ORIGINAL ARTICLE

# Reliability and Validity Study on Work Safety Culture Questionnaire (WSCQ) among Government Office Workers using Information Motivation and Behavior (IMB) Model

***Odu JO[a], Hamedon TR[a], Mahmud A[a], Baharudin R[b]***

[a]Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, UPM Serdang Darul Ehsan, Malaysia
[b]Occupational Safety and Health Management Office, Universiti Putra Malaysia, UPM Serdang Darul Ehsan, Malaysia

## ABSTRACT

**INTRODUCTION:** The Workplace Safety Culture Questionnaire (WSCQ) was developed to assess the level of knowledge, attitudes and practices on Workplace Safety Culture (WSC) among public sector office workers in Nigeria. The main objective of this study was to determine the validity and reliability of the new Workplace Safety Culture Questionnaire (WSCQ) using the Information Motivation and Behavior (IMB) model. **MATERIALS AND METHODS:** The WSCQ questionnaire was completed twice by the respondents themselves, with an interval of ten days between sessions, to assess the accuracy of the initial results with the retest. This study involved 44 participants. **RESULTS:** Cronbach's alpha showed significant item consistency for each construct in the second pilot study. The information construct (Cronbach's α=0.929 and minimum corrected item-total correlation (CITC)=0.399). The motivation construct (Cronbach's α=0.932 and minimum corrected item-total correlation (CITC)=0.450). The behavior construct (Cronbach's α=0.812 and minimum corrected item-total correlation (CITC)= 0.401). In test-retest reliability, Cohen's kappa coefficient for construct of information for all items was almost 70% between (kappa k=0.689-1000, p<0.001). The intraclass correlation coefficient (ICC) for the construct of motivation for all items is 90% between (ICC=0.810-1000, p<0.001) and (kappa k=0.944-1000, p<0.001) for the construct of behavior was 71% for all items. **CONCLUSION:** This study introduces the WSCQ using the IMB model among public sector office workers as the first official validation of the WSCQ.

**Keywords**
Cohen's kappa, Cronbach's alpha, intraclass correlation coefficient, office ergonomics, and workplace safety culture

**Corresponding Author**
Dr. Odu Josiah Oluwaseun
Department of Community Health,
Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia,
UPM Serdang Darul Ehsan, Malaysia
E-mail : seun_odu2001@yahoo.com

Received: 1st November 2022; Accepted: 6th February 2023

Doi: https://doi.org/10.31436/imjm.v22i2

## INTRODUCTION

Workplace safety culture (WSC) is a significant factor in the provision of a safe working environment in every organization; therefore, it is important to develop Workplace Safety Culture Questionnaire (WSCQ) among office workers to determine the knowledge, attitudes and practices in WSC among them using questionnaires.[1]

High knowledge, positive attitudes and promotion of good practices regarding WSC are important in high-risk work areas such as the construction industry,[2] medical and health centers [3-4] and the aviation industry,[5] and the role among office workers is also very important, because of the nature of office work. For example, office workers spend long hours at work, often hours in front of a computer and in poor ergonomic posture.[6]

Physical injuries and illnesses are common among office workers who sit for long periods of time and don't move even when they have free time to exercise. This illness/ condition can cause absenteeism and suffering during working hours with the workers experiencing fatigue and body pain such as neck, back, shoulders and knees. In addition, eye and vision problems, stress-related issues, and the work environment can negatively impact workers' health.[7]

Prolonged sitting or maintaining a static position for a long time can cause posture and vision-related problems from looking at a computer screen for extended periods. In addition, musculoskeletal disorders, unhealthy eating habits, stress problems resulting from overwork, mental health issues caused by job insecurity, and harassment are some of the health effects or defects and accidents that can result from working in an office.[8-9]

"WSC can be viewed as a component of corporate culture, which alludes to individual, job, and organizational characteristics that affect and influence health and safety".[10] "WSC refers to the enduring value, priority, and commitment placed on safety by every individual and every group at every level of the organization".[11] WSC is a part of the corporate culture of every organization. "It has been described by the phrase, how we do things around here".[12]

The Health and Safety Committee[13] defines "WSC as the product of individual and collective values, attitudes, skills and behavioral patterns that determine the commitment, style and competence of an organization's health and safety management". In its simplest form, it is explained that communication is a characteristic of organizations that have a good safety culture based on self-confidence, a shared vision of the importance of safety and confidence in the implementation of preventive measures.

Work-related disasters, such as accidents, injuries, and illnesses, result from deficiencies in organizational safety policies and procedures. This failure stems from a lack of focus on the WSC to make the workplace safe for everyone." For example, the accident investigation of the Chernobyl disaster revealed many irregularities in the organization of the WSC".[14] WSC is precisely planned to minimize the rate of susceptibility to diseases/accidents/ injuries, or occupational health problems at the workplace.

Monitoring occupational health issues in specific populations requires accurate and reliable methods; In addition, the use of clinical measures is expensive and time -consuming. Thus, an easier way to determine the level of exposure to these occupational health problems among office workers is needed. Using questionnaires is the most common way to do this in epidemiological research with large numbers of participants, as the cost incurred is usually low compared to other available options.[15] The WSCQ can be used to determine the level of knowledge, attitudes and practices of the WSC among office workers, which will ultimately reduce their level of exposure to workplace health problems and will also facilitate the way to recognize this job problem among them.

The validity and reliability of this workplace safety culture questionnaire among office workers is the first to be comprehensively investigated among a study population. Therefore, there is no questionnaire on workplace safety culture among office workers. To fill this gap, it is necessary to conduct a study on the reliability and validity of the WSCQ among office workers in Nigeria.

## MATERIALS AND METHODS

### Development of the WSCQ using the IMB Model

WSCQ was developed using the Information, Motivation and Behavior (IMB) model. The information construct of the IMB model was used to assess the level of knowledge on work safety culture (WSC), the motivation construct of the IMB model was used to assess the level of attitude towards WSC, and the behavior construct was used to assess the level of practices towards WSC among the office workers.

The WSCQ on knowledge, attitude, and practices towards WSC was used as an instrument for data collection in this study. The questionnaire was administered in English in both the first and second pilot studies.

### Pilot study

Twenty males and twenty-four females answered the preliminary version of the WSCQ before the second pilot study. These subjects were administrative workers at the Ministry of Education and Ministry of Environment, Lagos State Government, Ikeja, Nigeria, aged 27 to 55 years, with different marital status (Married, Single, Widow, and Divorced) and different levels of education. The main aim of this pilot study was to determine if the respondents understood the questionnaire's wordings and

scales, evaluate any ambiguities in the questions and identify any modifications needed in the study instrument.

The researcher made the necessary modifications to the words or phrases that the participants did not understand. The reliability of the WSCQ also was used to determine the consistency of scores over time or across raters and was used to ascertain the test-retest reliability test in the first and second pilot studies. Questions with nominal scale were ascertained with Cohen's kappa coefficient, and questions with Likert scale or ordinal scale were assessed using intraclass correlation coefficient (ICC). An interval of 10 days was used between the pre-test and the retest.

### Response rate

The self-administered WSCQ was pre-tested among subjects comprised of 20% of the sample size of the main study (the main study sample size was 244) for the reliability pilot study. In total, 49 questionnaires were administered, but only 44 agreed to participate and returned their questionnaires, hence giving a response rate of 90%. Therefore a total of 44 subjects were included for reliability testing.

### Participants

All participants of the study were Lagos state government administrative workers who worked at the Ministry Of Education and Ministry Of Environment, Lagos State Government, Ikeja, Nigeria, and English was the official language. A total of 44 volunteers (with various levels of education and length of service) participated in this study.

### Data collection

Data were collected on March 4, 2021, for a pre-test and a re-test 10 days later, in the same month of March 2021. Participants were contacted outside their working hours and had to give their written consent. They had 15 minutes to complete the questionnaire. The participants were then contacted again ten days later to complete WSCQ a second time, the results of which allowed to measure the reliability of the survey questionnaire.

### Validity

### Content validity

Five professionals (two from Universiti Putra Malaysia (UPM), Faculty of Medicine and Health Sciences, Community Health Department and one from the Office of Occupational Safety and Health Management, UPM, and two from the Ethics Committee from UPM with PhD and MD specialized in Occupational Health Medicine reviewed the WSCQ, using the IMB model.

Content validity was done to determine whether the questions provide relevant answers to the underlying concepts that are to be explored. The UPM ethical committee reviewed the WSCQ, consisting of a Ph.D. degree holder in occupational health and Assoc. Prof in occupational health and Medicine as well. Also, one Ph.D. degree holder from UPM, Occupational safety and health management office, and one Ph.D. degree holder and one MD in Medicine specialized in occupational health from the Department of Community Health, Faculty of Medicine and Health Sciences reviewed the WSCQ.

Content validity results of five professionals that reviewed the WSCQ showed that from the initial 43 items of the knowledge on work safety culture, 34 (79.1%) were agreed upon to be used, initial 32 items of the attitude towards work safety culture, 23 (71.9%) were agreed upon to be used, and initial 15 items of practices towards work safety culture, 10 (66.7%) were agreed to be used.

### Face validity

The face validation of the questionnaire was done by using ten other administrative workers of similar demographic backgrounds within the study population from the Ministry Of Finance, Lagos State Government, Ikeja, Nigeria, who were randomly selected from the 25 administrative workers working in the ministry to answer all items in the questionnaire.

These participants commented on their understanding of the questions. These participants took an average of

fifteen minutes to complete the WSCQ. Only two participants needed further explanation about the WSC questionnaire. All other participants were positive about the orderly layout, clarity, display of items, and simplicity of statements, confirming a high level of face validity.

### Statistical analysis

Statistical analysis was performed with Statistical Product and Service Solutions (SPSS) software (IBM SPSS Statistics 25), with the significance level set at $P < 0.05$. Reliability analysis was used to analyze Cronbach's alpha, Minimum CITC, and Intraclass Correlation Coefficient (ICC), and descriptive statistics using the crosstabs was used to analyze Cohen's Kappa Coefficient.

## RESULTS

### Reliability

In order to measure the internal consistency (Cronbach's alpha, α), inter-item correlation r, in which the minimum Corrected Item-Total correlation (CITC) must be > 0.3, reliability analysis was conducted to determine the Cronbach's alpha α (recommended value >0.70), and the minimum CITC value (recommended value > 0.3) of all items from the information construct, motivation construct and behavior construct.[16]

Regarding the reliability of the WSCQ, participants completed the questionnaire twice. The interval between test and retest is ten days, as suggested in the study. The values of the Cronbach's α and minimum CITC, respectively, for information, motivation, and behavior constructs in the first test were α=0.791 and CITC=-0.059 for the information construct, α=0.906 and CITC=0.084 for motivation construct and α=0.788 and CITC=0.176 for behavior construct. In the second pilot study (retest), were α=0.929 and CITC=0.399 for information construct, α=0.932and CITC=0.450 for motivation construct, and α=0.812 and CITC=0.401 for behavior construct.

In the first test, the total number of items for knowledge, attitude, and practices towards WSC in the WSCQ were 34, 23, and 10, respectively, but were reduced to 15, 20, and 7 after the second pilot study (retest) as shown in Table I

**Table I:** Summary from reliability analysis (first and second Pilot Test)

| First Test Construct | Number of items | Cronbach's alpha | Minimum CITC |
|---|---|---|---|
| Information (knowledge of WSC) | 34 | 0.791 | -0.059 |
| Motivation (attitude towards WSC) | 23 | 0.906 | 0.084 |
| Behavior (practices towards WSC) | 10 | 0.788 | 0.176 |
| **Second Test Construct** | **Number of items** | **Cronbach's alpha** | **Minimum CITC** |
| Information (knowledge of WSC) | 15 | 0.929 | 0.399 |
| Motivation (attitude towards WSC) | 20 | 0.932 | 0.450 |
| Behavior (practices towards WSC) | 7 | 0.812 | 0.401 |

*p<0.01*

In the test-retest reliability for items in the information construct, among 15 Kappa coefficients examined across all items of the information construct, 66.7% showed moderate agreement to perfect agreement, and 33% showed slight agreement. The preferred value (0.40-1.00) is shown in Table II.[17]

**Table II: Summary of the test-retest reliability for items in the information construct**

| No | Number of Items | Cohen's kappa |
|---|---|---|
| 1 | Work safety culture is a sub-facet of organizational culture, which affects workers' attitude and behavior in relation to an organization's ongoing safety performance | 0.689 |
| 2 | Decreased information on work safety culture will result in high exposure to occupational health risks at workplace | 0.290 |
| 3 | Increased information on work safety culture will result in low exposure to occupational health risks at workplace | 0.136 |
| 4 | Bad behavior toward work safety culture will result in high exposure to occupational health risks at the workplace | 0.689 |
| 5 | Increased information on work safety culture will result in a decrease in occupational health problems at the workplace | 0.189 |
| 6 | Lack of motivation toward work safety culture will increase occupational health problems at workplace | 0.228 |
| 7 | Increased motivation toward work safety culture will result in a decrease in occupational health problems at the workplace | 1.000 |
| 8 | Good behavior toward work safety culture will result in a decrease in occupational health problems at the workplace | 0.689 |
| 9 | Do you agree to extend work to weekends can cause health risks | 0.901 |
| 10 | The office is too cold can cause health risks | 0.152 |
| 11 | Prolonged computer usage can cause health risks | 0.476 |
| 12 | Job insecurity can cause health risks | 0.834 |
| 13 | Prolonged static posture can cause health risks | 0.807 |
| 14 | Disregard for health can cause health risks | 0.814 |
| 15 | Friction with colleagues can cause health risks | 0.730 |

*p<0.01*

Test-retest reliability for items in the motivation construct, among the 20 Intraclass correlation coefficients (ICC) across items of the motivation construct, 90% are considered good, and 10% were fair. The preferred value (0.70-1.00) is shown in table III.[17]

**Table III: Summary of the test-retest reliability for items in the motivation construct**

| No | Number of items | Intraclass correlation coefficient (ICC) |
|---|---|---|
| 1 | I am proud of my work | 1.000 |
| 2 | I think my work makes me happy | 1.000 |
| 3 | I think my job suits me better than any other job | 1.000 |
| 4 | I don't force myself to go to work | 1.000 |
| 5 | I think my hope has been fulfilled by getting this job | 0.995 |
| 6 | I feel satisfied with the stimulation I took | 0.932 |
| 7 | I regularly receive health and safety information | 1.000 |
| 8 | I have specialized training in health and safety | 0.953 |
| 9 | I know the number of sick leave days | 0.352 |
| 10 | I know my job description | 0.810 |
| 11 | Employees comply with safety regulations | 0.995 |
| 12 | A leading culture in departments and agencies encourages learning from mistakes | 0.944 |
| 13 | It's easy for any employee to request information they want to know while at work | 0.995 |
| 14 | Professional disagreements between colleagues are resolved appropriately and dealt with in a manner that is acceptable and satisfactory to all | 0.531 |
| 15 | There are clear policies and regulations that govern work in ministries and agencies | 0.993 |
| 16 | The social status and health of workers are taken into account during work | 0.957 |
| 17 | Annual leave is granted according to the wishes of the employee | 0.935 |
| 18 | Sick leave is given to employees without any problems | 0.989 |
| 19 | I choose work time that suits my family | 0.996 |
| 20 | There are no restrictions to apply abroad | 1.000 |

*$p<0.01$

Test-retest reliability for items of the behavior construct, among 7 Kappa coefficients examined across all items of the behavior construct, 71.4% showed substantial agreement to perfect agreement, and 28.6% showed slight agreement across the raters. The preferred value (0.40-1.00) as shown in Table IV.[17]

**Table IV: Summary of the test-retest reliability for items in the behavior construct**

| No | Number of Items | Cohen's kappa |
|---|---|---|
| 1 | Do you undergo any health promotion program | 1.000 |
| 2 | Do you undergo any work health education or promotion training | 1.000 |
| 3 | Do you monitor your health to know how you are feeling at every point in time | 0.022 |
| 4 | Do you take break time at work | 0.944 |
| 5 | Do you undergo exercises and physical activity during your leisure time | 1.000 |
| 6 | Do you use computer screen cover at work | 0.954 |
| 7 | I do not sit in one position for a prolonged period of time at work | 0.183 |

*$p<0.01$

## DISCUSSION

Due to their educational and professional background, all those who participated in the survey were voluntary and represented public sector administrative staff. Additionally, a team of researchers, including occupational health, community medicine, occupational safety and health, and medical professionals, participated in the validation of the WSCQ and a full ethics committee review and pre-test of the questionnaire.

The content validity and face validity results of the WSCQ using the IMB model among public sector administrative staff show that the above changes and modifications are acceptable and that the final version of the WSCQ is relevant and useful to determine the level of knowledge, attitudes and practices of WSC among the research population. Content validity is done to determine whether the questions provide relevant answers to the underlying concepts that are to be explored. Participants were positive about the orderly layout, clarity, item representation, and simplicity of statements, confirming high levels of face validity and content validity.

Examining its reliability testing showed that the WSCQ using the IMB model demonstrated strong reliability in the second pilot study in terms of correlation within the scales reported in the WSCQ. In order to determine the degree of correlation within the scales, the internal consistency (Cronbach's alpha, α) and the minimum Corrected Item-Total correlation (CITC) were measured, which showed a strong degree of correlation among the scales in the second pilot study while motivation scale was substantially high.[16]

Test-retest reliability for the information and behavior scales, Cohen's kappa coefficient was considered adequate, and the intraclass correlation coefficient (ICC) for motivation was also considered adequate. The Kappa coefficient shows a significant, almost perfect and perfect agreement between the initial test and retest responses on almost all information and behavioral scales, while the same is true for the motivation scale for the intraclass correlation coefficient (ICC). The exceptions to this rule are questions 3, 5 and 10 for the information scale and 3 and 7 for the behavior scale. This was found to have a mild/moderate degree of fit, and questions nine and fourteen for the motivation scale were considered fair or moderate in their degree of correlation.[17]

These results imply that the reliability between the initial test and the retest can be considered sufficient for the three scales, in addition to the high level of internal consistency and CITC indicated by the high value of Cronbach's alpha and CITC > 0.3. A study similar to this finding was conducted by[18] on the Malay version of the

Cornell Musculoskeletal Discomfort Questionnaire (CMDQ): Reliability and Validity Study in Malaysia. This study shows that Cronbach's alpha range has significant item consistency for each subscale (Cronbach's a>0.95). The range of Kappa coefficients was between (ICC= 0.690-0.949, p<0.001), (ICC=0.801-0.979, p<0.001) and (ICC=0.778-0.944, p<0.001) for scale and frequency, interference. The study introduced the Malay version of the CMDQ and confirmed high reliability and validity for the assessment of musculoskeletal discomfort in office workers.

Therefore, it is concluded that the WSCQ using the IMB model is a robust and reliable data collection method among the study population. Having good data collection tools is key to conducting valid assessments in workplace safety culture ergonomics research.

## CONCLUSION

This study focuses on the assessment of validity and reliability and introduces the WSCQ using the IMB model among public sector office workers as the first official validation of the WSCQ, and confirmed high reliability and validity for the evaluation of the level of knowledge, attitude, and practices towards WSC among the study population.

Using the IMB model, the WSCQ is expected to be a useful tool for assessing various aspects of workplace safety culture among office workers, with applications in both epidemiological research and in practice. However, this study was conducted among administrative staff who only work in ministries in Lagos State, Nigeria. Also, a large number of Nigerians are office workers with different attitudes and behaviors towards work and health; further validation and analysis may be required before the WSCQ can be considered a fully validated data collection tool for further research in Nigeria.

This study shows that the WSCQ using the IMB model is a valid and reliable method to assess the level of knowledge, attitudes and practices of WSC among the population.

## ETHICS STATEMENT

Ethical clearance was obtained from the UPM Ethics Committee for Research Involving Human Subjects (JKEUPM) with reference number JKEUPM-2020-051.

## CONFLICT OF INTEREST

None to declare.

## ACKNOWLEDGEMENTS

The authors are grateful to Dr. Anisah Baharom and Assoc. Prof. Dr. Rosliza Abdul Manaf for their permission to use the WSCQ after UPM ethical committee review. I thank my supervisor, Dr. Titi Rahmawati Hamedon, and my co-supervisors, Dr. Aidalina Mahmud and Assoc. Prof. Dr. Mohd Rafee Baharudin for their involvement in the validation of the tool process.

## REFERENCES

1. Lindberg CM, Srinivasan K, Gilligan B, Razjouyan J, Lee H, Najafi B, Canada KJ, Mehl MR, Currim F, Ram S, Lunden MM, Heerwagen JH, Kampschroer K, Sternberg EM. Effects of office workstation type on physical activity and stress. Occup Environ Med 2018;689–695. https://doi.org/10.1136/oemed-2018-105077.
2. Sneller TN, Choi SD, Ahn K. Awareness and perceptions of ergonomic programs between workers and managers surveyed in the construction industry. Work 2018;61(1):41–54. https://doi.org/10.3233/WOR-182778.
3. Hill MR, Roberts MJ, Alderson ML, Gale TCE. Safety culture and the five steps to safer surgery : an intervention study. British Journal of Anaesthesia 2015;114(6):958–962. https://doi.org/10.1093/bja/aev063
4. González-formoso, C., Clavería, A., Hermida-rial, L., Rial, A., Gude-sampedro, F., Pita-fernández, S.,& Martín-Miguel, V. Effectiveness of an educational intervention to improve the safety culture primary care : a randomized trial. BMC Family Practice, 2019; 8, 1–10.

5. Lawrenson AJ, Braithwaite GR. Regulation or criminalization: What determines the legal standards of safety culture in commercial aviation? Safety Science 2018;102:251–262. https://doi.org/10.1016/j.ssci.2017.09.024.
6. Lindberg CM, Srinivasan K, Gilligan B, Razjouyan J, Lee H, Najafi B, Canada KJ, Mehl MR, Currim F, Ram S, Lunden MM, Heerwagen JH, Kampschroer K, Sternberg EM. Effects of office workstation type on physical activity and stress. Occup Environ Med 2018;689–695. https://doi.org/10.1136/oemed-2018-105077.
7. Murad MS, O'Brien L, Farnworth L, Chien CW. Health Status of People with Work-Related Musculoskeletal Disorders in Return to Work Programs: A Malaysian Study. Occupational therapy in health care. Informa Healthcare New York; 2013;27(3):238-55.
8. Jongin L, Jung WK. Occupational Diseases Among Office Workers and Prevention Strategies. J Ergon Soc Korea JESK 2015;34(2):125-134.
9. Eberendu I.F, Ozims SJ, Agu GC, Ihekaire DE, Obioma-Elemba JE, Amah HC, et al. workplace health risks associated with diseases and health promotion in the Nigerian banking sectors. International Journal of Advanced Research in Biological Sciences 2018;5(2):197-208.
10. Everon CC. Assessing safety culture, values, practices, and outcome, Colorado State University, Fort Collins, Colorado. [Internet] 2010, [cited 2021 July 10]. Available from: https://dspace.library.colostate.edu/bitstream/handle/10217/40282/Chenhal_colostate_0053A_10070.pdf?sequence=1
11. Hamouda AS. Attitude toward safety culture among employees at the intensive care unit in the government hospital of Gaza city. [Internet] 2013, [cited 2021 July 10]. Available from: http://library.iugaza.edu.ps/thesis/110337.pdf.
12. Cooper MD. Towards a model of safety culture. Safety Science 2000;36(2):111–136. https://doi.org/10.1016/S0925-7535(00)00035-7.
13. Vu T, Cieri HD. Safety culture and safety climate definitions suitable for a regulator : A systematic literature review 2014;1–92.
14. Cox S, Flin R. Safety culture: Philosopher's stone or man of straw? Work and Stress 1998;12(3):189–201. https://doi.org/10.1080/02678379808256861.
15. Xiao D, Jakimowicz JJ, Albayrak A, Buzink SN, Botden SMBI, Goossens RHM. Face, content and Construct Validity of a Novel Portable Ergonomic Simulator for Basic Laparoscopic skill, Journal of surgical education. Elsevier 2014;71(1):65-72.
16. Pallant J. SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS. Routledge; Jul 16.
17. Meyers LS, Gamst GC, Guarino AJ. Performing data analysis using IBM SPSS. John Wiley & Sons; 2013 17.
18. Shariat A, Tamrin SB, Arumugam M, Ramasamy R. The Bahasa Melayu version of Cornell musculoskeletal discomfort questionnaire (CMDQ): reliability and validity study in Malaysia. Work. 2016 Jan 1;54(1):171-8. DOI: 10.3233/WOR-162269