International Journal of Therapies and Rehabilitation Research

www.ijtrr.com

Content validity and inter-rater reliability of a checklist to assess the ergonomic practice of computer professionals

Mohamed Sherif Sirajudeen[1] , Padmakumar Somasekharan Pillai*[2,] Umama Nisar Shah[3], Nagarajan Mohan[3]

[1] Associate Professor, Yenepoya Physiotherapy College, Yenepoya University, Mangalore- 575 018, India.
[*2] Dean, Faculty of Allied Health and Basic Sciences, Yenepoya University, Mangalore-575 018, India.
[3] Assistant Professor, Yenepoya Physiotherapy College, Yenepoya University, Mangalore -575 018, India.

*Corresponding author E-mail: padhupt@hotmail.com

ABSTRACT

Objectives: The objective of this study is to establish the Content validity and inter-rater reliability of an instrument (Checklist) to assess ergonomic practice of Computer professionals using a rigorous Judgment-quantification process and Intra-class correlation coefficient respectively.

Methods and Measures: The Draft Checklist composed of 43 items related to Working Postures, Seating, Keyboard/Mouse, Monitor, Table and Accessories and finally Rest breaks and Exercises. A panel of 9 experts validated the Draft Ergonomic Practice Checklist. The Content Validity Index (CVI) was calculated after receiving all correspondence regarding content validity for each item of the checklist. Finally, a Focus group was held to evaluate the instrument for overall comprehensiveness. A total of 20 computer professionals both males and females of mean age of 33.8 years participated in the inter-rater reliability study. The raters of this study were 2 Physiotherapy faculties with mean clinical and teaching experience of 7.5 years. Both the raters assessed the ergonomic practice of the computer professionals using the checklist. Observations were recorded independently and not discussed among the raters.

Analysis: The Content Validity Index (CVI) was 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. Intraclass correlation coefficient was used to assess the inter-rater reliability of the ergonomic practice checklist based on the observations recorded independently by the raters.

Results: Results from the panel of experts yielded a 0.98 overall Content validity index. Inter-rater reliability analysis revealed that r value was above 0.87 for all the sections of the checklist thus being in the excellent range.

Conclusion: The process used to determine Content validity and the inter-rater reliability proved to offer structure and consistency 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 checklist demonstrated an excellent reliability. The results support the Content validity and the inter-rater reliability of this Checklist as a tool to assess the Ergonomic Practice of Computer Professionals.

Keywords: Content Validity, Inter-rater reliability, Ergonomic Practice Checklist, Computer Professionals.

INTRODUCTION

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 ergonomic practice can be assessed by using checklist. Such a checklist must be valid- that is, it must be true measure of what it purports to measure and must not be subject to bias [4]. Validity can further classified as face, content, criterion and construct validity [5]. Content validity refers to the degree that the instrument covers the content that it is supposed to measure [6]. It also refers to the adequacy of the sampling of the content that should be measured [7]. Therefore, content validity measures the comprehensiveness and representativeness of the content of a scale [8]. The checklist must also be reliable – that is, the random error of responses must be minimized so that consistency of measurements is achieved [5]. Inter-rater reliability refers to the consistency with which two (or more) raters evaluate the same data using the same scoring criteria at a particular time [9, 10].

Measuring and reporting validity and reliability of instruments are important. This can help to give confidence to the readers and researchers about instruments [8]. The purpose of this study is to establish the Content validity and inter-rater reliability of an instrument (Checklist) to assess ergonomic practice of Computer professionals using a rigorous Judgment-quantification process and Intra-class correlation coefficient respectively. The Practice Checklist developed herein will be used for future studies comparing Computer professional's Ergonomic Knowledge with their actual Ergonomic Practice.

MATERIAL AND METHODS

Content Validity study

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 [11]. According to Lynn Content validation is a two-step process beginning with the Development stage and ending with the Judgment-quantification process [12]. 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. 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 [13]. As part of this process, expert panel members should be requested to suggest modifications for items that are not consistent with conceptual definitions [12]. When estimating Content validity, it is essential to utilize a quantitative measure, the content validity index (CVI) [11, 14, 15].

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.

Drafting the Checklist

This research required drafting of an Ergonomic Practice Checklist for use with Computer Professionals. Checklists and information from various sources were reviewed [16-22], and Draft Checklist items were created. The Draft Checklist composed of 43 items related to Working Postures, Seating, Keyboard/Mouse, Monitor, Table and Accessories and finally Rest breaks and Exercises. Approval was taken from Yenepoya University Ethical Committee prior to the commencement of the study.

Panel of Experts

A panel of experts was used to validate the Draft Ergonomic Practice Checklist. 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 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.

Inter-rater reliability Study

Subjects

A total of 20 computer professionals participated in the study. The subjects were both males and females of age ranged from 20 to 51 years (mean = 33.8 years). Subjects were included if they worked in computer for minimum 3 hours/day on an average and had completed minimum 1year of experience in the present or previous job.

Raters

The raters of this reliability study were 2 Physiotherapy faculties with mean clinical and teaching experience of 7.5 years. Both the raters are trained in the use of Checklist to assess the ergonomic practice of the computer professionals.

Procedure

Both the raters assessed the ergonomic practice of the computer professionals using the checklist. Observations were recorded independently and not discussed among the raters.

Analysis

Intraclass correlation coefficient was used to assess the inter-rater reliability of the ergonomic practice checklist based on the observations recorded independently by the raters.

RESULTS

CVI was calculated for each item under 6 sections (see Table 1-6) and for the overall instrument.

Results from the panel of experts yielded a 0.98 overall Content validity index. Inter-rater reliability analysis revealed that r value was above 0.87 for all the sections of the checklist (Working Postures, Seating, Keyboard/Mouse, Monitor, Table & Accessories and finally Rest breaks & Exercises) thus being in the excellent range (see Table 7).

Table 1: Content Validity Index (CVI) of Section – Working Postures		
S.NO	ITEM	CVI
1	Head and neck to be upright.	1
2	Head, neck, and trunk to face forward.	1
3	Trunk to be perpendicular to floor.	1
4	Shoulders and upper arms to be about perpendicular to the floor and relaxed.	1
5	Upper arms and elbows to be close to the body.	1
6	Forearms, wrists, and hands to be straight and parallel to floor.	1
7	Wrists and hands to be straight.	1
8	Thighs to be parallel to the floor.	1
9	Lower legs to be perpendicular to floor.	1
10	Feet rest flat on the floor or are supported by a stable footrest.	1

Table 2: Content Validity Index (CVI) of Section – Seating (Chair)		
S.NO	ITEM	CVI
1	Backrest adjustable	1
2	Backrest provides support for lower back.	1
3	Seat height adjustable.	1
4	Seat width and depth accommodate the user.	1
5	Seat front does not press against the back of the knees and lower legs.	1
6	Seat has cushioning.	1
7	Seat is rounded with a "waterfall" front.	0.89
8	Armrests present.	1
9	Armrests, if used, appropriate height and support both forearms.	1
10	Five legged base.	1
11	Caster wheels present.	1

Table 3: Content Validity Index (CVI) of Section – Key board/ Mouse		
S.NO	ITEM	CVI
1	Keyboard platform is stable.	1
2	Keyboard same height as the elbow.	1
3	Mouse is located next to keyboard.	1
4	The shape/size of mouse fits employee's hand.	1
5	Whether the employee uses mouse pad with wrist rest.	1
6	Holds mouse lightly and click gently.	1

Table 4: Content Validity Index (CVI) of Section – Monitor		
S.NO	ITEM	CVI
1	Top of the screen is slightly below eye level.	1
2	Monitor at a distance of 20 to 40 inches from the user.	0.89
3	Monitor position is directly in front of the employee.	1
4	Monitor is tilted 20^0 posterior	0.89
5	Screen is free from glare.	1

Table 6: Content Validity Index (CVI) of Section – Rest breaks and Exercises		
S.NO	ITEM	CVI
1	Vary computer tasks with other work activities.	1
2	Takes micro break once in 30-40 minutes.	0.89
3	Takes mini break once in 1-2 hours.	0.89
4	Perform regular eye exercises.	1
5	Perform regular stretching exercises.	1

Table 5: Content Validity Index (CVI) of Section – Table and Accessories		
S.NO	ITEM	CVI
1	The top of the table is rounded without sharp or hard edges.	1
2	Leg space below the table is adequate.	1
3	Document holder is provided.	1
4	Document holder, if provided, is placed at about the same height and distance as the monitor screen.	1
5	Telephone, documents and frequently accessed materials kept within easy arm's reach.	1
6	Telephone can be used with head upright and shoulders relaxed if the employee does computer tasks at the same time. or Whether employee uses head set with mic.	1

Table 7**:** Inter-rater Reliability of the Ergonomic Practice Checklist		
S.No	Section	Intraclass correlation coefficient (r)
1	Working Postures	0.93
2	Seating (Chair)	0.99
3	Keyboard/ Mouse	0.95
4	Monitor	0.95
5	Table & Accessories	0.87
6	Rest breaks & Exercises	0.99

DISCUSSION

The aim of the present study was to develop a valid and reliable checklist covering all aspects of the ergonomic practice which could be used in the future studies to look at the gap between knowledge and practice of ergonomics among computer professionals. In this study the content validity of the checklist was established by using a rigorous Judgment-quantification process.

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 [11, 12]. 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. In the present study CVI was calculated for each item under 6 sections (see Table 1-6) and for the overall instrument. Results from the panel of experts yielded a 0.98 overall Content validity index which indicates good agreement between the raters.

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.

In this study the inter-rater reliability was assessed by Intra-class correlation coefficient. The results revealed that r value was above 0.87 for all the sections of the checklist (Working Postures, Seating, Keyboard/Mouse, Monitor, Table & Accessories and finally Rest breaks & Exercises) thus being in the excellent range (see Table 7). Based on the CVI and inter-rater reliability of the instrument, it is believed that this checklist can be successfully used as a valid

and reliable tool to assess the ergonomic practice of the computer professionals.

CONCLUSION

In order to have confidence in the outcomes of a research, one must be ensured that the tool consistently measures what it purports to measure when perfectly administered. In brief, the tool must be both valid and reliable. In this study, Content validity and Inter-rater reliability of the ergonomic practice checklist was assessed by judgment quantification process and Intraclass correlation coefficient respectively. The results demonstrated good agreement between the raters and excellent reliability for the items of the checklist. Hence, it can be concluded that this checklist can be successfully used as a valid and reliable tool to assess the ergonomic practice of the computer professionals.

ACKNOWLEDGEMENT

Authors are grateful to the Panel of experts and the computer professionals participated in this study. This project was supported by Seed Grant for Research for Faculty of Yenepoya University (YU/Seed Grant/2011-012). Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

REFERENCES

1. Stubbs D.A. Ergonomics and occupational medicine: future challenges. Occup Med. 2000; 50(4): 277- 282.
2. Murphy DC. Ergonomics and dentistry. N Y state J. 1997; 63 (7): 30-34.
3. Palm N .Ergonomics – OSHA'S next regulatory frontier? J Mich Dent Assoc.1994; 76(5): 28-30.
4. Streiner DL, Norman GR. Health measurement scales – A practical guide to their development and use. Oxford: Oxford Medical Publications. 1989.
5. Aiken LR. Psychological testing and assessment. Boston, Massachusetts: Allyn and Bacon.1994.
6. Bush CT. Nursing research. Virginia: Reston Publishing Company; 1985.
7. Polit DF, Hungler BP. Nursing research principles and methods. 4thed. Philadelphia: JB Lippincott Company; 1991.
8. Yaghmale. Content Validity and its estimation. Journal of Medical Education. 2003;3(1):25-27.
9. Bailey KM. Learning about language assessment: Dilemmas, decisions, and directions. Pacific Grove, CA: Heinle & Heinle Publishers. 1998.
10. Stemler SE. A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. Practical Assessment, Research & Evaluation. 2004; 9(4). (http://PAREonline.net/getvn.asp?v=9&n=4)
11. Wynd CA, Schmidt B, Schaefer MA. Two Quantitative Approaches for Estimating Content Validity. Western Journal of Nursing Research. 2003;25(5): 508-518.
12. Lynn M. Determination and Quantification of Content Validity. Nursing Research.1986;35: 382–85.
13. Berk R. Importance of Expert Judgment in Content-Related Validity Evidence. Western Journal of Nursing Research.1990; 12: 659–71.
14. Anders RL, Tomai JS, Clute RM, Olson T. Development of a Scientifically Valid Coordinated Care Path. Journal of Nursing Administration.1997; 27:45-52.
15. Summers S. Establishing the Reliability and Validity of a New Instrument: Pilot Testing. Journal of Post Anesthesia Nursing.1993; 8:124-27.
16. Occupational safety and health administration OSHA VDT Work station check list. United states Department of labour (www.osha.gov).

17. A guide to health and safety in the office. Work safe Victoria. Victorian Work Cover Authority. (www.workcover.vic.gov.au)
18. Cook C, Burgess-Limerick R. Guidelines for Computer work stations. Ergonomics Australia. 2003;17(1):19-37.
19. VDU Workstation checklist. Health and Safety Executive. UK. (http://www.hse.gov.uk/index.htm)
20. Jacobs K. Ergonomics For Therapists. Mosby Elsevier. 2008.
21. Grandjean E. Ergonomics in Computerized Offices. Taylor and Francis.2003.
22. McKeown C. Office Ergonomics – Practical Applications. CRC Press. 2008.

******