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Psychometric Study and Content Validity of a Questionnaire to Assess Back-Health-Related Postural Habits in Daily Activities

Manuel Monfort-Pañego* and Vicente Miñana-Signes*

Department of Didactic of Musical, Arts and Body Expression, Docent Unit of Physical Education, Teacher Training Faculty, University of Valencia, Valencia, Spain

ABSTRACT

The purpose of this study was to develop a questionnaire to assess body posture habits in adolescents' daily activities. To develop and assess the instrument we used the Delphi method, and a test-retest reliability design. The questionnaire consisted of 31questions with 4-level Likert scale. One hundred and sixty-eight students were studied, 72 girls and 96 boys, between the ages of 13 and 17 (14.47 ± 1.26). Cronbach's alpha (α =.80) showed a high internal consistency. Test-retest reliability was excellent for total score (.85), with good results for standard error of measure (0.07) and minimal detectable change (0.20). The one-sample t-test showed non-differences between mean differences of total scores (−0.01), and the limits of agreement of the Bland-Altman plot showed a narrow error of measurement range (−0.34, 0.37). Our questionnaire is a valid and reliable instrument for assessing students' postural habits during activities in their daily lives.

KEYWORDS

Back education; postural habit assessment; health education; physical education; secondary education

Musculoskeletal conditions are an enormous global burden, and low back pain (LBP) is the most important major health and economic problem in the western world (Hoy et al., 2014). It is associated with multifactorial causes, with physical activity (Kahn et al., 2002), static or maintained postures, heavy physical work, and repetitive tasks such as bending, twisting, lifting, pulling and pushing being reported as risk indicators (Burton et al., 2005).

The vast amount of specific scientific literature concerning back health is usually related to the adult patient population, in specific work environments and from a clinical perspective (Leboeuf-Yde & Kyvik, 1998). All these studies provide valuable information; however, to study this topic from the point of view of the health of the adolescent population we need to collect information from the environments in which they spend most of their time, i.e. school and home. We know that body posture adopted during daily activities is related with LBP, but there are few studies in the adolescent population concerning this (Balagué et al., 1999; Noll et al., 2017). The most common postural habits studied in the lives of adults are related to sitting, standing and lying. These postures are also common among young people, but adolescents have other specific postural habits such as carrying backpacks (Sheir-Neiss et al., 2003) or sitting in a classroom for a long time, five days a week (Zórawska & Steciwko, 2007). This is why studying young peoples´ postural habits in school environments requires adapted and specific measuring instruments.

School age is an important period for research because the life time cumulative incidence of LBP increases from 7% (95% CI, 5–9%) in 12-year-olds to 67% (95% CI, 63–71%) in a 41-year-old person, and it is greater than 50% in 18-year-old girls and 20-year-old boys (Leboeuf-Yde & Kyvik, 1998). The incidence of LBP rises with age particularly among girls who reported more back problems with daily activities than boys ($p < .001$) (Salminen et al., 1992; Trevelyan & Legg, 2006). In addition, LBP was found to be the third most common form of pain which interfered with schoolwork or leisure time over a twelve-month period (Salminen et al., 1992). A 25-year prospective cohort study of 640 school children (Harreby et al., 1995) showed that subjects who had suffered from LBP during adolescence showed a significantly higher cumulative prevalence of LBP, a higher number of hospital admissions and a reduced work capacity due to LBP when asked about this as adults. The most recent studies (Minghelli, 2019; Noll et al., 2017) concerning the use of different postures during daily activities for the adolescent population, indicate that they have a low prevalence of adequate

CONTACT Monfort-Pañego, Manuel. manuel.monfort@uv.es Department of Musical, Arts and Body Expression Education, Docent Unit of Physical Education, Teacher Training Faculty, Universitat de València, València CP-22045, Spain

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sitting and sleeping postures, and that the use of inadequate postures and the use of mobile phones over long periods increases the probability of developing back problems. Furthermore, a review study supported the hypothesis that less well-educated people have a higher probability of being affected by back problems (Dionne et al., 2001). The issue of spine health in children and adolescents is a pressing problem (Hwang et al., 2019).

The European guidelines for LBP prevention (Burton et al., 2006), based on scientific studies and recent review studies (Gómez-Conesa et al., 2001; Heymans et al., 2005; Michaleff et al., 2014; Steele et al., 2006; Trevelyan & Legg, 2006), conclude that, although there is insufficient evidence to recommend generalized educational interventions in school-age children and adolescents, the development of preventive programs and risk factor modification would be a positive move. So, there is a wide consensus on the need to address back health problems at early ages from an educational context (Tinning, 2001) as health education in formal education systems allows for a greater number of, as well as more prolonged, interventions, and it means that a large percentage of the population can be accessed (Cardon & Balague, 2004).

The study of human movement and body posture with objective methods of measurement requires expensive equipment (cinematography, electrogoniometry or electromyography), a high level of human resource expertise, and complex procedures that make the study of large populations very difficult (Woollacott & Shumway-Cook, 2002). There are other more up-to-date and valid methods to assess global body posture in day-to-day static and dynamic tasks, as well as free-living physical activities (Ryan et al., 2008), but all of these are difficult to access and have been developed and tested for samples of adult subjects with LBP in clinical settings. Indirect and nonobjective methods such as questionnaires, direct or recorded observations, are easier to apply, cheaper and can be used with a large population (Cardon et al., 2001). Some studies have used these kinds of instruments to study the relationship of LBP and body posture in daily life (Candotti et al., 2017; Minghelli, 2019; Noll et al., 2017, 2013). Nonetheless, differences in the prevalence of adequate performances of different postures between the results of different studies were described by Noll et al. (2017). The lack of agreement between studies may be due to surface or none validity of instruments, differences in the instruments used and/or sociocultural and behavioral factors.

Despite the broad agreement on the need to use validated instruments (Hoffmann et al., 2019), we still find recent published studies that neither show nor validate the questionnaires and tests that they use as instruments (Dullien et al., 2018).

Dugan (2018) y Bettany-Saltikov et al. (2019), in recent systematic review studies concerning educational intervention programs point out the great disparity and diversity of body posture intervention programs in schools. This shows the need for greater organization on the part of the research community to guide and strengthen the results in the study of educational intervention programs.

In an analysis of postural education studies that include self-reported questionnaires, Dugan (2018) points out that these are highly heterogeneous, they contain questions with very different and diverse purposes related to their interests and objectives. The topics that we found in these studies could be classified into four groups, although it is usual to mix the different topics in the same questionnaire.

We find topics with a medical orientation which contain questions aimed at discovering aspects related to an illness, such as the presence or absence of back pain, its frequency and duration, its intensity and incapacitating effects on habitual activity, and its association with specific activities (El-Nagar & Mady, 2017)

Epidemiologically oriented topics also include questions aimed at finding out the time spent on sedentary activities, such as: watching television, reading, studying, working or sitting down and playing with electronic devices, the duration of convalescence and the kind of treatment received (Bobakova et al., 2015).

Topics with an ergonomic, physiological and biomechanical orientation ask about ranges of movement, degrees of flexibility of the joints, the strength of the muscles, the correct execution of actions or positions, as well as using furniture and electronic equipment such as computers (Bombardier, 2000).

Educational-oriented topics contain questions about back care skills and habits. These include questions to assess knowledge about the use of the body in daily life activities, knowledge about body shape and function, to understand the functioning of structures that protect spine stability, knowledge about physical activity and exercise, and postural habits in daily life and in the practice of specific physical exercise (Cardon et al., 2000; Miñana-Signes & Monfort-Pañego, 2016; Monfort-Pañego et al., 2016).

As far as we know, there are few studies with validated and reliable instruments that include questionnaires with a self-reported educational content (Méndez & Gómez-Conesa, 2001; Miñana-Signes & Monfort-Panego, 2016; Monfort-Pañego et al., 2016; Noll et al., 2013) Moreover, all of these studies only used a validity analysis through expert judgment

because there were no other validated or objective reference instruments to carry out content validity analysis. In addition, they presented an analysis of internal consistency using Cronbach's Alpha and a reliability study with repeated use of the same questionnaire to apply the test-retest reliability.

Two of these studies provided incomplete information related to content validation processes (Méndez & Gómez-Conesa, 2001; Miñana-Signes & Monfort-Panego, 2016). These studies explained that the instrument was validated by expert judgment, but they did not explain how this was done. However, the other two studies (Monfort-Pañego et al., 2016; Noll et al., 2013) described a more comprehensive expert-judgment validation process. The work of the experts, the number of content reviews carried out, the format of the questionnaires and the adequacy of the language were explained, and the questionnaire was tested with a sample of potential users.

However, only one of the studies analyzed the measuring instrument error by applying the Bland-Altman method to study the variations in the responses between the different measurements (Monfort-Pañego et al., 2016). This work assessed young people's knowledge of back care in daily life activities using multiple choice questions on a 0–1 scale.

Of all these studies, only the one by Noll et al. (2013) contains questions about postural habits in daily live activities. Out of a total of 21 questions, only 6 are related to daily-life postural habits; 3 concerning a sitting posture, 1 related to lying down and 2 concerning lifting or carrying a weight. The rest of the questions are related to medical or epidemiological topics.

Although the questionnaires include important topics based on scientific evidence, we consider that their contents are not fully adapted to the needs of educational contexts and that they are limited; they do not deal with relevant activities during daily life in a standing posture, and they reduce the range of possible questions about postures such as sitting, lying down and lifting or carrying weight. In addition, they use a type of dichotomous response, which greatly reduces the possibilities of extracting information concerning how the students use postural habits.

In view of this analysis, we can affirm that at present there are no complete and validated instruments that allow us to assess postural habits in the daily life activities of healthy young people. In order to gain a deeper understanding of postural habits, and to assess their changes and evolution, we need an instrument which can accurately measure them. Therefore, the objective of this study is to develop a questionnaire to assess the back-health-related postural habits in everyday activities of adolescents, analyze the content validity and provide a psychometric evaluation.

Methods

To develop and assess the instrument we used the Delphi method and a test-retest reliability design.

The Humans Research Ethical Committee of the University of Valencia, adhering to the outlines of the Helsinki Declaration, approved this study (H1509086047576).

Participants

The initial sample was 206 students from two public schools, chosen based on a convenience factor, in the Valencia Community, Spain. All the secondary school students from the selected schools participated in the study. Data concerning 38 of them were not included in the study as they either did not complete the questionnaire the second time, or because they had a high number of omitted answers (more than 2% of the questions). Finally, 168 students, 96 boys and 72 girls, aged between 13 and 17 (M age = 14.42 ± 1.26, M weight = 57.02 ± 11.57, M height = 1.67 ± 0.09), completed the questionnaire twice (Table 1).

Questionnaire design and content validity analysis

The questionnaire was called BEHALVES, Back-hEalth-related postural Habits in dAiLy actiVitiES.

The questionnaire was developed to assess back-health-related postural habits in the daily activities of adolescents. As in previous studies (Monfort-Pañego et al., 2016), to develop and to assess questionnaire content validity we used the Delphi method with four rounds (Mokkink et al., 2010). Six expert and independent researchers (all with experience in low-back research work, and PhDs in Physical Education, Medicine and Physiotherapy) and eight young students

Table 1. Descriptive data of the sample.

Age (years)	Gender	n	M Weight (kg.) (± SD)	M Height (cm.) (± SD)
13	Male	34	51.20 (11.33)	1.62 (0.09)
	Female	21	52.07 (7.34)	1.62 (0.08)
14	Male	18	58.79 (11.93)	1.73 (0.07)
	Female	12	52.47 (10.69)	1.59 (0.06)
15	Male	14	64.05 (8.86)	1.75 (0.05)
	Female	23	52.66 (5.39)	1.64 (0.08)
16	Male	25	69.54 (10.51)	1.77 (0.08)
	Female	16	54.58 (6.44)	1.65 (0.07)
17	Male	5	67.18 (10.89)	1.74 (0.11)
Total	Male	96	60.23 (12.93)	1.71 (0.10)
	Female	72	52.89 (7.16)	1.63 (0.08)

M = mean; SD = standard deviation.

from four different courses were selected to participate in this process. The experts' role was to assess if the content of the questionnaire considered the most relevant aspects of postural habits for back health. They also assessed whether the language used in the questionnaire was suitable for the age group, and if the questions were pitched at the correct level. The students were included in this process as users to report on the clarity of the questions, and to verify if the questions were related to their daily-life postural habits.

The first round involved identifying scientific evidence via the reviewed literature and presenting this to the group of six experts (Cardon et al., 2000; Méndez & Gómez-Conesa, 2001; Miñana-Signes & Monfort-Panego, 2016; Monfort-Pañego et al., 2016; Noll et al., 2013). The experts had to agree, by consensus, on the fundamental aspects of healthy and unhealthy habits for back care that the questionnaire was required to collect.

In the second round, the group of students met to find out which of the aspects indicated by the expert group were more common in their daily lives, and what their usual habits in these situations were. Based on the literature, the experts' comments in the first round and the students' opinions, the researchers developed the first version of the questionnaire.

In the third round, the group of experts assessed the first version of the questionnaire. They were asked about the number and the content of the questions, their difficulty and the language used. After the experts' assessment, the students were interviewed in order to evaluate the clarity of the questions and their interpretation.

The fourth and last round consisted of the evaluation of the final version of the questionnaire by the experts (Annex I & II). They assessed whether or not the questionnaire had taken into account all the previous agreements and decisions, as well as the final structure and presentation of the questionnaire.

Procedure

Administration of the questionnaire took place in computer laboratory classrooms, during class time. Each student had a computer with an internet connection. The questionnaire was prepared as a form on the Google platform. The students were provided with the access link to the questionnaire and the questions were read one by one. The responses were completed via the computer and were recorded in Google Drive. All the students participated voluntarily. One researcher introduced the objective of the study to the students, then the questions were read one by one, any queries the participants had were answered and the procedure to fill in the form was explained (T1). Four weeks later, the questionnaire was administered for the second time (T2). As the same questions were being asked, it was believed that this period would be adequate to avoid any interference with the results due to learning or influence through the exchange of opinions between students. In T2, the same items were presented; however, the order in which they were given to the participants was modified.

Statistical analysis

The analysis was carried out with the item scores, category item score average and total item score average. SPSS v.19 software for Mac was used for all the analysis. To gather information related to important topics asked about in the questionnaire, the items were grouped into five categories: standing posture (items 1–4), sitting posture (items 5–13), use of backpacks (items 14–20), mobilizing heavy weights (items 21–26) and lying posture (items 27–31). The items in the questionnaire were scored with: 1 = Never, 2 = Hardly ever, 3 = Almost always and 4 = Always. Questions 4, 6, 7, 8, 9, 27, 30 were scored inversely.

Question number 14 was scored with 4 points for the answers "A wheeled trolley to pull along" and "A wheeled trolley to push along", 3 points for "A backpack", 2 points for "A shoulder bag carried across the body", 1 point for "A briefcase" and "A clutch bag".

To test internal consistency, Cronbach's alpha was used. Test-retest reliability was expressed according to the differences observed between the readings (T1–T2) and the standard deviation of the differences, intraclass correlation coefficient (Shrout & Fleiss, 1979), 95% confidence intervals for the intraclass correlation coefficient, standard error of measurement (SEM), coefficient of repeatability (CR) and minimal detectable change (MDC), also termed smallest real difference (Beckerman et al., 2001; Bland & Altman, 1986). A 95% confidence level for the minimal detectable change that corresponded to a z value of 1.96 was established. The intraclass correlation coefficient was assessed according to Landis and Koch (1977), less than .40, .40 to .75 and greater than .75 represented poor, moderate, and excellent agreement, respectively.

The scores and average scores were normally distributed. The mean and standard deviation of the differences between item scores at T1 and T2 were calculated and tested for significance using a one-sample t-test of the differences against zero. A Bland-Altman plot of the differences between T1 and T2 against the mean for the total score of the BEHALVES questionnaire was used to determine the agreement between the reported values at the individual level (95% limit of agreement, Bland &

Altman, 1986). The association between the difference and the magnitude of the total score of the BEHALVES questionnaire (i.e. heteroscedasticity) were calculated by regression analysis (Bland & Altman, 1986). Floor/ceiling effects were calculated from the percentage of adolescents showing the highest (4) or lowest (1) value in total score in test 1. If >15% of the participants achieve the lowest/highest values, a floor/ceiling effect is present (Terwee et al., 2007).

Repeated measures analysis of variance was used to assess the effect of gender between-subjects and time within-subject (T1, T2) for total scores.

Results

Content validity questionnaire

To develop the questionnaire, the experts selected five kinds of topics related to habits in basic postures such as standing, sitting and lying, and specific tasks such as lifting and carrying weights. They identified habits in the use of the standing posture to perform housework, for personal hygiene and mobilizing weights. For the sitting posture, they marked tasks such as reading, studying or using a personal computer. For the lying position, they highlighted postural habits at rest. The students indicated, as habitual postural habits in their daily lives, ones related to brushing their teeth, standing up, sweeping, the kind of footwear used, habits in the preparation and use of bags or backpacks to carry weights, postural habits in the sitting position in the classroom, such as studying or reading and using a computer, and the lying position when resting. Based on this information, a 31-item questionnaire with a 5-level Liker scale (never, almost never, sometimes, habitually, always) was developed. There were four questions about the standing position, nine about the sitting position, thirteen about weight management (seven about carrying weights and six about lifting weights) and five questions about the lying position and the type of surface used to rest on. This was the first complete pilot questionnaire evaluated by the experts and students, and only made up of questions with written text.

In the third round, the main change proposed by the experts was to avoid questions with double negatives, or answers with inverse meaning. Thus, for the question: "When I have to stand for a long time I choose shoes without heels", if the student wears shoes with heels the correct answer is "never". The use of the word "without" in the question and "never" in the answer could be difficult to understand. So, the proposed question was "When I have to stand, I wear shoes with heels". In addition, it was observed that students had difficulty in correctly understanding some items. To avoid this problem, we decided to review the text in the items, and to support it with figures that facilitated understanding.

As a result of the experts' review of the questionnaire, in the fourth round the number of options present for each item changed from five to four (never, hardly ever, almost always, always). The experts suggested that the central option on a five-point scale could be a problem because undecided students usually select this option. The final version of the questionnaire (Annex I: Spanish version, Annex II: English version) was accepted by expert consensus.

Psychometric properties

Internal consistency

Cronbach's alpha for the scores of the 31 items was good (α = .80). This result indicates that the items showed high internal consistency.

Test-retest reliability

The result of applying the test-retest reliability of category items and total scores are shown in Table 2. Mean differences between the test and retest were not different from zero for the mean total scores. Only the mean difference of the mobilizing heavy weights category was different from zero (p = .001). The intraclass correlation coefficient (ICC) was excellent for the total score (.85) and for all categories (.71 – .83), only the standing posture category had a moderate ICC (.69). The SEM and the MDC were good for the total score (.07 and .20 points, respectively) and for each category (Table 2). The differences of the mean for all categories, and for the total scores, were

Table 2. Test-retests reliability of the back-health questionnaire for postural habits in daily activities of young students (n = 168).

Category	M (± SD) T1 (points)	M (± SD) T2 (points)	DM (± SD) (points)	MDC (points)	SEM (points)	CR (points)	ICC	CI 95%
Standing Posture	2.77 (0.50)	2.83 (0.54)	0.06 (0.50)	0.77	0.28	0.98	.69	.58-.77
Sitting Posture	2.45 (0.36)	2.40 (0.43)	-0.05 (0.38)	0.56	0.20	0.74	.71	.60-.78
Using backpacks	2.57 (0.31)	2.58 (0.36)	0.01 (0.31)	0.44	0.16	0.60	.73	.63-.80
Mobilizing heavy weights	2.68 (0.44)	2.61 (0.50)	-0.07 (0.37)*	0.43	0.15	0.72	.82	.76-.87
Lying Posture	2.80 (0.57)	2.79 (0.51)	0.00 (0.41)	0.46	0.17	0.80	.83	.78-.88
Total	2.65 (0.24)	2.64 (0.27)	-0.01 (0.18)	0.20	0.07	0.36	.85	.79-.89

* Significant difference p <.01; M = mean; SD = standard deviation; ICC = intra-class correlation; CI 95% = 95% confidence interval; T1 = time 1; T2 = time 2.

lower than the respective values of SEM. The CR was lower than 2 standard deviations. The one-sample t-test showed non-differences between different values of total scores and category scores, except for the mobilizing heavy weights category ($p < .01$).

Figure 1 shows the results of the Bland-Altman plot for the mean total scores. The value of mean differences was −0.01 (*SD*, ± 0.18), and the limits of agreement for the total scores were −0.34 and 0.37 points. The regression analysis showed that differences between the test and retest total scores did not change significantly when the amount of the score changed ($F_{(1,166)} = 4.10$; $p = .05$; $R^2 = .024$; corrected $R^2 = .018$; Beta coefficient = 0.15).

The average time each participant took to complete the questionnaire was 17.14 minutes (*SD*, ± 5.27) for T1, and 10.02 minutes (*SD*, ± 3.18) for T2. No floor/ceiling effects were observed in the total score of T1 (0% floor/ceiling). On a scale from 1 to 4, 0% of participants were in the 1–2 score range, and 4.6% of participants were in the 3–4 score range.

The mean scores by time and gender are shown in Table 3. Repeated measures analysis of variance shows non-differences between-subjects for gender ($F_{1,166} = 0.95$; $p = .33$) and within-subject for time ($F_{1,166} = 0.88$; $p = .35$) and for time x gender ($F_{1,166} = 0.26$; $p = .87$)

Table 3. Mean scores of the sample by time and gender.

Time	Gender	M (points)	± SD	n
T1	Male	2.64	0.24	96
	Female	2.66	0.23	72
	Total	2.65	0.24	168
T2	Male	2.63	0.27	96
	Female	2.66	0.26	72
	Total	2.64	0.27	168

M = Mean; SD = standard deviation; T1 = test 1; T2 = test 2

Discussion

The most important result of our study is that we have developed a valid, reliable instrument (BEHALVES) with good psychometric properties to assess body posture habits during daily activities for 13 to 17-year-old adolescents. We need to remember that the BEHALVES questionnaire was validated using a Spanish population. Another important characteristic of this validation is that we have used the Delphi method with the participation of experts and users. Experts' participation is usual in validation studies, but the contribution of young people to the development of the BEHALVES questionnaire, the very people who are going to use it, helps to guarantee the selection of the most useful actions and provides clearer questions (Monfort-Pañego et al., 2016).

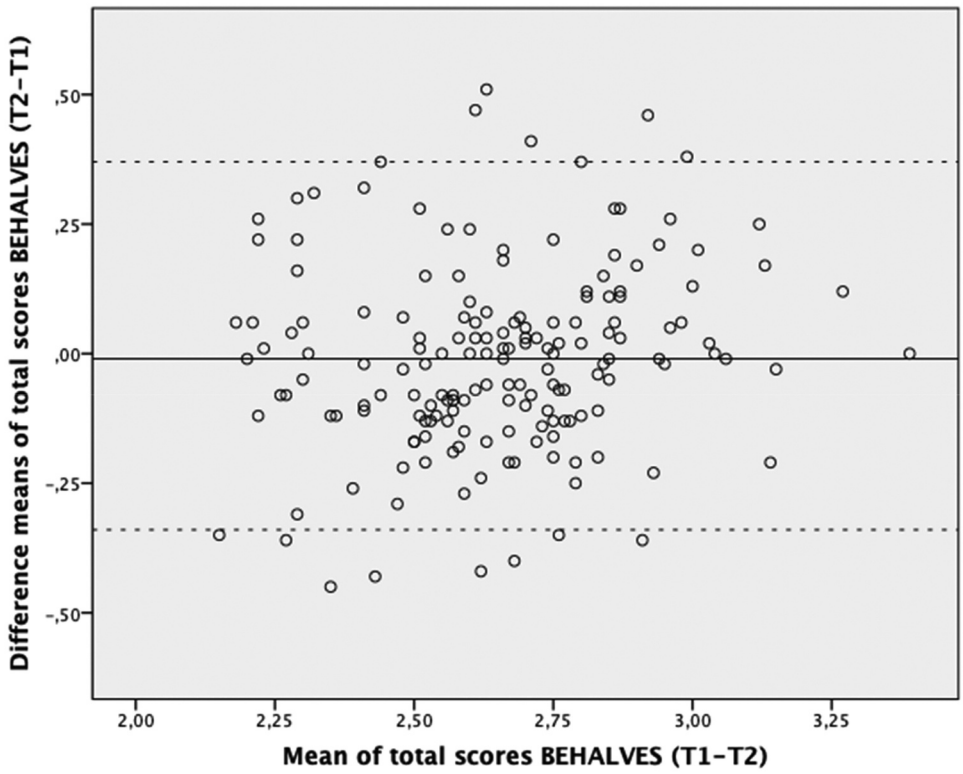

Figure 1. Bland-Altman plot of the differences between time 1 (T1) and 2 (T2) for the total score of the BEHALVES questionnaire. The means of the differences (solid lines) and limits of agreement (dashed lines) within ± 2 standard deviations are shown.

The operational qualities show that the use of our validated questionnaire requires very little time, it is easy to use and it is neither too easy nor too difficult for students as there are no extreme scores.

The reliability results show good stability of scores over time. Total and category scores did not change at different times, as shown by the very low mean differences of measurements. Only the mobilizing heavy weights category was different (p = .01), probably because these kinds of tasks were the least usual in the participants' daily lives. The ICC was high for total scores, and good for category scores; the SEM indicated a very low error index for total scores, and a low index for category scores. The limits of agreement of the Bland-Altman plot for the values of total scores (−0.34 to 0.37) of the BEHALVES also suggest a narrow error of measurement range. With these results, we can state that a change of 0.37 points in the total scores of one participant exceeded the measurement error, and therefore we understand that there is a real change in the level of habits. The low value of the mean difference (−0.01 scores) drawn in the Bland-Altman plot, the continuous line in Figure 1, shows a low systematic error, or a minimal difference between mean values measured at different times, and an assumable random error of 0.18. The results of the regression analysis indicate good stability of the mean difference when the number of scores was high or low. Non-differences were observed between genders at different times. The questionnaire was reliable for both males and females.

This is not the first validated postural habits questionnaire. Noll et al. (2013), developed and validated an instrument to assess back pain and body posture. However, it was not only a specific questionnaire about habits, as it included six questions about postural habits and 15 other questions about active lifestyle and frequency of back pain. The authors used a process of validation which considered scientific literature and experts' opinion. In our study, in addition, the experts took into account the students' opinions which allowed us produce a questionnaire adapted to the context of the study sample. They used questions about postural habits whose answers were dichotomic with no gradation. Our study looked at answers with four levels, which allowed us to obtain graduated information on the use of postural habits. Consequently, our study was able to use a more demanding statistical procedure when analyzing differences between measurements and error measurements in the statistical analysis.

Probably, this is the first comprehensive, specific, validated and reliable instrument to assess postural habits during the daily activities of healthy young adolescents. Although this study has not attempted to establish a relationship between postural habits and health, we consider that the validation of our instrument is a first step toward it. Related to this, there are studies on physical activity whose first step was the validation of instruments. For example, the first physical activity questionnaire (Ainsworth et al., 2000) was validated, and later it was used in combination with others instruments on health to relate the different types of physical activity to health and to be able to make recommendations (Ceschini et al., 2009). So, we consider that future studies could use our instrument in this way, not only to discover postural habits but to look for relationships with other variables such as health, motivation or learning.

We think that an instrument like this is necessary because it responds to the need to begin to study topics like behavior in the use of the body and health beyond the usual aspects studied. The most cited studies concerning health are related to physical activity, and they do not mention these kinds of topics (Craig et al., 2003; Haskell et al., 2007; Plowman, 2014; Twisk, 2001). These studies analyze frequency, duration and level of intensity in different contexts (Haskell et al., 2007; Sjöström et al., 2006) and recommend moderate to vigorous physical activity, as well as improving levels of physical activity to enhance health and the quality of life (Bevans et al., 2010; Sallis et al., 2000). Only a few take into account possible problems related to the correct use of the body (Bauman, 2004; Coleman et al., 2009; Janssen & LeBlanc, 2010; Strong et al., 2005), such as injuries or musculoskeletal disorders. Reducing inactivity and improving levels of physical activity are basic strategies for the development of health and to improve the quality of life, but we think that physical activity itself is not enough. The principles of frequency, intensity and duration when carrying out physical activities are not the only ways to ensure an improvement in health or health education. We must also consider the type and quality of movement (Tancred & Tancred, 1996) used during physical activity, and especially during tasks in our daily lives involving our body, or during free-living physical activity (Ryan et al., 2010). Here, PE teachers have an important duty to teach and improve body consciousness in daily life and when performing physical activities, in addition to promoting physical activity. Our questionnaire could help to answer the following question: Can an improvement in postural habits in daily life provide us with better back health and a better quality of life?

Previous studies have indicated that to understand teacher effectiveness in PE we need to account for learning by outcomes (Rink, 2013). Our questionnaire is a valid and reliable instrument to assess 13 to 17-year-old

students' postural habits, and changes in their postural habits, and it could help to improve public health outcomes in PE (McKenzie & Lounsbery, 2014). However, the introduction of back-care education as content in the physical education curriculum at an early age, with a follow-up into adulthood of the effect on back health, is recommended (Burton et al., 2006). Related to this, future studies should be proposed to develop and validate an instrument addressed to younger people, adapted to their needs and abilities, to assess habits and knowledge from a scientific perspective. We also recommend the use of our questionnaire to health professional. It could be useful to assess the level of postural habits to study its relationship with clinical and therapeutic intervention programs or with potential diagnostics.

Probably one of the limitations of our study is related to the limited number of habits included in the questionnaire, or the inclusion of others which are no longer used. We consider that with the passage of time, and changes in the habits of the population, the questionnaire will require an adaptation of the questions to new uses. In addition, to improve the validation of this instrument, future studies with the capacity to take objective measurements of body posture in daily activities will be necessary to analyze their relationship with the scores provided by our instrument. We must take into account that this instrument was developed for a limited sample in a specific cultural context. The instrument's validity and reproducibility should be checked again if it is to be used for other age groups or in other countries.

Conclusion

BEHALVES is a valid and reliable instrument with good psychometric properties to assess body posture habits during daily activities for 13 to 17-year-old adolescents. In future studies, the use of this instrument will allow us to quantitively measure postural habits in daily activities, changes in postural habits and their relationship with other variables such as LBP, back health, age, gender and learning.

ORCID

Manuel Monfort-Pañego http://orcid.org/0000-0002-3181-2170

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