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CONTENT VALIDITY OF A QUESTIONNAIRE TO ASSESS THE ERGONOMIC KNOWLEDGE OF COMPUTER PROFESSIONALS

Mohamed Sherif Sirajudeen, Umama Nisar Shah, Nagarajan Mohan, Padmakumar Somasekharan Pillai

Yenepoya Physiotherapy College, Yenepoya University, Mangalore, Karnataka

E-mail of Corresponding Author: padhupt@hotmail.com

ABSTRACT

Background: Ergonomics is the scientific study of human work. The objective of ergonomics is to obtain an effective match between the user and work station to improve working efficiency, health, safety, comfort and easiness to use. Neglect of ergonomic principles brings inefficiency and pain in the workplace. **Objectives**: The purpose of this study is to establish the content validity of an instrument (Questionnaire) to assess Ergonomic Knowledge of Computer professionals using a rigorous Judgment-quantification process. **Methods and Measures:** The Draft Questionnaire composed of 35 items related to Knowledge about Musculoskeletal disorders and its risk factors, Working Postures, Seating, Keyboard/Mouse, Monitor, Table and Accessories and finally Rest breaks and Exercises. A panel of 9 experts validated the Draft Ergonomic Knowledge Questionnaire. After all correspondence was received regarding Content validity for each item, The Content Validity Index (CVI) is calculated by tallying the results of the experts based on the degree to which the experts agree on the relevance and clarity of the items. Finally, a Focus group was held to evaluate the instrument for overall comprehensiveness. **Results:** Results from the panel of experts yielded a 0.98 overall Content validity index. Few experts suggested minor revisions regarding the clarity or wording of the items, and those revisions were incorporated into the instrument. **Conclusion:** The process used to determine Content validity proved to offer consistency and structure to the instrument development. High CVI scores were generated for the items judged relevant to the content domain as well as for the overall instrument. The results support the Content validity of this Questionnaire as a tool to assess the Ergonomic Knowledge of Computer Professionals.

Keywords: Content Validity, Ergonomic Knowledge Questionnaire, Musculoskeletal Disorders, Computer Professionals.

INTRODUCTION

This article describes the process undertaken to develop and validate a Questionnaire to assess the Ergonomic knowledge of computer professionals. Why is it important? Ergonomics is the scientific study of human work[1]. The objective of Ergonomics is to obtain an effective match between the user and work station to improve working efficiency, health, safety, comfort and easiness to use. Neglect of Ergonomic principles brings inefficiency and pain in the workplace. An ergonomically deficient workplace may not cause immediate pain, because the human body has a great capacity for adapting to a poorly designed workplace or structured job. However, in time,

the compounding effect of job and/or workplace deficiencies will surpass the body's coping mechanisms, causing the inevitable physical symptoms, emotional stress, low productivity, and poor quality of work [2,3]. These problems if ignored can prove debilitating and can cause crippling injuries forcing one to change one's profession. The purpose of this study is to establish the Content validity of an instrument (Questionnaire) to assess ergonomic knowledge of Computer professionals using a rigorous Judgment-quantification process. The Knowledge Questionnaire developed and validated herein will be used for future studies comparing Computer professional's Ergonomic Knowledge with their actual Ergonomic Practice.

MATERIALS AND METHODS

Overview

Content validity is a cardinal step in the development of new experimental measuring devices because it represents an initiating mechanism for linking abstract concepts with observable and measurable indicators[4]. According to Lynn Content validation is a two-step process beginning with the Development stage and ending with the Judgment-quantification process[5]. The Development stage requires an extensive review of the literature to identify content for the instrument and constitute relevant domains. In this study, the literature review identified approximately 40 to 50 articles on the subject of Computer Ergonomics and Work-related Musculoskeletal disorders. After the literature was reviewed the items were constructed. The entire instrument was developed along with instructions and scoring guidelines.

The Judgment-quantification stage requires a Panel of experts, working independently, to evaluate the instrument and rate items of relevance according to the Content domain[5]. In addition, item content and clarity, as well as overall instrument comprehensiveness, are evaluated in this stage. Berk recommends that expert panel members should evaluate how representative the items are of the Content domain [6]. As part of this process, expert panel members should be requested to suggest modifications for items that are not consistent with conceptual definitions[5]. When estimating Content validity, it is essential to utilize a quantitative measure, the content validity index (CVI)[4,7,8]. The CVI is calculated by tallying the results of the experts based on the degree to which the experts agree on the relevance and clarity of the items.

Questionnaire

This research required drafting of an Ergonomic Knowledge Questionnaire for use with Computer Professionals. Approval was taken from Yenepoya University Ethical Committee prior to the commencement of the study. Questionnaires and information from various sources were reviewed[9-11], and Draft Questionnaire items were created. The Draft Questionnaire composed of 35 items related to Knowledge about Musculoskeletal disorders and its risk factors, Working Postures, Seating, Keyboard/Mouse, Monitor, Table and Accessories and finally Rest breaks and Exercises.

The section related to Knowledge about Musculoskeletal disorders and its risk factors composed of 3 Multiple choice questions(MCQ) and 2 True or False (T or F) questions related to Definition of Ergonomics , Cumulative Trauma Disorders, Goal of Ergonomics, Signs and symptoms of Musculoskeletal disorders and its risk factors. The Working Postures section composed of 1 MCQ and 4 Tor F questions related to Head, Neck and Trunk, Upper arm and Elbow, Wrist and Hand, Thigh and finally Feet. The Seating (Chair) section composed of 3

MCQs an 2 Tor F questions related to Adjustable back rest, Low back support, Seat height, Seat pan and finally Base of the Chair. The Key board/ Mouse section composed of 3 MCQs and 2 T or F questions related to Key board level, Mouse Size, Mouse grip, Mouse placement and finally Ideal Mouse pad.

The Monitor section composed of 3 MCQs and 2 T or F questions related to Monitor's Position, Level (Height), Tilt, Distance (From the User) and finally presence of Glare. The Table and Accessories section composed of 3 MCQs and 2 T or F questions related to Placement of Telephone and Documents, Document holder, Telephone Usage, Edge of Table's Top and finally Leg room under the Table. The Rest breaks and Exercises section composed of 3 MCQs and 2 Tor F questions related to Periodically alternating Computer tasks, Micro breaks, Mini breaks, Stretching and finally Eye exercises.

Sample

A panel of experts was used to validate the Draft Ergonomic Knowledge Questionnaire. The Content validation process described by Lynn was used[5]. The panel comprised of 9 experts including Orthopedic Surgeons, Physiotherapists, Research methodology expert, Psychiatrist, Community health Physician and Information technology expert. The panel of experts was selected based on their knowledge and experience in the area of Musculoskeletal disorders and Computer Ergonomics.

Data Collection

A cover letter explaining the purpose of the instrument along with Background, Aims and Objectives of the study and instructions on how to complete the criteria checklist were provided to the panel of experts. The researcher verbally explained the process to the panel of experts to ensure understanding of the process. Informed consent was obtained from the experts. The panel was asked to review the items in the tool and give their suggestions regarding accuracy, relevance, and appropriateness of the content. After all correspondence was received regarding content validity for each item, a Focus group was held to evaluate the instrument for overall comprehensiveness. The objective of the Focus group was to reach consensus on the overall comprehensiveness of the instrument, that is, to determine whether the experts felt the instrument measured what it was intended to measure.

RESULTS

The calculation or proportion that is sufficient for determining content validity agreement was searched in the literature. A CVI of 0.70 represents average agreement; 0.80, adequate agreement; 0.90, good agreement and CVI of 1.00 indicates 100 percent agreement between raters [4,5]. According to Lynn, when there are six or more judges, the CVI should be no lower than 0.78 for an item to be judged acceptable. CVI was calculated for each item under 7 sections (see Table 1-7) and for the overall instrument.

Results from the panel of experts yielded a 0.98 overall Content validity index. Few experts suggested minor revisions regarding the clarity or wording of the items, and those revisions were incorporated into the instrument. Once all items had been evaluated and all changes were made, the revised instrument was sent to Focus group to evaluate the overall instrument.

The focus group discussed the instrument for overall comprehensiveness. None of the experts suggested additional content or changes at this time. Based on the CVI for each item as well as that for the overall instrument, it is believed that the instrument contains questions relevant to Ergonomic Knowledge of Computer Professionals.

CONCLUSION

Content validity is a cardinal step in the selection and administration of an instrument. The two-step method used in this study, consisted of a Developmental stage and a Judgment-quantification stage, required a comprehensive literature review, item creation, and agreement from a specific number of experts about the item's and the entire instrument's validity. The panel of Experts was asked to review the items in the tool and give their suggestions regarding accuracy, relevance, and appropriateness of the content. Finally a focus group discussed the instrument for overall comprehensiveness. The process used to determine Content validity proved to offer consistency and structure to the instrument development. High CVI scores were generated for the items judged relevant to the content domain as well as for the overall instrument. The results support the Content validity of this Questionnaire as a tool to assess the Ergonomic Knowledge of Computer Professionals.

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TABLE 1: Content Validity Index (CVI) of Section - Knowledge about Musculoskeletal disorders and its risk factors

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Definition of Ergonomics	1	1	1	1	1	1	1	1	1	1
Cumulative Trauma Disorders	1	1	1	1	1	1	1	1	1	1
Goal of Ergonomics	1	1	1	1	1	1	1	1	1	1
Signs & Symptoms of MSDs	0	1	1	1	1	1	0	1	1	0.78
Risk factors for MSDs	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification

Table 2: Content Validity Index (CVI) of Section – Working Postures

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Head, Neck and Trunk	1	1	1	1	1	1	1	1	1	1
Upper arm and Elbow	1	1	1	1	1	1	1	1	1	1
Wrist and Hand	1	1	1	1	1	1	1	1	1	1
Thigh	1	1	1	1	1	1	1	1	1	1
Feet	1	1	0	1	1	1	1	1	1	0.89

1 – Agree, 0 – Disagree or Need Modification

Table 3: Content Validity Index (CVI) of Section – Seating (Chair)

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Adjustable Back rest	1	1	0	1	1	1	1	1	1	0.89
Low Back support	1	1	1	1	1	1	1	1	1	1
Seat height	1	1	1	1	1	1	1	1	1	1
Seat pan	1	1	1	1	1	1	1	1	1	1
Base of the Chair	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification

Table 4: Content Validity Index (CVI) of Section – Key board/ Mouse

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Key board level	1	1	1	1	1	1	1	1	1	1
Mouse Size	1	1	1	1	1	1	1	1	1	1
Mouse grip	1	1	1	1	1	1	1	1	1	1
Mouse placement	1	1	1	1	1	1	1	1	1	1
Ideal Mouse pad	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification

Table 5: Content Validity Index (CVI) of Section – Monitor

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Monitor's Position	1	1	1	1	1	1	1	1	1	1
Level of Monitor	1	1	1	1	1	1	0	1	1	0.89
Tilt of Monitor	1	1	1	1	1	1	1	1	1	1
Monitor distance	1	1	1	1	1	1	1	1	1	1
Presence of Glare	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification

Table 6: Content Validity Index (CVI) of Section – Table and Accessories

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Placement of Telephone and Documents	1	1	1	1	1	1	1	1	1	1
Document holder	1	1	1	1	1	1	1	1	1	1
Telephone Usage	1	1	1	1	1	1	1	1	1	1
Edge of Table's Top	1	1	1	1	1	1	1	1	1	1
Leg room under the Table	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification

Table 7: Content Validity Index (CVI) of Section – Rest breaks and Exercises

ITEM	RATER									CVI
	I	II	III	IV	V	VI	VII	VIII	IX	
Periodically alternating Computer tasks	1	1	1	1	1	1	1	1	1	1
Micro breaks	1	1	1	1	1	1	1	1	1	1
Mini breaks	1	1	1	1	1	1	1	1	1	1
Stretching	1	1	1	1	1	1	1	1	1	1
Eye exercises	1	1	1	1	1	1	1	1	1	1

1 – Agree, 0 – Disagree or Need Modification