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Original

Development and Validity of Krik patrick's Evaluation Tool to Investiagte the Efficincy of the Training Course on Workers' use of Hearing Protection Equipment

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Abstract

Background: The last strategy to protect workers' hearing against load noises is use of hearing protection devices. The efficiency of wearing headphone depends on its full time application. After education, we need to evaluate the efficiency of the conducted training course. One of the most important factors affecting a valid assessment is existence of an appropriate questionnaire to evaluate the course properly. **Methods:** In order to standardize and investiagte the validity of the researcher-made questionnaire, 12 experts were asked to review it. To determine the questionnaire's validity, we used the face validity and content validity. In order to determine the quantitative content validity, we applied the content validity ratio (CVR) and content validity index (CVI). Then, reliability of the questionnaire was investigated by Alpha-Cronbach method. **Results:** We designed 30 questions as the questionaire's items, containing five demographic questions, 10 response questions, four content questions, four learning questions, four behavior evaluation questions, and seven questions about the outcomes. In experts' content evaluation, questions with CVR of higher than 0.56 were selected; while, the CVI of the remaining questions was 0.91. The overall reliability of the research tool was 0.83 using the internal consistency.Conclusion: This study provided a valid and reliable questionnaire for assessing the Kirkpatrick model. This questionnaire can be used as an appropriate tool to evaluate the training courses in accordance with the BASNEF model to increase the duration of using headphones by workers.

Key Words: Evaluation; Kirkpatrick model; Validity; Reliability; Questionnaire; Hearing protection

Introduction

According to the studies, loud noise is one of the most important causes of hearing loss.[1,2] The last strategy to control the noises is to wear hearing aid devices.[3,4] The efficincy of the headphones depends on a variety of factors, such as the type of headphone, the headphone's noise reduction, the method of using headphone, as well as its protection and maintenance. In addition, one

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of the most important parameters in using headphone is its application duration. According to Williams, if a peron wears headphone (NRR 30 dB) 97 percent of the time, the protection will be only 15dB, which is the half of the required efficicny.[5,6] One of the strategies to increase the duration of using headphones in exposure to load noise is training. Therefore, application of an educational model is recommended in this area.

One of the most comprehensive training models is the BASNEF model, which is based on the PRECEDE and Behavioral attitude models .[7] The BASNEF model is an appropriate model for assessing the educational needs of health education in the developing countries. The structure of thismodel includes behavior, attitude, subjective norms, and enabling factors. The BASNEF model is used in conducting behavior studies, planning to change the behavior, and determining the effective factors on individuals' decisions to conduct a behavior. The main difference of the BASNEF model with the behavioral attitude model is that in the former intentions do not necessarily lead to behavior and other factors such as money, skill, time, services, and facilities are required for realization of the behavior. In order to plan for the BANSEF model, we need to consider the facts that social norms and people's attitudes may force individuals to behave, but the enabilng factors can hinder realization of the behavior. In order to determine the effectiveness of the training course, we need to examine its results and learning outcomes, which are necessary for the education process.[8]

Educational evaluation, while applied as a decision maker is the most important tool in improving the quality of educational courses.[9] One of the evaluation models is the Kirkpatrick model. It is one of the most important and applicable models in evaluating the educational courses, which consists of four levels of reaction, learning, behavior, and results Figure 1.[10]

The first level: The first and simplest level of evaluating the efficiency includes the assessment of participants' reactions to the quality of the educational course, curriculum, homework assignments, training materials and equipment, the physical conditions of the place where the course is conducted, the value and depth of the training course contents, etc.

The second level: At this level of efficiency assessment using the Kirkpatrick model, we aimed to examine the participants' learning quality.

The third level: In fact, education means change in the behavior. In the case that we conduct a training course, but we observe no change in the behavior of the participants, the effectiveness of the training would be questioned.

The forth level: At this stage, we are dealing with the results that staffs' training had on our organizational goals. Evaluation at this level is very difficult and we need evidences to reduce the costs, decrease rework, increase sales, improve quality of products, etc. The main issue is that which organizational goals were met by the conducted course.

The Kirkpatrick model assesses the knowledge and skills of the learners. In addition, it pays particular attention to the sustainability of the learning materials and their benefits to the learners.[11]To collcet the information and evaluate the variables of the Kirkpatrick model, an effective tool is needed to evaluate the program appropriately.[12] To the best of our knowledge, no research has ever been conducted on the evaluation of the training program regarding the increase in the duration of headphones application in accordance with the BASNEF model. Furthermore, no valid and suitable tool exists for evaluating the Kirkpatrick model. So, we carried out this study to design a tool for evaluating the training courses regarding the BASNEFF model.

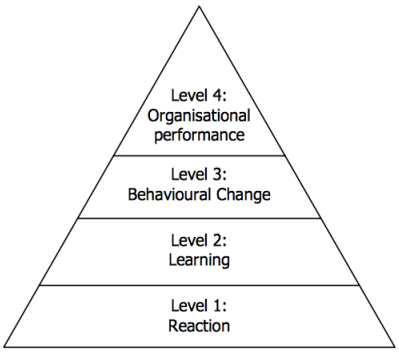

Figure 1. Kirkpatrick model

Methods

In the present study, we reviewed the literature, searched the resources, and prepared a list of items. To determine the validity of the researcher-made questionnaire, we used the face validity and content validity. Moreover, Cronbach's alpha method was applied to measure the reliability.

-Face validity

In order to investiagte the questionnaire's face validity, we applied qualitative and quantitative methods. To determine the qualitative face validity, a questionnaire was distributed among 12 professors of health education and occupational health as well as 10 workers. They were asked to comment on the physical appearance of the questionnare such as its level of difficulty, degree of items' mismatch, ambiguity of the expressions, or failure in delivering the intended meaning of words. We used the collected comments at this stage to slightly modify the questionnaire. In order to determine the face validity index, the Likert scale was considered for each item and the professional panel assessed the relevance, clarity, and simplicity of questions.[13] Then, we calculated the relevance, clarity, and simplicity for each item and included the questions with acceptable percentages of higher than 70 percent.[14]

- Content Validity

In order to evaluate the content validity, content validity ratio (CVR) and content validity index (CVI) were used. To investiagte the CVR, the Lawshe's method was applied; we asked 12 experts to comment on the importance and necessity of each item in the questionnaire based on a three-point Likert scale containing the choices of important and relevant, can be used but is not necessary, and irrelevant. Later, the responses were calculated according to the CVR formula:

$$CVR = [ne- (N / 2)] / (N / 2),$$

Where ne is the number of professionals who chose the important and relevant option for each question and N is the total number of professionals.[15,16] According to the table of Lawshe, the items with content validity of higher than 0.56 were retained (13). To evaluate the CVI, we applied the Waltz and Bausell methods.[13,17] To calculate the final score of CVI, we summed all the CVR scores of items and divided them by the number of items. In this method, questions with CVI scores of higher than 0.79 were considered appropriate.[18]

- Reliability

In the present study, the internal consistency of the questionnaire was studied by calculating the Cronbach alpha coefficient. [19]To hit this point, the data of the questionnaire were compared regarding their internal consistency (odd and even) using the SPSS version 19.[19] Then, the Cronbach's alpha was calculated totally and for each item individually.

Results

The number of excluded questions in each validation step is shown in Figure 2.

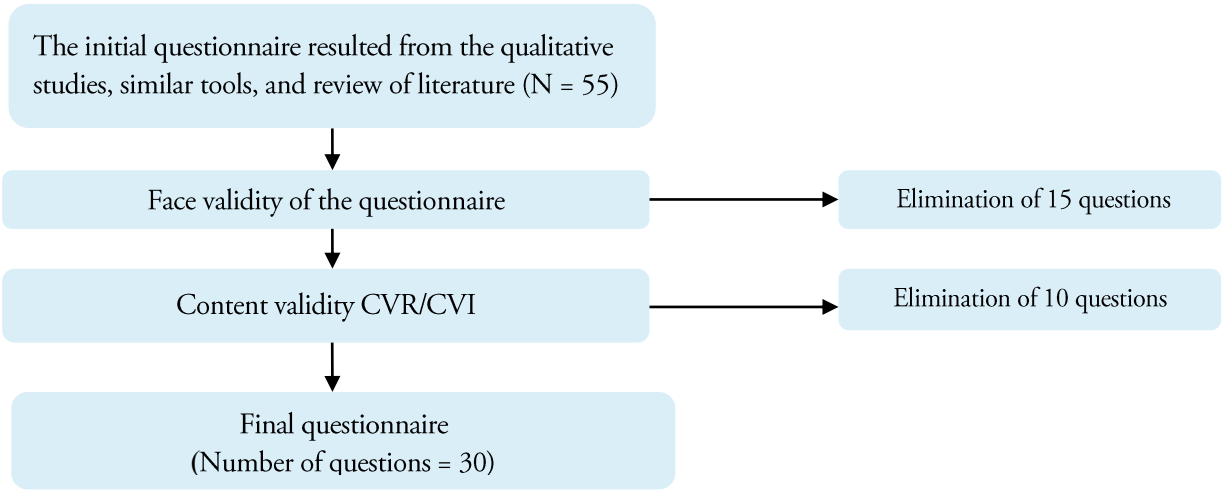

Figure 2. The number of eliminated questions in each validity level

Table 1. Cronbach Alpha value of the applied scales based on the preliminary evaluation data of Kirkpatrick

Scale	Response	Content	Learning	Behavior	outcome	Total
Cronbach Alpha coefficient	0.89	0.79	0.84	0.79	0.87	0.83

Face validity:

The number of initial questions was 55. The face validity for the questionnaire was evaluated qualitatively and quantitatively. Then, the experts' opinions on the physical characteristics of the questionnaire were asked. Fially, we included 40 questions that received the acceptable percentage of higher than 70 perecnt.

- CVR

According to the Lawshe's formula and table as well as the fact that the number of experts who cooperated in this study was 12, the items with content validity of less than 0.56 were ommited. This indicates that only the essential and important questions were applied in this questionnaire.

- CVI

The value of CVI was obtained using the following formula:

$$CVI = \frac{26.39}{29} = 0.91$$

Therefore, the CVI value of the desigend questionnaire was acceptable (0.91). The number of eliminated questions at this stage was 10.

- Reliability:

According to the researchers' suggestions, alpha values of less than 0.5 are unacceptable, values in the range of 0.5-0.6 are weak, in the range of 0.6 - 0.7 are moderate, and values higher than 0.7 are appropriate.20 Considering that the Cronbach's alpha values calculated for the studied dimensions were higher than 0.8 in this research, the reliability of this instrument was also confirmed and evaluated as very good. The reliability values related to the dimensions of the questionnaire are represented in Table 1.

Discussion

In order to carry out the research projets using a questionnaire, the validity and reliability are two crucial factors, without which the questionnaires are not acceptable and valid.[21,22] In most studies conducted on the validity an reliability of a questionnare, less than ten or a maximum of ten professionals were used to determine the validity of the questionnaire. However, in this study we gave the initial version of the questionnaire to a 12-member panel of experts.[23,24] Our study is one of the first studies in which a valid and reliable questionnaire was designed to evaluate the

efficiency of an educational course in accordance with the BASNEF model. To determine the validity of the questionnaire, face validity and content validity were used. The face validity of the tool was assessed by the experts and the necessary omissions and corrections were made according to their viewpoints. The opinions of the experts were also used to determine the content validity of the questionaire. Later, we applied the CVR and found that followed by the experts' opinions, the included items had the minimum score of 0.56.[25,16] The CVI obtained in the present study after implmentation of the experts' opinions was calculated as 0.91using the Waltz and Bausell methods. Considering that Waltz and Bausell recommend the average CVI of 0.9, this questionnaire had an apppropriate level of content validity.[14] In order to evaluate the reliability of the questionnaire, Cronbach's alpha was determined using the internal consistency method. The results indicated that all items had an appropriate alpha value, so that the total Cronbach's alpha was calculated as 0.83. According to Bernez, the alpha value of 0.7 is an appropriate level to show the reliability of a tool. Therefore, the reliability of this questionnaire was als confirmed and appropriate.[26]

The strengths of this questionnaire included application of experts' opinions as well as use of appropriate quantitative and qualitative methods for calculating the validity and reliability of the questionnaire. However, one of the limitations of this research was the lack of similar studies to compare the results.

Conclusion

The findings of this study showed that the reseracher-made tool for evaluating the efficicney of educational courses on the duration of headphone application among the workers based on the Kirkpatrick model had a good validity and reliability.

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