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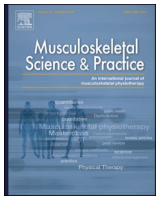

Original article

A new version of a measurement for presence and impact of pain in children and adolescents - Presence and impact of pain in Kids (PIP-KIDS) questionnaire: Translation, cross-cultural adaptation and measurement properties into Brazilian-Portuguese

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ABSTRACT

Background: Musculoskeletal pain in children and adolescents is prevalent and responsible for high levels of disability. Instruments to measure the presence and impact of pain in this population are needed.
Objective: To translate, cross-culturally adapt, then test the measurement properties (structural validity, reliability and construct validity) of a questionnaire (Presence and Impact of Pain in Kids (PIP-Kids) questionnaire) to measure the presence and impact of pain in children and adolescents.
Design: Measurement properties study.
Methods: We conducted a measurement properties study. We translated and culturally adapted the PIP-Kids questionnaire into Brazilian Portuguese. The structural validity was measured by Confirmatory Factor Analysis. Reliability was measured by Kappa Coefficient. Measurement error was measured by the percentage of agreement. Construct validity was measured by Spearman Correlation.
Results/findings: We included 656 children and adolescents from public and private schools. During the translation and cross-cultural adaptation no changes to wording were necessary. Structural validity confirmed two domains. Reliability by Kappa Coefficient ranges from 0.20 to 0.68. Measurement error by the percentage of agreement ranged from 60.2 to 92%. Construct validity was confirmed with 80.5% in accordance with prior hypotheses.
Conclusion: The PIP-Kids questionnaire translation and cross-cultural adaptation were adequate. The PIP-Kids questionnaire also has adequate structural validity with two dimensions (presence and impact), fair reliability, good agreement, and adequate construct validity.

1. Introduction

Musculoskeletal pain is highly prevalent in children and adolescents and is responsible for substantial disability (King et al., 2011; O'Sullivan et al., 2012). The prevalence of musculoskeletal pain in children and adolescents ranges from 4 to 40% according to body region and recall period (King et al., 2011). Children and adolescent's life can be impacted by musculoskeletal pain resulting in school absenteeism and disruption of daily and recreational activities (O'Sullivan et al., 2012). Thus, it is important to assess the impact of pain in children and adolescents' life beyond pain intensity, in a way that covers multiple body regions.

The presence of pain and its impact on a patient's life is subjective and complex constructs (Doleys, 2017; Jette et al., 2003), and are commonly measured by Patient-Reported Outcome Measurements (PROMs) (Meadows, 2011; Chang et al., 2019). Compared to the adult population, there are relatively few instruments that measure the impact

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of pain in children and adolescents, and even fewer have been adapted for the Brazilian-Portuguese-speaking population (Rainey et al., 2014; Marti et al., 2018; Michaleff et al., 2017). O'Sullivan et al. have used the items from the Nordic Low Back Pain Questionnaire, adapted to obtain specific information on the presence and impact of pain on children and adolescents context (O'Sullivan et al., 2012). Specific items for children and adolescents context better represents relevant activities for this population (Michaleff et al., 2017). The questionnaire was developed to map the distribution of the presence and impact of back pain in the population of adolescents. The questions from O'Sullivan included items on the presence and the impact of pain that could be used in clinical practice and research. However, the questionnaire is not available in Brazilian-Portuguese for children and adolescents.

To make an instrument available in another language, translation and cross-cultural adaptation are required (Beaton et al., 2000). After translating and culturally adapting an instrument to another language, testing of the measurement properties of the new version is also required (Beaton et al., 2000). The aims of this study were to translate, cross-culturally adapt, and test the measurement properties (structural validity, reliability and construct validity) of a questionnaire (Presence and Impact of Pain in Kids (PIP-Kids) questionnaire) to measure the presence and impact of pain specific to children and adolescents in the Brazilian-Portuguese language.

2. Methods

2.1. Study design

We conducted a measurement properties study using the taxonomy, terminology and definitions from COnsensus-based Standards for the selection of health status Measurement INstruments (COSMIN) (Mokkink et al., 2010). First, we translated and cross-culturally adapted questions related to the presence and impact of pain used by O'Sullivan (O'Sullivan et al., 2012) into Brazilian-Portuguese (Presence and Impact of Pain in Kids (PIP-Kids) questionnaire). Then, we tested the structural validity and measurement properties related to reliability (reliability and measurement error) and construct validity of the questionnaire. This study was approved by the Human Ethics Committee of the Universidade Cidade de São Paulo (UNICID) (CAAE: 18752219.0000.0064).

2.2. Participants and procedures

At least 500 (Osborne, 2014) children and adolescents from public and private schools in Sao Paulo state with ages between 8 and 18 years old with or without musculoskeletal pain (chronic or acute) were necessary for this study. The minimum of eight years old was chosen because at this age it is expected that children have sufficient cognitive and linguistic development to self-report their feelings and their own opinions in an interview (Arbuckle and Abetz-Webb, 2013). To contact public schools, first, we contact the municipal district councils to receive authorization. After the schools were invited randomly. Private schools were invited directly to the school (contacting the principal). Participants who answered "yes" to the question: "did you feel some pain in your back, neck, arms (including hands) or legs (including feet) in last month?" were considered to have musculoskeletal pain. People with pain due to surgery or any other specific pathology (e.g.: cancer, infection, fracture, inflammatory diseases) were excluded.

2.3. Instruments

The Presence and Impact of Pain in Kids (PIP-Kids) questionnaire: An instrument to measure the constructs of the presence and impact of pain used by O'Sullivan (O'Sullivan et al., 2012) in a previous study with adolescents with back pain. The original instrument comprised 10 items, of which five measure the presence of low and middle back pain, duration and frequency of pain (e.g., continuous or intermittent) (O'Sullivan et al., 2012; de Barros and Alexandre, 2003), and a second dimension with five items focuses on the impact that pain has on various aspects of an individual's life, such as medication use, appointments, and interference with normal or recreational activities. The questionnaire was developed to map the distribution of the presence and impact of back pain in the population of adolescents. We conducted a few adaptations **(Appendix 1 and 2)** on items 1 to 5 to broaden the scope of the original questions, including musculoskeletal pain at any site and to account for sports injuries. We added an item to identify the body region of pain (back, neck, upper limb or lower limb). The remaining five questions from the original instrument measure pain impact based on medical appointments, medication use, school absenteeism, interference with daily, and on physical activities (O'Sullivan et al., 2012). The questionnaire does not have a final score per dimension or even a score for the total questionnaire. We have proposed the name 'Presence and Impact of Pain in Kids' (PIP-Kids) questionnaire for this newly adapted version of the instrument. Respondents answer "yes" or "no" for each item of the questionnaire. If the participant answers "no" for item 1 "did you feel some pain in your back, neck, arms (including hands) or legs (including feet) in last month?", they should answer "no" for the remaining items.

Brief Pain Inventory (BPI): It is a multidimensional questionnaire with nine items that measures two dimensions: intensity/severity (items 3 to 6) and pain interference in patients' lives (9A to 9G); plus two items about the presence of pain and two items regarding the treatment or medications. The questionnaire asks respondents about the intensity and interference of pain using Likert scales of 11 points. Zero represents "no pain" or "pain does not interfere in patients' lives" while 10 represents "worst imaginable pain" or "complete interference with daily life" (Ferreira et al., 2011; Mikkelsen et al., 2021; Fouladbakhsh et al., 2012).

The BPI has previously been translated and cross-culturally adapted into Brazilian-Portuguese in a population of adults with cancer, and had measurement properties tested (Ferreira et al., 2011). The BPI presented two factors (Ferreira et al., 2011). The internal consistency (Cronbach Alpha) of the questionnaire was 0.91 for the severity of pain and, 0.87 for pain impact (Ferreira et al., 2011). The questionnaire showed adequate construct validity (moderate [0.38] to strong [0.90] positive correlation against McGill Pain Questionnaire) (Ferreira et al., 2011).

Numerical Rating Scale (NRS): NRS measures pain intensity (Costa et al., 2008; Birnie et al., 2019). The NRS is a Likert 11-point scale ranging from 0 (no pain) to 10 (worst pain possible) points. A systematic review found a strong recommendation for use in children and adolescents with acute pain and a weak recommendation for chronic pain (Birnie et al., 2019). This scale was previously translated and adapted to Brazilian-Portuguese and had its measurement properties tested in the adult population. The reliability (Intraclass Correlation Coefficients) was 0.94 (CIs 95% 0.90 to 0.96) (Costa et al., 2008). We used NRS in this study to ensure stability from baseline to follow-up for test-retest analysis and to describe the sample. We considered stable children and adolescents who did not change >2 points out of 11.

Pediatric Quality of Life Inventory™ (PedsQL) version 4.0: PedsQL measure quality of life (Klatchoian et al., 2008). The PedsQL has 23 items and a total score ranging from 0 (low quality of life) to 100 (high quality of life) (Klatchoian et al., 2008). The questionnaire showed good internal consistency through a Cronbach's Alpha of 0.88 in Brazilian children and adolescents children and adolescents (Klatchoian et al., 2008).

Other information: Socioeconomic level was measured by the Brazilian Economic Criteria (English for: *Critério de Classificação Econômica Brasil* - 2010) (Associação Brasileira de Empresas de Pesquisa, 2019). The classification is divided from A1 (R$ 8099.01–14, 366.00/month) to E (until R$ 403.00/month) (Associação Brasileira de Empresas de Pesquisa, 2019).

2.4. Translation and cross-cultural adaptation

We translated and cross-culturally adapted the PIP-Kids questionnaire following the six steps guideline suggested by Beaton, after the approval from the author of the original version (Beaton et al., 2000). The six steps included:

1. Initial translation of the PIP-Kids questionnaire from English to Brazilian-Portuguese. Two translators with Brazilian-Portuguese as the primary language conducted this stage. One translator had no previous knowledge of pediatric research;
2. Synthesis of the translations was conducted by the two translators in step 1;
3. Back-translation of the PIP-Kids questionnaire from Brazilian-Portuguese to English. Two back-translators with English as the primary language conducted this stage. Both back-translators did not have any knowledge of the instrument;
4. Synthesis of the back-translations was conducted by the two translators in step 3;
5. An expert committee (i.e., researchers and language professionals) revised and reached a consensus on a pre-final version of the questionnaire. The expert committee considered the original version, the translation, and the back-translation version of the questionnaire;
6. The questionnaire was piloted to assess participants' ability to comprehend and answer each item of the PIP-Kids questionnaire. A convenience sample of 38 children and adolescents was asked about: 1) Understanding each item; and 2) Difficulty in answering any item (Beaton et al., 2000).

2.5. Measurement properties

We tested the following measurement properties: structural validity, reliability and construct validity. Measurement error and reliability were measured in the sub-sample of children and adolescents that reported musculoskeletal pain and that reported stable pain intensity over a period of 7 days intervals.

- **Structural validity (domain):** measures the degree to which the scores of the PROM are a reflection of the dimensionality of the construct to be measured (Mokkink et al., 2010). A very good sample considered to measure structural validity is at least 500 children and adolescents (Osborne, 2014).
- **Reliability (domain):** measures the degree that the measurement is free from measurement errors. In this study we measured two (reliability and measurement error) of three measurement properties of this domain (Mokkink et al., 2010):
  - **Reliability (measurement property):** measures the proportion of the items' variance in the measurement which is due to "true" differences between participants (Mokkink et al., 2010);
  - **Measurement error (measurement property):** the systematic and random error that is not attributed to "true" changes in the construct to be measured (Mokkink et al., 2010). Both reliability and measurement error required at least 50 children and adolescents (Terwee et al., 2007)
    * Internal consistency was not calculated due to the formative model of the questionnaire and also considering the dichotomous nature of the answers.
- **Construct validity (domain):** measures the degree to which the scores are consistent with the hypotheses stipulated a priori (i.e., relationship to scores from another instrument) assuming that the PROM measures the construct that it is proposed to measure (Mokkink et al., 2010). At least 50 children and adolescents are required to measure construct validity (Terwee et al., 2007).

2.6. Statistical analysis

Characteristics of the whole sample were summarised descriptively. We used mean and standard deviation for continuous variables and frequency and percentage for categorical and dichotomous variables. The proportion of missing data was calculated by dividing the total number of unanswered questions by all possible answers and multiplying by 100.

Structural validity was measured by Confirmatory Factor Analysis (CFA). We hypothesised that the PIP-Kids questionnaire has two dimensions (presence and impact of pain) based on the content of the items. Computation of parameter estimates used the mean and variance adjusted least-squares method (WLSMV) using all categorical (yes/no) responses from the questionnaire (Muthén, 2017). Item 1 was not included in the factor analysis due to floor effects. ie. a "no" response to item 1 ("Has your back, neck, upper limb or lower limb been painful at any time in the last month") resulted in predominately "no" responses to all other items. Item 2 was not included in the factor analysis as it was an extension of item 1 ("back", "neck", "arms", "legs"). To confirm the model fit we used the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Residuals (SRMR). The CFI and TLI ranges from 0 to 1, where higher values represent a better fit. We considered CFI and TLI $\geq$0.95 a "good fit" (Hu and Bentler, 1999; Prinsen et al., 2018). The RMSEA and SRMR also ranges from 0 to 1, where lower values represent a better fit. We considered RMSEA $\leq$0.06 and SRMR $\leq$0.08 an "good fit" (Hu and Bentler, 1999; Prinsen et al., 2018; Chen et al., 2008). We reported the standardized factor loadings which represent correlations between the item responses and their associated factor interpreted as $>$ 0.70: "excellent", 0.63: "very good", 0.55: "good", 0.45: "fair", and 0.32: "poor" (DiStefano and Hess, 2005). We then calculated the variance (R^2) explained by items to aid interpretation (DiStefano and Hess, 2005).

Reliability (measurement property) was measured by the Kappa Coefficient interpreted as 0–0.20: no agreement; 0.21–0.39: minimal agreement; 0.40–0.59: weak agreement; 0.60–0.79: moderate agreement; 0.80–0.90: strong; and $>$0.90: almost perfect agreement (McHugh, 2012). The measurement error was calculated by the frequency and percentage of agreement (positive or negative) between baseline and 7-days follow-up (Terwee et al., 2007).

Construct validity was measured by the Spearman Correlation (r) between items from the PIP-Kids questionnaire and items from the Brief Pain Inventory (BPI) (Terwee et al., 2007). Spearman correlation (r) in this study is interpreted as: $\leq$0.20: strong divergence; 0.20–0.40: moderate divergence; 0.50–0.69: moderate convergence; and $\geq$0.70: strong convergence (Saragiotto et al., 2018; Streiner, 2008). The hypotheses stipulated a priori regarding the correlation between items from the PIP-Kids and items from the BPI are in Table 1. The a priori hypotheses were founded on prior research, both concerning studies of measurement properties and studies correlating similar constructs of the items in both questionnaires, as well as the guidelines provided by the COSMIN (Consensus-based Standards for the selection of health Measurement Instruments) for establishing generic hypotheses (Walker and Greene, 1991; Andias et al., 2019; Namnik et al., 2016; Claar and Walker, 2006; Stahlschmidt et al., 2018; Offenbächer et al., 2016). The construct validity was considered adequate if at least 75% of the results were in accordance with stipulated hypotheses regarding the correlation between both instruments (Terwee et al., 2007).

All analysis was performed by IBM SPSS software version 23.0 (IBM corporation, Somers, NY, USA) and Mplus version 8 (Muthén & Muthén, Los Angeles, CA).

3. Results

We included 656 children and adolescents from public and private schools with and without musculoskeletal pain (Fig. 1). A sub-sample of 107 participants with musculoskeletal pain answered the questionnaires

Table 1
Prior hypotheses for the correlations between the PIP-Kids questionnaire and the BPI to test construct validity (Andias et al., 2021; Fejer and Hartvigsen, 2008; Hübscher et al., 2013).

	BPI 3	BPI 5	BPI 6	BPI 9 Geral activity	BPI 9 Humor	BPI 9 Walk hability	BPI 9 Relationship	BPI 9 Sleep	BPI 9 Life enjoying
PIP-Kids P1	r: <40[48]	r: 20-69[48]	r: <40[48]	r: <40[49]	r: 20-40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P2 – Back	r: <40[48]	r: 20-69[48]	r: <40[48]	r: <40[49]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P2 – Neck	r: <40[48]	r: 20-69[48]	r: <40[48]	r: <40[25]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P2 – Arms	r: <40[48]	r: 20-69[48]	r: <40[48]	r: <40[25]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P2 – Leg	r: <40[48]	r: 20-69[48]	r: <40[48]	r: <40[25]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P4	r: <40[25]	r: <40[25]	r: <40[25]	r: <40[25]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids P5	r: <40[25]	r: <40[25]	r: <40[25]	r: <40[25]	r: <40[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids I6	r: 20-69[50]	r: 20-69[50]	r: 20-69[50]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]
PIP-Kids I7	r: 20-69[25]	r: 20-69[25]	r: 20-69[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: ≤ 0.20[25]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids I8	r: <40[35]	r: <40[35]	r: <40[35]	r: 20-69[31]	r: <40[25]	r: ≤ 0.20[25]	r: <40[16]	r: <40[25]	r: ≤ 0.20[25]
PIP-Kids I9	r: <40[33,35]	r: <40[33,35]	r: <40[33,35]	r: 20-69[50]	r: 20-40[16]	r: ≤ 0.20[25]	r: <40[16]	r: <40[25]	r: <40[25]
PIP-Kids I10	r: <40[33,35]	r: <40[33,35]	r: <40[33,35]	r: 20-69[50]	r: 20-40[16]	r: ≤ 0.20[25]	r: <40[16]	r: <40[25]	r: <40[25]

Strong Divergence	Moderate Divergence	Moderate to Strong Divergence	Moderate Divergence to Moderate convergence

BPI: Brief Pain Inventory
PIP-Kids: Presence and Impact of Pain in Kids – P: Presence / I: Impact

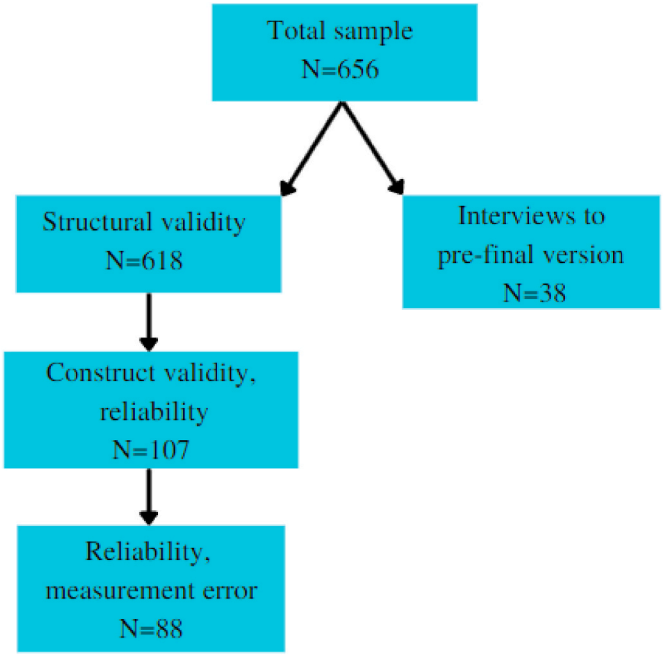

Fig. 1. Flow chart of sample recruitment.

at two different time points in order to perform the test-retest analysis and, this sub-sample was also used to evaluate missing data. Another sub-sample of 38 children and adolescents (from the total sample of 656) was interviewed to test the pre-final version of the PIP-Kids questionnaire (Fig. 1).

The mean age of all the participants was 11.8 (SD 2.7) years old and most (58.6%) of the sample was female (Table 2). The 38 interviewed during the pre-final version of the PIP-Kids questionnaire (step 6) had a mean age of 11.7 (SD 1.6) years.

3.1. Translation and cross-cultural adaptation

No wording changes were necessary. Most of the 38 children and adolescents said that they totally understood the questions, had no difficulty answering the items and that the items represent their daily life (Appendix 3 - TABLE 3). Only one child reported difficulty understanding item 5 (pain ever lasted for more than 3 months continuously) and only one child reported difficulty understanding item 6 (seek health professional advice or treatment).

3.2. Missing data

Of 618 children and adolescents, 107 reported pain and consequently answered the whole questionnaire. The missing data rate for the 107 participants was 0.7% (10/1391 items).

3.3. Structural validity

With data from the sample of 618 children and adolescents with and without pain, we found an adequate fit of the data to the model. The CFI was 0.948 (good fit), the TLI was 0.924 (good fit), the RMSEA was 0.056 (good fit) and the SRMR was 0.078 (good fit). Fig. 2 depicts standardized factor loadings (with standard error).

Factor loadings for presence of pain ranged from 0.549 (good) to 0.786 (excellent), which equates to the variance (R^2) explained by these items of 30%–62%, respectively. For impact of pain, factor loadings ranged from 0.476 (fair) to 0.791 (excellent) which equates to the explained variance of 23%–73%, respectively.

3.4. Reliability

Measurement error ranging from 60.2% to 92.0% of agreement (Table 4). Reliability by the Kappa Coefficient for each item ranged from 0.20 (no agreement) to 0.68 (moderate agreement) for the stable sample (Table 4).

Table 2
Characteristics of children and adolescents included in the study (N = 618).

	N = 618		N = 107		N = 88		N = 38	
Variables								
Gender, n (%)								
	Female	362 (58.6)		58 (54.2)		51 (58.0)		20 (52.6)
	Male	256 (41.4)		49 (45.8)		37 (42.0)		18 (47.4)
Age (years), mean (SD)		11.8 (2.7)		10.9 (2.1)		11.1 (2.1)		11 (1.6)
School year, n (%)	2nd year	26 (4.2)	2nd year	3 (2.8)	2nd year	2 (2.3)	2nd year	0 (0)
	3rd year	81 (13.1)	3rd year	17 (15.9)	3rd year	14 (15.9)	3rd year	3 (7.9)
	4th year	118 (19.1)	4th year	31 (29)	4th year	20 (22.7)	4th year	2 (5.3)
	5th year	60 (9.7)	5th year	14 (13.1)	5th year	13 (14.8)	5th year	2 (5.3)
	6th year	88 (14.2)	6th year	12 (11.2)	6th year	11 (12.5)	6th year	16 (42.1)
	7th year	77 (12.4)	7th year	12 (11.2)	7th year	11 (12.5)	7th year	7 (18.4)
	8th year	61 (9.9)	8th year	5 (4.7)	8th year	5 (5.7)	8th year	4 (10.5)
	9th year	35 (5.7)	9th year	9 (8.4)	9th year	9 (10.2)	9th year	4 (10.5)
	10th year	28 (4.5)	10th year	2 (1.9)	10th year	2 (2.3)	10th year	0 (0)
	11th year	22 (3.5)	11th year	2 (1.9)	11th year	1 (1.1)	11th year	0 (0)
	12th year	22 (3.5)	12th year	0 (0)	12th year	0 (0)	12th year	0 (0)
Socioeconomic level, n (%)	Class A1	34 (5.5)	Class A1	6 (5.6)	Class A1	6 (6.8)	Class A1	0 (0)
	Class A2	99 (16.0)	Class A2	22 (20.6)	Class A2	19 (21.6)	Class A2	1 (2.6)
	Class B1	149 (24.1)	Class B1	26 (24.3)	Class B1	22 (25.0)	Class B1	4 (10.5)
	Class B2	119 (19.2)	Class B2	14 (13.1)	Class B2	9 (10.2)	Class B2	12 (31.6)
	Class C1	123 (19.9)	Class C1	19 (17.7)	Class C1	14 (15.9)	Class C1	10 (26.3)
	Class C2	31 (5.0)	Class C2	5 (4.7)	Class C2	5 (5.7)	Class C2	6 (15.8)
	Class D	10 (1.6)	Class D	1 (0.9)	Class D	0 (0)	Class D	2 (5.3)
	Class E	21 (3.4)	Class E	5 (4.7)	Class E	5 (5.7)	Class E	2 (5.3)
	Missing data	32 (5.2)	Missing data	9 (8.4)	Missing data	8 (9.1)	Missing data	1 (2.6)
Pain intensity (0–10), mean (SD)		-[a]		5.6 (2.5)		5.9 (2.1)		-[a]
Quality of life (0–100), mean (SD)		74.0 (13 8)		69.7 (14.1)		69.8 (13.9)		
School type, n (%)	Public	405 (65.5)	Public	61 (57.0)	Public	45 (51.1)	Public	38 (100)
	Private	213 (34.5)	Private	46 (43.0)	Private	43 (48.9)	Private	0 (0)

SD: standard deviation.
n (%): absolute number and percentage.
Table considers: 1) the sample of participants with and without musculoskeletal pain (n = 618); 2) the sub-sample of children and adolescents with impactful musculoskeletal pain (n = 107); 3) the sub-sample of children and adolescents that presented stable symptoms regarding pain intensity after a period of 7-days (n = 88); and 4) the sub-sample of children and adolescents included to interview of process of translation and cross-cultural adaptation (n = 38).
*Missing data: 9.
[a] With and without musculoskeletal pain.

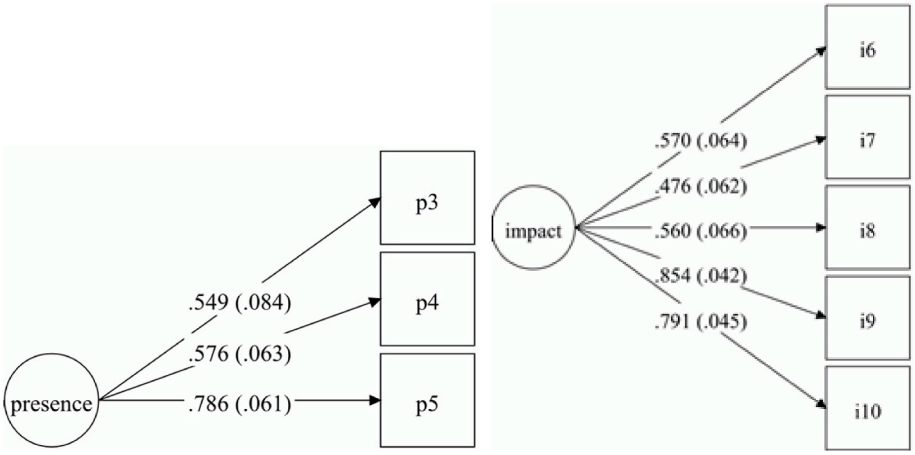

Fig. 2. Path diagram with standardized loadings factors of the presence of pain and the impact of pain domains of the Presence and Impact of Pain in Kids (PIP-Kids) questionnaire.
P: presence; **I:** Impact.

3.5. Construct validity

From our 108 a priori hypotheses regarding the correlation between both instruments (PIP-Kids and BPI), 87 (80.5%) results were in accordance indicating adequate construct validity. Appendix 4 - Table 5 shows all correlations, and correlations in accordance with our stipulated hypotheses are in bold and light grey.

4. Discussion

We have translated and cross-cultural adapted the PIP-Kids questionnaire into Brazilian-Portuguese and tested its measurement properties in children and adolescents with and without musculoskeletal pain. The PIP-Kids questionnaire was suitable to assess the presence and impact of musculoskeletal pain in Brazilian children and adolescents. The translation and cross-cultural adaptation resulted in a version with

Table
4Reliability of the presence and impact of pain in kids (PIP-kids).

Presence and Impact of Pain in Kids (PIP-Kids) questionnaire items	Proportion of "yes" – baseline n (%)*	Proportion of "yes" – follow-up n (%)*	Agreement n (%)*	Reliability - stable sample* [a]	Reliability - all sample[a]
1- Has your back, neck, upper limb or lower limb been painful at any time in the last month?	100 (100)	81 (92)	81 (92.0)	-[b]	-[b]
2- Back	34 (38.6)	30 (34.1)	64 (72.7)	0.65	0.67
2- Neck	12 (13.6)	11 (12.5)	71 (80.7)	0.68	0.69
2- Arms	11 (12.5)	7 (7.9)	68 (77.3)	0.41	0.49
2- Legs	45 (51.1)	38 (43.2)	62 (70.4)	0.61	0.62
3- Have you ever had any sport injury in the last month? Sport injury is defined as any injury as a result of sport activity that caused you to miss school, or restrict normal activities or sports activities.	17 (19.3)	18 (20.4)	68 (77.3)	0.34	0.37
4- Has your back, neck, upper limb or lower limb pain ever lasted for more than 3 months off and on (it hurt at least once a week but not every day)?	38 (43.2)	44 (50)	69 (78.4)	0.59	0.54
5- Has your back, neck, upper limb or lower limb pain ever lasted for more than 3 months continuously (it hurts more or less every day)?	27 (30.7)	28 (31.8)	68 (77.3)	0.49	0.48
6- Have you sought health professional advice or treatment for back, neck, upper limb or lower limb pain in the last month?	27 (30.7)	22 (25)	75 (85.2)	0.63	0.60
7- Have you taken medication to relieve the back, neck, upper limb or lower limb pain in the last month?	37 (42)	38 (43.2)	60 (68.2)	0.36	0.36
8- Have you missed school due to the back, neck, upper limb or lower limb pain in the last month?	26 (29.5)	20 (22.7)	71 (80.7)	0.55	0.49
9- Has the back, neck, upper limb or lower limb pain interfered with your normal activities in the last month?	53 (60.2)	44 (50)	53 (60.2)	0.20	0.17
10- Has the back, neck, upper limb or lower limb pain interfered with recreational physical activities (e.g., sport, walking, cycling etc.) in the last month?	60 (68.2)	46 (52.3)	62 (70.4)	0.40	0.41

* Sub-sample of children and adolescents that presented stable symptoms regarding pain intensity after a period of 7-days.
[a] Kappa Coefficient.
[b] Not possible to calculate Kappa Coefficient – based in crosstab.

no wording changes and any major difficulty in understanding the items by participants. We found an adequate fit by confirmatory factor analysis. The questionnaire also showed adequate measurement error (percentage of agreement), fair reliability (Kappa Coefficient), and adequate construct validity.

This study had strengths and limitations. We included a large, representative sample of children and adolescents, especially for the CFA, which requires a large sample (Osborne, 2014; Wolf et al., 2013). We have performed a CFA based on our priori hypotheses of two dimensions (presence and impact of pain), even not considering a final score due to the formative model characteristics of the PIP-Kids questionnaire (de Vet et al., 2011). The questionnaire used to assess construct validity (Brief Pain Inventory) (Ferreira et al., 2011) was developed and validated in a Brazilian adult population. However, instruments aiming to assess the construct of the presence and impact of pain in children and adolescents are not available in the literature. To minimize the impact of using the BPI questionnaire for construct validity, we developed a priori hypotheses to assess construct validity. Furthermore, although the questionnaire does not identify the specific pain location that leads to an impact, it makes feasible to identify whether the pain reported in the musculoskeletal system leads to some interference in daily life – as well as the regions children and adolescents report pain.

Previous studies have used and tested the measurement properties of other instruments or questionnaires in children and adolescents with pain (Michaleff et al., 2017). Most questionnaires assess pain in children and adolescents have a large number of questions that make them unfeasible in clinical practice (Michaleff et al., 2017; Goddard et al., 2021; Machado et al., 2001; Varni et al., 2010). The majority of the available instruments are proposed to measure two or more without perform confirmatory factor analysis (Michaleff et al., 2017). Regarding the percentage of agreement, another study measured the percentage of agreement in the same week using the Young Spine Questionnaire (Lauridsen and Hestbaek, 2013). The authors found that the agreement ranges from 83.7% (cervical pain today) to 97.9% (thoracic pain today) (Lauridsen and Hestbaek, 2013) showing superior agreement compared to our findings (ranging from 60.2% to 92.0%). The higher percentage of agreement in this previous study may be explained by the shorter interval of the assessment (e.g., same week) and also by the recall period (Lauridsen and Hestbaek, 2013).

Regarding reliability (measurement property) a previous study used the Extended Nordic Musculoskeletal Questionnaire (NMQ-E) – an extended version for adolescents – and also measured reliability (Legault et al., 2014). The authors found Kappas ranging from 0.64 to 1.0, higher than our study (Legault et al., 2014). The differences in the findings (compared to our study) might be due to the time interval between baseline and follow-up assessments. The previous study measuring the measurement properties of the NMQ-E considered a 24- to 48-h interval (Legault et al., 2014), differing from our 7-day interval. Construct validity was also measured by previous studies of questionnaires or instruments of impact on pain (Claar and Walker, 2006; Palermo et al., 2004; Eccleston et al., 2007). The authors found moderate to high correlations with similar constructs (e.g., another instrument measuring the impact of pain) (Terwee et al., 2007; Claar and Walker, 2006; Palermo et al., 2004; Eccleston et al., 2007).

This study made available a Brazilian-Portuguese version of a questionnaire for children and adolescents to measure the presence and impact of musculoskeletal pain. Previous studies discuss about instead of developing a new instrument to avoid creating a burden of different instruments, and spend time and costs, it is preferable to adapt an existing questionnaire (Ortiz-Gutiérrez and Cruz-Avelar, 2018; Hambleton and K, 1995). The questionnaire proposes to identify the presence of musculoskeletal pain (prevalence) and the impact associated with activities of daily living, considering different body regions, instead of only the back (O'Sullivan et al., 2012; Lauridsen and Hestbaek, 2013). The PIP-Kids questionnaire seems to be a good option to measure the prevalence of musculoskeletal pain and the associated impact of this pain on daily life activities, although caution is necessary regarding some low values of reliability.

Future studies need to test the PIP-Kids questionnaire in longitudinal designs, which are the most appropriate design to measure responsiveness to understand if the questionnaire can identify changes over the

time (Mokkink et al., 2010). Another important perspective is to test the questionnaire in other contexts (e.g.: clinical), but also in other languages to understand if the questionnaire maintains its measurement properties (Beaton et al., 2000).

5. Conclusion

The Brazilian-Portuguese version of PIP-Kids questionnaire was well understood by Brazilian children and adolescents. The PIP-Kids questionnaire also has adequate structural validity with two dimensions (presence and impact), fair reliability, good agreement, and adequate construct validity.

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Declaration of competing interest

All authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.msksp.2023.102772.

APPENDICES.

Appendix 1. Presence and Impact of Pain in Kids (PIP-Kids) questionnaire Portuguese version

Presence and Impact of Pain in Kids (PIP-Kids) questionnaire Avaliação da presença e do impacto da dor em criança e/ou adolescente (Adaptado de O'Sullivan)	
Presença de dor	
1. Você sentiu alguma dor nas costas, pescoço, braços (incluindo mãos) ou pernas (incluindo pés) no último mês?	( ) Sim ( ) Não
2. Se sim, qual região doeu com mais frequência? ( ) costas ( ) pescoço ( ) braços ( ) pernas	
3. Você teve alguma lesão esportiva no último mês? Lesão esportiva é definida como qualquer lesão resultante de atividade esportiva que faça você faltar na escola, ou que restrinja a sua participação em atividades normais ou atividades esportivas.	( ) Sim ( ) Não
4. A sua dor nas costas, pescoço, braços ou pernas já durou mais de 3 meses indo e vindo (pelo menos uma vez por semana, mas não todos os dias)?	( ) Sim ( ) Não
5. A sua dor nas costas, pescoço, braços ou pernas já durou mais de 3 meses de forma contínua (dói mais ou menos todos os dias)?	( ) Sim ( ) Não
Impacto da dor	
6. Você procurou orientação ou tratamento de profissionais de saúde para sua dor nas costas, pescoço, braços ou pernas no último mês?	( ) Sim ( ) Não
7. Você tomou algum medicamento para aliviar a sua dor nas costas, pescoço, braços ou pernas no último mês?	( ) Sim ( ) Não
8. Você faltou na escola devido à dor nas costas, pescoço, braços ou pernas no último mês?	( ) Sim ( ) Não
9. A sua dor nas costas, pescoço, braços ou pernas interferiu nas suas atividades normais no último mês?	( ) Sim ( ) Não
10. A sua dor nas costas, pescoço, braços ou pernas interferiu nas suas atividades físicas recreacionais (exemplo: esporte, caminhada, ciclismo etc.) no último mês?	( ) Sim ( ) Não

Appendix 2. Presence and Impact of Pain in Kids (PIP-Kids) questionnaire (adapted from O'Sullivan) - English version

Presence and Impact of Pain in Kids (PIP-Kids) questionnaire Assessment of the presence of pain the impact on children's life. Adapted from O'Sullivan	
Presence of pain	
1. Has your back, neck, upper limb or lower limb been painful at any time in the last month?	( ) Yes ( ) No
2. If yes, where is the most common site of pain? ( ) back ( ) neck ( ) upper limb or ( ) lower limb	
3. Have you ever had any sport injury in the last month? Sport injury is defined as any injury as a result of sport activity that caused you to miss school, or restrict normal activities or sports activities.	( ) Yes ( ) No
4. Has your back, neck, upper limb or lower limb pain ever lasted for more than 3 months off and on (it hurt at least once a week but not every day)?	( ) Yes ( ) No
5. Has your back, neck, upper limb or lower limb pain ever lasted for more than 3 months continuously (it hurts more or less every day)?	( ) Yes ( ) No
Impact of pain	
6. Have you sought health professional advice or treatment for back, neck, upper limb or lower limb pain in the last month?	( ) Yes ( ) No
7. Have you taken medication to relieve the back, neck, upper limb or lower limb pain in the last month?	( ) Yes ( ) No
8. Have you missed school due to the back, neck, upper limb or lower limb pain in the last month?	( ) Yes ( ) No
9. Has the back, neck, upper limb or lower limb pain interfered with your normal activities in the last month?	( ) Yes ( ) No
10. Has the back, neck, upper limb or lower limb pain interfered with recreational physical activities (e.g., sport, walking, cycling etc.) in the last month?	( ) Yes ( ) No

Appendix 3. Cognitive interviews of the pilot to test the pre-final version of the PIP-Kids questionnaire

Table 3
Cognitive interviews of the pilot to test the pre-final version of the PIP-Kids questionnaire

Did you understand the questions? n (%)	
I totally understood	34 (89.5)
I partially understood	4 (10.5)
I did not understand	0 (0)
Did you have any difficulty answering the questionnaire? n (%)	
No difficulty	29 (76.3)
A little difficulty	8 (21.0)
A lot of difficulty	1 (2.6)

Appendix 4. Results of the correlations test between the Presence and Impact of Pain in Kids (PIP-Kids) questionnaire and the Brief Pain Inventory (BPI) to test construct validity

Table 5
Results of the correlations test between the Presence and Impact of Pain in Kids (PIP-Kids) questionnaire and the Brief Pain Inventory (BPI) to test construct validity.

	BPI 3	BPI 5	BPI 6	BPI 9 Geral activity	BPI 9 Humor	BPI 9 Walk ability	BPI 9 Relationship	BPI 9 Sleep	BPI 9 Life enjoying
PIP-Kids P1	**-0.03**	0.07	**0.09**	**0.15**	0.12	**0.16**	**0.05**	**0.14**	**0.02**
PIP-Kids P2 – Back	**0.05**	-0.02	**-0.03**	**-0.12**	**-0.10**	**-0.15**	**-0.10**	**-0.06**	**-0.00**
PIP-Kids P2 – Neck	**0.10**	-0.04	**-0.06**	**-0.07**	**-0.12**	**-0.12**	**0.04**	**-0.04**	**0.03**
PIP-Kids P2 – Arms	**0.11**	0.08	**-0.14**	**-0.09**	**-0.04**	-0.21*	**-0.13**	**-0.17**	**-0.08**
PIP-Kids P2 – Leg	**0.01**	0.02	**-0.10**	**0.09**	**-0.06**	**0.08**	**0.05**	**-0.09**	**0.05**
PIP-Kids P4	**0.05**	**0.22***	**0.19**	**0.29***	**0.28***	0.31*	0.26*	**0.27***	0.25*
PIP-Kids P5	**0.18**	**0.19***	**0.21***	**0.16**	**0.05**	**0.09**	**0.08**	**0.03**	0.22*
PIP-Kids I6	**0.31***	**0.31***	**0.32***	0.30*	0.22*	0.22*	**0.05**	**0.03**	**0.19***
PIP-Kids I7	-0.10	-0.11	-0.07	**-0.03**	**-0.08**	**-0.14**	**0.10**	**-0.05**	**-0.12**
PIP-Kids I8	**0.16**	**0.10**	**0.13**	0.15	**0.12**	**0.10**	**0.22***	**0.11**	**0.18**
PIP-Kids I9	**0.19***	**0.31***	**0.30***	**0.27***	0.18	**0.20***	**0.07**	**0.14**	**0.14**
PIP-Kids I10	**0.10**	**0.19***	**0.14**	0.13	0.02	**0.12**	**0.13**	**0.05**	**0.12**

Hypothesis met | Hypothesis not met

BPI: Brief Pain Inventory
PIP-Kids: Presence and Impact of Pain in Kids – P: Presence / I: Impact
Bold: *in accordance with our prior hypothesis*
***:** $p<0.05$*

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