Malaysian	255	98.8
	Other	3	1.2
Educational level	Certificate	120	46.5
	Diploma	112	43.4
	Bachelor degree	25	9.7
	Master	1	0.4
Years of	≤Five years	177	68.6
working	6–10 years	68	26.4
	11 years and above	13	5

percentage of 3.1%. For nationality status, most of the respondents with 98.8%, are Malaysian, and the rest, 1.2%, are foreign workers. In terms of education level, only 1 (0.4%) of the participants have a Master degree, and 25 respondents, with 9.7%, have a bachelor's degree. The majority of the respondents, 120 (46.5%), have a basic education level which is a certificate level, followed by 112 respondents, with 43.4% with a diploma (academic qualification). For the distribution of years of working, most of the respondents, 68.6%, are in the shortest working period, which is ≤ five years of working experience. There are 68 respondents with 26.4% in the group with 6–10 years of working experience. The remaining 13 respondents with 5% having the most extended working period in the company with 11 years and above, considered senior workers in the plant.

3.3 Exploratory Factor Analysis (EFA)

EFA is performed by PCA in this study. It is a method to extract and reduce the number of items to a smaller number of variables. The PCA is done to extract such factors as it may allow for the loss of information as little as possible [34]. Also, a smaller set of construct measures is simpler to understand and be used in further analysis [35]. An EFA was conducted on 63 items with a Varimax rotation with Kaiser Normalization. The selection of factors to retain in the study takes into account Kaiser Criteria (eigenvalues greater than one), scree plot analysis, criteria based on the number of total variances explained (at least more than 50%), and KMO [25]. To determine the suitability of the EFA analysis, the sampling adequacy test was conducted by Kaiser–Meyer–Olkin (KMO) and Bartlett's test [26]. KMO values of more than 0.7 show that the factor analysis for the data is significant [36]. The result has presented Bartlett's Test of Sphericity as significant with Chi-Square = 8459.107 and p-value < 0.001, KMO of sampling adequacy has appeared as 0.812, which is indicated as an excellent value because it surpasses the suggested value of 0.7. These two methods are vital so that the construct of data is relevant to proceed with factor analysis.

Table 3 shows the changes in the dimensional construct under study. Aforementioned, the selection of the constructed measure to be retained after conducting dimensional reduction (PCA) are few criteria, including Kaiser Criteria (eigenvalues greater than one), scree plot analysis, criteria based on the number of total variances explained (at least more than 50%), and KMO value. The purpose of the dimensional construct into a smaller set of variables is to reduce random variables into a significant purpose-driven construct under study. In other words, PCA is a dimensionality reduction technique that condenses the original variables to a smaller number of significant principal components [37, 38].

Table 4 shows the psychosocial and work performance factors present in the manufacturing industry. Task and Contextual performance are combined as Factor 1. Factor 1 is found to be the strongest factor that influences workers. In contrast, the weakest factor that can affect the manufacturing industry workers is Job control. The second factor, followed after Factor 1, is Job Demands and Counterproductive Work Behaviour, which then become consecutive of Factor 2 and Factor 3. Job demand is part of psychosocial factors while counterproductive work behaviour is from work performance factors. Next, Factors 4, 5 and 6 are demonstrated by Environment and

Table 3 Changes in the dimensional construct of the factors under study

	Original construct		Source	Construct retained for the current study	
	Factor	Item		Factor	Item
Psychosocial risk	7	S1, S2, S3, S4, F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12, J1, J2, J3, J4, J5, J6, C1, C2, C3, C4, E1, E2, E3, E4, E5, E6, E7, E8, R1, R2, R3, R4, R5, R6, O1, O2, O3, O4, O5,	COPSOQ [29] and NGJSQ [30]	6	S1, S2, S3, S4, F4, F5, F10, F11, J2, J3, J5, C1, C2, C4, E2, E3, E4, E7, E8, R1, R2, R4, R5
Work performance	3	T1, T2, T3, T4, T5, P1, P2, P3, P4, P5, P6, P7, P8, B1, B2, B3, B4, B5	IWPQ 1.0 [19]	2	T1, T2, T3, T4, T5, P2, P3, P4, P5, P6, P7, P8, B, B2, B3, B4, B5
Total	10	63	–	8	40

Note S = Interpersonal relationships, F = Job demands, J = Job control, E = Environment, R = Job content, O = Role in organisation, T = Task performance, P = Contextual performance, B = Counterproductive work behaviour

Equipment, Job Content and Career Development factors. Interpersonal Relationships at Work emerged as the 7th Factor that contributes to the factors that affect the well-being of the workers in the manufacturing industry. Therefore, from the result achieved, in the manufacturing industry, excellent construct to conduct the psychosocial study will be job demands, environment and equipment, job content, career development, interpersonal relationships at work and job control. Instead, the role in the organisation construct is weak to use in the study. While, for work performance study, task performance, contextual performance and counterproductive work behaviour are the precise construct that can be applied.

Table 5 shows the result of the factor analysis, which presented the retained items in the final construct using PCA. The items that are retained have an eigenvalue of more than 1. Thus, eight factors with eigenvalues of more than one have accounted for 51.37% of the total variance. From the results, Factor 1 is termed task and contextual performance with 12 items ranging from 0.608 to 0.768 of factor loading. Factor 1 originated from two factors which are task performance and contextual performance factors which then merged and became one factor after conducting dimensional reduction using PCA. Both Factor 2 (Job Demand) and Factor 5 (Job Content) consist of 4 items which range from 0.610 to 0.703 and 0.603 and 0.658, respectively. Also, the four items construct applied to Factor 7, which is termed as Interpersonal Relationships at Work. The items have factor loading ranging from 0.699 to 0.759. Next, Factor 3 and Factor 4, termed as Counterproductive Work Behaviour and Environment and Equipment, consist of 5 items construct. Factor 3 has factor loading ranging from 0.780 to 0.828, while Factor 4 has factor loading ranging from 0.660 to 0.802. Lastly, Career Development Factor and Job Control Factor, known as Factor 6 and Factor 8, are included with 3 item construct. Three items in Factor 6 have factor loading 0.766, 0.799 and 0.853. While three items in Factor 8 have factor loading of 0.672, 0.677 and 0.693. In short, the PCA had reduced the original ten factors understudy with 63 items in total into eight factors that construct a measure of psychosocial risk and work performance study with 40 items. The final research construct and the mean and standard deviation values can be seen in Table 6.

Table 4 Contributing psychosocial risk and work performance factors

Contributing construct	Factors
Total % of variance	51.37%
Factor 1	Task and contextual performance (12.704%)
Factor 2	Job demands (6.971%)
Factor 3	Counterproductive work behaviour (6.671%)
Factor 4	Environment and equipment (5.995%)
Factor 5	Job content (5.162%)
Factor 6	Career Development (5.080%)
Factor 7	Interpersonal relationships at work (4.747%)
Factor 8	Job control (4.039%)

Table 5 Result of factor analysis by Principle Component Analysis (PCA)

Rotated Component Matrix[a]								
Items	Component							
	Task and Contextual Performance	Job Demands	Counterproductive Work Behaviour	Environment and Equipment	Job Content	Career Development	InterPersonal Relationship at work	Job Control
P7	0.786							
P6	0.77							
P4	0.769							
T1	0.761							
T3	0.756							
P5	0.755							
T5	0.74							
P3	0.737							
T2	0.735							
P2	0.721							
T4	0.72							
P8	0.608							
F4		0.703						
F10		0.647						
F5		0.635						
F11		0.61						
B4			0.828					

(continued)

Table 5 (continued)

Rotated Component Matrix[a]								
Items	Component							
	Task and Contextual Performance	Job Demands	Counterproductive Work Behaviour	Environment and Equipment	Job Content	Career Development	InterPersonal Relationship at work	Job Control
B3			0.82					
B1			0.79					
B5			0.786					
B2			0.78					
E7				0.802				
E3				0.712				
E2				0.699				
E8				0.688				
E4				0.66				
R1					0.658			
R2					0.653			

(continued)

Table 5 (continued)

Rotated Component Matrix[a]								
Items	Component							
	Task and Contextual Performance	Job Demands	Counterproductive Work Behaviour	Environment and Equipment	Job Content	Career Development	InterPersonal Relationship at work	Job Control
R5					0.634			
R4					0.603			
C2						0.853		
C4						0.799		
C1						0.766		
S1							0.759	
S2							0.709	
S3							0.701	
S4							0.699	
J3								0.693
J2								0.677
J5								0.672
α	0.939	0.697	0.904	0.806	0.803	0.869	0.709	0.587
% of Var	17.31	8.71	5.936	4.562	4.314	4.16	3.322	3.055
Eigen-value	10.905	5.487	3.739	2.874	2.718	2.621	2.093	1.925

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization
[a]Rotation converged in 8 iterations

Table 6 Finalise research construct

Psychosocial risk factors		Mean	S.D.
Interpersonal relationships at work (S)			
S1	How often do you get help and support from your colleagues?	2.17	0.951
S2	How often do you get help and support from your immediate superior?	2.30	0.951
S3	Is there a good atmosphere and good cooperation between you and your colleagues?	1.66	0.794
S4	Is there good cooperation between the colleagues at work?	1.60	0.733
Job demand (F)			
F1	Is your workload unevenly distributed so it piles up?	3.44	1.080
F2	Do you have enough time for your work tasks?	2.50	0.896
F3	Does your work require you to remember a lot of things?	2.48	0.926
F4	Does your work require you to make quick and difficult decisions?	2.66	0.899
F5	Do you have to make very important decisions at your workplace?	2.53	0.996
F6	Does your work put you in emotionally disturbing situations?	3.56	1.085
F7	Does your work demand a great deal of concentration or constant attention or high level of precision?	2.34	1.015
F8	Does your work require that you have very clear and precise eyesight?	2.12	0.906
F9	Could your work injure other people or affect the well-being of others if you make mistakes in your work?	3.12	1.286
F10	Could it cause financial losses if you make mistakes in your work?	2.85	1.335
F11	Does your work demand you to come up with new ideas?	2.27	0.885
F12	How many break times between heavy workloads do you have?	2.92	0.772
Job control (J)			
J1	Do other people make decisions regarding your work tasks?	3.27	0.932
J2	Do you have a say in choosing who you work with?	3.09	0.956
J3	Can you influence the amount of work assigned to you?	3.16	0.957
J4	Can you decide whenever to take a break?	2.65	0.956
J5	Do you have any influence on your work environment?	2.91	0.966
J6	If you have some personal business, is it possible for you to leave your place of work for half an hour without special permissions?	3.84	1.143
Career development (C)			
C1	Do you have the possibility of learning new things through your work?	1.93	0.820
C2	Does your work give you the opportunity to develop your skills?	1.90	0.909
C3	Are you certain regarding the opportunities for promotion and advancement in the next few years?	2.50	1.011

(continued)

Table 6 (continued)

Psychosocial risk factors		Mean	S.D.
C4	Are you certain about whether your job skills will be used and valued five years from now?	2.08	0.961
Environment and equipment (E)			
E1	How often does your job expose you to verbal abuse or confrontations with clients or the general public?	2.05	1.130
E2	How often does your job expose you to the threat of physical harm or injury?	2.63	1.084
E3	The level of noise in the area in which I work is usually high	2.66	0.941
E4	The level of lighting in the area in which I work is usually poor	2.47	1.154
E5	The temperature of my work area during the hot weather is usually comfortable	2.83	0.995
E6	The air in my work area is clean and free of pollution	3.16	2.152
E7	The overall quality of the physical environment where I work is poor	2.45	1.105
E8	My work area is awfully crowded	2.36	1.065
Job content (R)			
R1	How often does your job require you to work very fast?	3.35	0.918
R2	How often does your job require you to work very hard?	3.30	0.874
R3	Do you have too little to do at work?	2.36	0.911
R4	How often is there a marked increase in the workload?	3.00	0.788
R5	How often is there a marked increase in the amount of concentration required on your job?	3.18	0.814
R6	How often can you use the skills from the previous experience and training?	3.40	1.071
Role in organisation (O)			
O1	Do you know exactly which areas are your responsibility?	2.14	0.749
O2	Do you know exactly what is expected of you at work?	2.47	0.834
O3	Are contradictory demands placed on you at work?	3.37	0.972
O4	Do you sometimes have to do things, which ought to have been done in a different way?	3.06	0.857
O5	Do you sometimes have to do things, which seem to you to be unnecessary?	3.35	1.009
Task performance (T)			
T1	I managed to plan my work so that it was done on time	3.79	0.896
T2	My planning was optimal	3.82	0.869
T3	I kept in mind the results that I had to achieve in my work	3.96	0.891
T4	I was able to separate main issues from side issues at work	3.90	0.896
T5	I was able to perform my work well with minimal time and effort	3.67	0.873

(continued)

Table 6 (continued)

Psychosocial risk factors		Mean	S.D.
Contextual performance (P)			
P1	I took on extra responsibilities	3.24	0.895
P2	I started new tasks myself, when my old ones were finished	3.59	0.835
P3	I took on challenging work tasks, when available	3.45	0.838
P4	I worked at keeping my job knowledge up-to-date	3.83	0.863
P5	I worked at keeping my job skills up-to-date	3.88	0.897
P6	I came up with creative solutions to new problems	3.60	0.858
P7	I kept looking for new challenges in my job	3.56	0.915
P8	I actively participated in work meetings	3.49	0.856
Counterproductive work behaviour (B)			
B1	I complained about unimportant matters at work	2.08	1.030
B2	I made problems greater than they were at work	1.70	0.965
B3	I focused on the negative aspects of a work situation, instead of on the positive aspects	1.87	1.112
B4	I spoke with colleagues about the negative aspects of my work	2.01	1.106
B5	I spoke with people from outside the organisation about the negative aspects of my work	1.65	1.049

High performance at work is important to ensure the job is delivered timely as per required. Having bad relationships can cause one to develop poor work performance at work. Poor work performance is expressed as violence, insulting, complaining and others. According to, different types of interpersonal relationships can cause significant changes in negative work behaviour. Interpersonal arguments among peers at work are certainly associated with counterproductive work behaviour [39]. High workers' performances are basically because of the high motivation to work. Career advancement opportunities might be one of the reasons that impact the workers' motivation [40]. Thus, undoubtedly low career development might lead to negative emotional responses among workers that turned into counterproductive behaviour too. Abrey and Smallwood [41] also highlighted that physical work environment correlates with performance in terms of productivity which in this study factors of physical work condition and negative behaviour are included together. Not only those, but researchers also believe that social interaction at work may also affect worker's contextual performance. This hypothesis is also supported by the study of Shaukat, Yousaf and Sanders [42].

4 Conclusion

Finally, the factor analysis by PCA to find the constructed measure of psychosocial factors and workers' performance in a manufacturing industry is studied. This study managed to develop 8-factor constructs consisting of 40 items which include (1) task and contextual performance, (2) job demands, (3) counterproductive work behaviour, (4) environment and equipment, (5) job content, (6) career development, (7) interpersonal relationships and (8) job control. The eight construct measure of psychosocial risk factors with work performance factors is valid to be used in a manufacturing setting. However, the current study only validated eight factors which, for future study, other latent factors might be present. Thus, the found construct measure can be used to conduct a psychosocial and work performance study in the manufacturing sector. Generally, the determined Cronbach's alpha value is within the acceptable limit, indicating the instrument is found to be reliable for the study. KMO and Bartlett's test is also found significant, thus indicating the suitability of data for structure detection. For future research purposes, this study can be utilised as the main tool to explore the psychosocial risk factors and work performance in other sectors.

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