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Design and Validation of a Health Questionnaire about Knowledge for Health and Back Care Related to the Practice of Physical Activity and Exercise for Adolescents: COSACUES-AEF

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Abstract

Background: Adolescents have a high prevalence of back problems. Some risk indicators are associated with sedentary lifestyle, the practice of inadequate physical activity, the physical contraindicated exercises, joint actions inadvisable, etc. For these reasons, there is a need to study the knowledge held by students about back health and sports to improve intervention programs and help them to improve their education and care of the back. Currently, there are no specific knowledge questionnaires on health and back care related to the practice of physical activity and exercise in adolescents. For these reasons, the aim of this study was to design and validate an assessment tool that measures such specific knowledge.

Methods: For this, the test-retest design was used with an interval of time of two weeks between each passes. The sample consisted of 230 students with a mean age of 15.31 (SD=1.52).

Results: The internal consistency of Cronbach's alpha coefficient was 0.80. The intraclass correlation coefficient (ICC) for average measurements was 0.80 with a significance of $p<0.001$. The t test for paired samples showed no statistically significant differences between the values of the first and second pass.

Conclusion: The COSACUES-AEF (in spanish cuestionario sobre "*Conocimientos sobre la Salud y Cuidados de la Espalda relacionados con la Actividad y Ejercicio físico*") is a valid and reliable tool to evaluate the level of specific knowledge about health and back care related to physical activity and exercise in adolescents. The tool will let to compare the specific knowledge with other variables like presence or absence of LBP.

Keywords: Health; Physical education; Questionnaire; Knowledge; Back care; Adolescents

Introduction

The health back as practical content in the curriculum has been developed exclusively by the area of Physical Education.

The young people of school age are subject to a variety of risk factors for back health in their daily lives: the improper transport weight in the backpack and excessive load, prolonged and improper sitting position, the positions held during long periods, the use of a homogeneous school furniture, inadequate physical activity, poor posture during physical exercise, sedentary lifestyle, high body mass index, reduced mobility and flexibility of muscles and joints, insufficient force and stability in the trunk musculature, psychosocial factors, etc. [1-3]. Because these risk factors have been an increase in the number of people suffering from back pain in young [2].

Currently, it is estimated that the prevalence of low back pain (LBP) in children and adolescents during the course of life is high, varying between 7% and 72% [4], with an average of 39.9% [5].

According to this evidence the back health should be an important curricular content in the currently educational system, and especially in the area of Physical Education [6,7].

Currently, Physical Education seeks that the students are able to learn, acquire and maintain good health habits to care their back, improve their quality of life, reducing and preventing high prevalence of back problems. To achieve this objective, it is necessary to study what know students to develop a more appropriate intervention programs [8-11].

The literature contains studies that used assessment instruments to analyze health knowledge and back care in children and adolescents [12-14]. Most of them used validated instruments, although some used pilot tests questionnaires before the main study [8,9,14-17]. Only one study [11] used a validated questionnaire and it was published in the literature [10]. However, none have approached the study of the level of knowledge possessed by students in relation to the practice of physical activity and exercise to improve health back.

To establish the level of knowledge of young people the use of reliable and valid instruments are required. These instruments will let us to establish relationships with other variables such as the presence or absence of pain, relationship to the risk or prevent back health, or if they influence in the acquisition of habits of active lifestyles, postural habits or engaging in regular physical activity.

The aim of this study was to develop and evaluate the psychometric properties of a questionnaire about knowledge of health and back care in the practice of physical activity and exercise for teens.

Material and Methods

First of all, we have to explain that the questionnaire is called COSACUES-AEF (spanish name: cuestionario sobre "Conocimientos

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Phases	Description
1	Selection of content: Systematic review
2	Formulation of the items in the firts questionnaire
3	Preparation of the preliminary 13-item questionnaire
4	Assessment of experts: Delphi technique
5	Assessment of persons belonging to the target population
6	Exploring the assessment of expert and target population.
7	Launching the second round of expert reviews
8	Developing a first version of the questionnaire.
9	Administration of the first version to a pilot sample
10	Psychometric analysis
11	Preparation of the final questionnaire
12	Defining user guide

Table 1: Process design and validation of the COSACUES-AEF.

sobre la Salud y Cuidados de la Espalda relacionados con la Actividad y Ejercicio físico") that means questionnaire about knowledge for health and back care related to the practice of physical activity and exercise.

Process design and validation of the questionnaire

The design and validation process had a total of twelve phases (Table 1) in which the two fundamental characteristics of any questionnaire were developed: the validity and reliability.

At the beginning, the assessment tool was composed of three categories: knowledge about fitness, muscle strengthening knowledge and stretching or joint mobility knowledge.

Subject population

The population consisted of 325 students of Secondary Education and Bachelor from a state high school selected at random in the province of Alicante. 230 students completed the questionnaire getting a share of 70.8% of the population. The total sample consisted of students aged between 13 and 18 years (mean age=15.31, SD=1.52). 56.1% of the sample were boys and 43.9% girls.

According to Nunnally [18], the sample is sufficient to construct a measuring instrument of 13 items.

Selection criteria: The study included students of secondary school from Valencian Community; a center with available computer room. Students who were absent the day of the administration of the questionnaire and participated in only one of the two passes of the questionnaire were excluded.

Data collection

The questionnaires were filled out during physical education classes through the web platform Moodle in the computer rooms of the high school. The time required to complete the questionnaire was about 5 to 10 minutes per student. An experienced researcher presented the questionnaire to students, explained the procedure and rules for filling in the survey and personally attended to all doubts individuals had. The management of the centers, each group tutors and parents were informed of the study and expressed written consent.

Data analysis

Analysis of the expert reviews and target population

To improve the purification of the questionnaire was submitted to seven experts' judgment. For this, the two-round Delphi method was used.

Besides, it was estimated convenient to pass the questionnaire to a voluntary and representative sample of the target population of 20 students (students of secondary school).

As statistical analysis to evaluate the "inter-rater" agreement and "inter-students" was used the coefficient intraclass correlation (ICC).

Quantitative analysis

A rating scale of 1-10 was used to obtain knowledge levels. The following formula was applied to calculate it. $P = 10 \cdot \frac{1}{N} \cdot \left(1 \cdot A + 0 \cdot B - \frac{1}{2} \cdot F\right)$

Where P is the questionnaire score (on a total of 10 points), A is the number of hits, B is the number of missed values, F is the number of failures and N is the total number of questions in the questionnaire.

Statistical analysis was conducted using SPPS v.18.

Descriptive analysis. Tests based on the response process

In this section, an analysis of item response process took place. For this, the distribution of responses by calculating the number of non-responses for each person, the number of missing values per item, and no response patterns described. Moreover, the frequencies of the extreme responses were studied various conflicting items.

Validity of the questionnaire

To study the validity of the measuring instrument developed we used psychometric standards for educational and psychological tests recommended by the American Psychological Association according to Viladrich and Doval [19] and Doval and Viladrich [20].

First, an exploratory factor analysis (EFA) in order to make decisions about the number of factors or relationships between observable and latent variables was performed. Thus, with this analysis, the interpretations of the common factors are met, to better analyze the interrelationships between variables.

To make the EFA, it was conducted a principal component analysis (PCA) starting with an initial scan containing the evidence of sampling adequacy of Kaiser, Meyer Olkin (KMO) and Barlett sphericity to check whether it was appropriate to apply both techniques to all original variables and the scree plot. Then, it was obtained all possible solutions. The matrix components were explained clearer and more interpretable through the principal component analysis (PCA) with varimax rotation.

Based on the results obtained in the PCA, we proceeded to study the analysis of the validity of the questionnaire. We assessed the temporary internal consistency of the questionnaire developed globally and by age groups. We used the coefficient Cronbach's alpha (no formula 20 of Kuder- Richardson) to calculate it.

Reliability of the questionnaire

For the analysis of the reliability of the COSACUES-AEF, the test-retest design was used. For this questionnaire two passes leaving a time interval of two weeks between each were performed. Then, they applied different statistical indices relating the results obtained from the repeated measurements.

Later, it was calculated for each individual arithmetic average of the scores obtained in the questionnaire items in each pass in order to meet the normal distribution through the nonparametric *Kolmogorov-Smirnov*.

To determine the *reproducibility or test-retest reliability* was calculated the intraclass correlation coefficient (ICC) between the measurements averages two passes of the global questionnaire and components.

To study the *reliability of the questionnaire* the Pearson correlation coefficient and t test was used for related samples.

On the other hand, and to estimate the discriminatory capacity of the items of COSACUES-AEF, the t test was calculated. To do this, a contrast of measures was applied in each item (t test) depending on the highest and lowest scores by the subjects. Scores for each item were classified by quartiles compared to 25% of the top scorers with 25% of the lowest scores.

Finally, another test for the study of the reliability of the items was calculated through the correlation coefficient Phi and V of Cramer for dichotomous variables.

Results

Assessment of the agreement "inter-rater" and "inter-students"

Regarding the inter-rater agreement, the intraclass correlation coefficient (ICC) for measures average was >.60 with a significance of p=0.000 in both the first and second round of the expert group. In the group of inter-students the intraclass correlation coefficient (ICC) for the average measurements was 0.90 with a significance of p=0.000.

Tests based on the response process

Regarding the distribution of responses per person it was observed that 91.7% of students (n=211) answered the 13 questions in the questionnaire.

The number of missing values per item

No item was observed with a difference of more than 5% compared to others in terms of non-responses, the maximum difference of 3.9 for both item number 7 and 9 the questionnaire.

There was no ceiling or floor effect in any of the items. The difference between success and failure for each question were below 95% and the errors above 5% in all cases.

Principal components analysis (PCA)

With the analysis of the main components with varimax rotation we observed that the matrix with five factors got the most criteria data reduction and adjustment. That is, the first five factors reach more than 1 own value, based on the first criterion. On the other hand, the solution with five factors was the only one getting describes the structure of the original matrix of the simplest form, with a higher load factor, besides forming a relatively small number of components on the number of the original variables.

However, based on the grouping of the factors of the questionnaire, we note that some of them have acceptable factor loadings ranging from 0.42 to 0.78, while other components obtained polarized charges.

Validity

In order to meet the internal consistency of the test Cronbach's alpha coefficient of 0.80 was calculated.

Reliability

The *Kolmogorov-Smirnov test* showed normal study data (Z=1.323, p=0.06). The intraclass correlation coefficient (ICC) for the average measurements was 0.80 with a significance of p<0.001.

Regarding the solution of the matrix of principal components with five factors, we observed that the ICC took low values in categories 3 and 4.

However, in the category of items expected by researchers, it should be noted that higher and adequate results are obtained.

The *t*-test for paired samples showed no statistically significant differences between the values of the first and second pass.

Reliability analysis of the items

One of the main functions of the items is to provide information for differentiating people who occupy different position in the construct assessed. It means the discriminatory capacity of the items among those who know the answer and not. If two people differ in the evaluated trait, should choose different response options. It was found that there are significant differences (p=0.000) among all items except number 9 (p=0.146).

In the study of the reliability of the items Phi correlation coefficient for dichotomous variables pointed us a significant correlation in all items.

Discussion

The results show that the developed questionnaire is valid and reliable for assessing the level of knowledge about the health and back care related to the practice of physical activity and exercise in adolescents (Supplementary file). Composed of thirteen items and a single construct, it presents a theoretical foundation, validity and reliability suitable.

This is the first tool developed to be applied to adolescents in the school context and taking into account physical activity and the regular physical exercise on his age.

Studied the different possible factorial solutions and based on the analysis of the validity and reliability, the researchers determined that none of them managed to explain in a clear way the components of the main matrix. However, the internal consistency analysis taking into account all items showed that the questionnaire could be considered as a unidimensional instrument (level of specific knowledge in health back).

As the first questionnaire related to the practice of physical activity and exercise for back care that validates knowledge, we could not compare this model with others, not being able to check the validity of the construct.

Regarding the completion of the questionnaire, we can say that the 13 questions were answered in a very quick manner and without requiring large amounts of time for teachers. Within 5-10 minutes, the questionnaires were filled.

As future improvements to the questionnaire, the researchers suggest that the questions could have three levels of answer. A kind of scale with the most appropriate response to the less correct could give us more grades of knowledge. Sometimes the student may not know all the theory but have some of the skills that are also valid, as part of the teaching-learning process.

The education system is expected to play an important role in the dissemination and promotion of scientific knowledge and understanding of different health problems among students to allow adequate quality of life [21-23].

For these reasons, we understand that the assessment instrument presented here provide that teachers know the level of knowledge about health back that has students and to know what content they require to improve their quality of life.

Conclusion

The COSACUES-AEF is a valid and reliable tool to evaluate the level of specific knowledge about health and back care related to physical activity and exercise in adolescents. The questionnaire seems to be

comprehensive and to include most of the relevant questions through a unidimensional model. The tool will let to researchers to compare the specific knowledge with other variables like the presence or absence of pain, relationship to the risk or preventing health back, or if they influence in the acquisition of habits of active lifestyles, postural habits or engaging in regular physical activity and organized.

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Conflict of Interest

Non declared

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