LOCUS OF CONTROL AND PAIN: VALIDITY OF THE FORM C OF THE MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL SCALES WHEN USED WITH ADOLESCENTS

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Abstract

The objective of this study was to examine the factor structure, reliability and validity of the Form C of the Multidimensional Health Locus of Control (MHLC-C) scales in adolescents. A Confirmatory Factor Analyses indicated adequate fit of a four-factor model and the internal consistency of the scales was adequate. Criterion validity of the four scales MHLC-C was also supported by significant correlations with measures of pain-related self-efficacy, anxiety, and coping strategies. The results indicate that the four MHLC-C scale scores are reliable and valid, and therefore support their use to assess pain-related locus of control beliefs in adolescents.

Keywords: Pain; Locus of control; Multidimensional Health Locus of Control; Young people.

INTRODUCTION

Pain, both acute (Stinson et al., 2008) and chronic (King et al., 2011), is a significant problem in young people that can have widespread negative effects on their lives and their families. Pain can interfere significantly in a child's psychological and physical functioning (Huguet et al., 2009), seriously diminishing their quality of life (Gold et al., 2009). Pain is known to be a multidimensional and complex phenomenon where psychological factors -- particularly pain-related beliefs -- play an important role in how young people cope with and adjust to their pain (Miró et al., 2007).

Beliefs of health locus of control (HLOC) reflect the degree to which people believe that their health status is controlled by their own behavior or by environmental factors (Wallston and Wallston, 1982). Studies with samples of adults with chronic pain have demonstrated that HLOC beliefs are a significant predictor of health behaviors and

an important predictor of treatment outcomes (Härkäpää et al., 1991; Hudzinski and Levenson, 1985; Keedy et al., 2014). For example, research has shown that adults with headaches who endorse internal locus of control pain-related beliefs are more confident about being capable of doing things despite pain than those who belief that their health status is determined by external factors (French et al., 2000). Similarly, adults with predominantly external locus of control beliefs have been shown to be more likely to report more pain-related anxiety than people that believe that their pain and the extent to which it interferes with their lives depends on their own behavior (Crisson and Keefe, 1988; Shuster et al., 2009). Other studies have also shown that adults with predominantly internal pain locus of control beliefs are more likely to use more adaptive coping strategies than those with external pain locus of control beliefs who are more prone to use maladaptive coping strategies (Gibson and Helme, 2000; Nicholson et al., 2007). Although this research in adults with pain is consistent with the idea that locus of control beliefs play an important role in adjustment to chronic pain, information regarding the importance of these beliefs in adolescents is limited.

One of the most commonly used measures in adults to assess HLOC beliefs is the Multidimensional Health Locus of Control (MHLC) scales developed by Wallston, Wallston, & DeVellis (Wallston, 2005; Wallston et al., 1978). There are two equivalent forms of the measure (A and B) that assess three HLOC domains: Internal, Chance and Powerful Others. A third form of this measure, the Form C of the Multidimensional Health Locus of Control scales (MHLC-C), was developed to assess HLOC beliefs related to specific medical problems by replacing the word '*condition*' in each item with the medical problem of interest (Wallston et al., 1994). It contains the same number of items as the earlier forms, although the Powerful Others scale was divided into two 3-item scales, namely: Doctors and Other People scales.

The Form A and B of the MHLC scales have been used with adolescents to explore general health beliefs (Astrøm and Blay, 2002; Nada-Raja et al., 1994; Ozolins and Stenström, 2003; Stanton et al., 1995), whereas and to our knowledge, the Form-C has not been yet validated in this population. Although research on the MHLC-C scales is limited, a number of studies have examined its factor structure in samples of adults. The 4-factor solution suggested by the original authors has been supported in adult populations with a number of different conditions (e.g., rheumatic arthritis, HIV, pain) (De Las Cuevas et al., 2015; Lundgren et al., 2007; Pereira et al., 2011; Ubbiali et al., 2008). However, the findings regarding the factor structure of the MHLC-C scales are not consistent. For example, at least two studies with adults have supported a 3-factor solution in samples of adult patients with conditions such as cancer, irritable bowel syndrome or diabetes (Jomeen and Martin, 2005; Konkolÿ Thege et al., 2014). In addition, Ip and Martin (2006) found in a sample of pregnant women that neither the 4- or 3- factor solution could be supported. To date and to the best of our knowledge, researchers have not yet evaluated the factor structure and other psychometric properties of the MHLC-C scales in adolescents. Such basic research is needed in order to determine if the MHLC-C scales can be used to test hypothesized associations between HLOC beliefs and adjustment to pain in adolescents.

The principal aim of this study was therefore to evaluate the psychometric properties of the MHLC-C scales in a sample of adolescents when used to examine pain-related locus of control beliefs. Based on the available evidence from adult studies, cited previously, we hypothesized that the items of the MHLC-C scales would fit better into a 4-factor solution than in a 3-factor solution as the first alternative has been supported by more studies. In addition, we anticipated that the MHLC-C scales would evidence at least an adequate internal consistency, as indicated by Cronbach's

alphas of 0.70 or greater (Cronbach, 1990). We also hypothesized that the scales of the MHLC-C would evidence adequate criterion validity. Specifically, we hypothesized that (1) scores on the Internal scale would be positively correlated with self-efficacy and negatively associated with pain-related anxiety, and that (2) scores on Chance, Doctors and Other People scales would be negatively associated with self-efficacy scale scores and positively with pain-related anxiety. We also anticipated a positive and significant association between internal locus of control and adaptive coping strategies. Finally, we expected that a positive and significant correlation would emerge between scores of the scales referring to external locus of control (i.e., Chance, Other People and Doctors scales) with maladaptive coping strategies.

METHODS

Participants

Potential participants were adolescents aged 12 to 18 years attending to a public school. Participants were excluded if they (1) had any cognitive impairment as reported by their teachers or (2) were not able to read and understand Catalan, as the questionnaires were written in that language.

Procedures

The study protocol was approved by the principal of the participating school as well and by the Internal Review Board of the *masked information*. To recruit the study participants we first sent a letter to the parents of potential participants describing the study, and asking them if they would provide consent for their children to participate. Four-hundred and fifty-three letters were sent to parents and 381 (84%) agreed for their children to participate in the study. In addition, children were asked to provide assent prior to data collection, and all of the 381 children asked provided this. However, only

data from participants who completed all of the MHLC-C items were included in the analyses, and this occurred in 363 cases (95%) of those who provided some data.

After collecting demographic and pain-related data for descriptive purposes, all participants (both those who reported pain in the previous three months and those who did not) were requested to respond to the assessment protocol which took them about 20 minutes. Data were collected during school hours and the protocol was self-administered and anonymous.

Translation of the Form C of the Multidimensional Health Locus of Control into Catalan.

Because the research was performed in a sample of children who lived in Catalonia, we first translated the MHLC-C scales into Catalan using the back-translation procedure described by Miró (1997). That is, two psychologists fluent in English first translated the MHLC-C instructions and items into Catalan. Next, a native professional translator translated the Catalan version back into English. Finally, in the last step, the back-translated version was sent to another English native speaker to ensure if the back-translated version was equivalent to the original. No additional work or further analysis was required as both forms were found to be linguistically equivalent.

Measures

Descriptive measures

Participants were asked to provide information about their sex, age and grade level. In addition, participants were asked to report if they had experienced any significant pain somewhere in their body within the 3 months preceding the study. If so,

they were then asked to indicate the area(s) of the most frequent pain using a pain drawing used in previous studies (Goodman et al., 1997; Huguet and Miró, 2008), and whether any of them had been present for three months or more. Their responses to the pain drawing were then coded into the Axis I (pain location) of the IASP Classification of Chronic Pain (Merskey and Bogduk, 1994).

Pain-related Locus of Control

Health-related locus of control was assessed using the Form C of the Multidimensional Health Locus of Control (MHLC-C) scales (Wallston et al., 1994). As indicated previously, this measure was designed to assess people's beliefs about their ability to control health states resulting from a particular health/medical condition, in this case, pain. Thus, for the purposes of this study, the word 'condition' in each of the items was replaced by pain (e.g., "If my *pain* worsens, it is my own behavior which determines how soon I will feel better again"). The MHLC-C scale has 18 items that are distributed into four independent scales: (1) Internal (6 items), that is, the extent to which a person believes that internal factors determine his/her health condition; (2) Chance (6 items), that is, the extent to which one believes that his/her health is determined by external factors such as luck or fate; (3) Doctors (3 items) that is, the extent to which one believes that his/her health is determined by health professionals ; and (4) Other people (3 items),that is, the extent to which a person believes that his/her health is determined by others. Each item is rated on a 6-point Likert scale ranging from 1 = "Strongly disagree" to 6 = "Strongly agree", and the score from each scale is obtained by summing the rating of the items (it is not possible to calculated a total MHLC-C score). Higher scores mean higher levels of locus of control beliefs as assessed by each scale.

Pain coping strategies

Coping strategies used when adolescents are experiencing pain were examined using the Catalan version of the Pain Coping Questionnaire for children (PCQ-C) (Huguet et al., 2009) which has 36 items that are grouped in seven subscales (i.e., Information Seeking-Problem Solving, Seeking Social Support, Positive Self-Statements, Behavioral Distraction, Cognitive Distraction, Externalizing, Internalizing/Catastrophizing) and three second-order scales (Approach, Problem-Focused Avoidance, Emotion-Focused Avoidance). Participants were asked to rate how often they use each coping response on a 5-point Likert scale ranging from 1= "Never" to 5 = "Very often". Higher scores in each subscale/second-order factor indicate more frequent use of the type of strategies assessed by that scale. The psychometric properties of the Catalan version of the PCQ-C used here have been previously documented in a sample of schoolchildren (Huguet et al., 2009). The reliability of the three second-order factors in our sample was good (Cronbach's alphas = 0.89, 0.87, 0.82).

Pain-related self-efficacy

The 10-item Pain Self-Efficacy Questionnaire (PSEQ) (Nicholas, 2007) was used to examine participants' confidence in performing activities despite pain. Participants indicate how confident they are in engaging in each activity listed on 6-point scales where 0 = "Not at all confident" and 6 = "Completely confident". A total self-efficacy score is calculated by summing each item responses (scores range from 0 to 60), with higher scores reflecting stronger self-efficacy beliefs. We used the Catalan version of the PSEQ that has demonstrated adequate psychometric properties when used

with adolescents (masked information XXXX), and the reliability of the PSEQ in our sample was excellent (Cronbach's alpha = 0.91).

Pain-related anxiety

The Child Pain Anxiety Symptoms Scale (CPASS) (Pagé et al., 2010) was used to assessed pain-related anxiety. Participants are asked to rate the frequency that they have each of 20 pain-related anxiety responses on a 0 = "Never think, act or feel that way" to 5 = "Always think, act, or feel that way" scale. The CPASS can be scored into four subscales (Cognitive, Physiological Anxiety, Fear and Avoidance-Escape), and a total score (range from 0 to 100) can be also calculated with higher scores reflecting greater levels of pain-related anxiety. For the analyses of the present study we used the total score. The CPASS has shown to provide valid and reliable data in children and adolescents (Pagé et al., 2010). In this study we used the Catalan version of the CPASS that has demonstrated good psychometric properties when used with adolescents (Sánchez-Rodríguez et al., 2016). The reliability of the total score in our sample was good (Cronbach's alphas = 0.87).

Data analyses

We first examined the study variables distributions by computing skewness and kurtosis in order to ensure that the assumptions of the planned analyses were met. We also determined if the data were adequate to be factor analyzed by computing the Kaiser-Meyer-Olking test statistic (KMO) and the Bartlett's statistic using Factor 8.1 / (http://psico.fcep.urv.es/utilitats/factor/). We then conducted a Confirmatory Factor Analysis (CFA) using Mplus version 5.1 (http://www.statmodel.com/) to evaluate the 3- and 4-factor solutions of the MHLC-C items. We used the maximum likelihood (ML) as

a factor extraction method and to consider that a model had at least an acceptable fit, we determined that the Comparative Fit Index (CFI) value should be 0.90 or greater, that the Root-Mean-Square Error of Approximation (RMSEA) value should be 0.08 or lower, and that the Standardized Root Mean Residual (SRMR) should be less than 0.10 (Schweizer, 2010). The models tested were (1) the original 4-factor model proposed by Wallston et al. (1994) which has been supported by a number of studies (De Las Cuevas et al., 2015; Lundgren et al., 2007; Pereira et al., 2011; Ubbiali et al., 2008) and (2) a 3-factor model where items from the Doctors and Other People scales are included in the same scale (Jomeen and Martin, 2005; Konkolÿ Thege et al., 2014).

The successive analyses were planned to be conducted with the factor solution that reach an adequate fit according to the CFA results. Internal consistency was assessed by computing Cronbach's alphas for each of the scales resulting from the CFA. We then computed Pearson correlation coefficients to examine criterion validity of each of the scales of the questionnaire. Specifically, we computed the correlations between the MHLC-C scores and measures of self-efficacy and pain-related anxiety scores. Finally, we examined the associations between measures of health locus of control and pain-related coping strategies. Coping strategies have often been considered adaptive (e.g., information seeking, problem solving, distraction) and maladaptive (e.g., externalization and catastrophizing), according to the effects on the children and adolescents' adjustment to pain experience (Huguet et al., 2009; Lynch et al., 2007; Reid et al., 1998; Thastum et al., 2001). For the purposes of this study, we calculated two scores with the subscales included in the PCQ-C, one referring to adaptive pain coping strategies (by averaging the scores of the following PCQ-C's subscales: Information Seeking-Problem Solving, Seeking Social Support, Positive Self-Statements, Behavioral Distraction and Cognitive Distraction) and another referring to

maladaptive coping strategies (by averaging the scores of the following PCQ's subscales: Externalizing and Internalizing/Catastrophizing). We then computed the correlations between the MHLC-C Internal scale score and the resulting score from adaptive coping strategies and between each of the MHLC-C scales assessing external locus of control (i.e., Chance, Other People and Doctors) and the score from maladaptive coping strategies. These last analyses were computed using SPSS 17.0 (IBM, http://www-01.ibm.com/software/analytics/spss/).

Results

Sample Description

Participants were 363 adolescents attending to a public school in (masked information, XXX, XXX). Mean age of the participants was 14.24 years (SD = 1.58 years), and 203 (56%) were girls. Most participants (n = 299, 82%) reported that they had experienced pain in the three months prior to the assessment, with the 'lower limbs' (20%), the 'lower back' (11%) and the 'head, face, and mouth' (10%) being identified as the most frequent parts of the body where pain was present. Ninety-one of those (30%) reported that they had chronic pain (i.e., that their pain had been present for three months or more (Merskey and Bogduk, 1994).

Confirmatory Factor Analyses

Values of skewness and kurtosis showed that the distributions of the MHLC-C scales items were essentially normal. A KMO of 0.84 and a significant Bartlett's test of sphericity (χ^2 = 1741.7, *df* = 153, $p < .0001$) indicated sampling adequacy for the analyses. The CFA results indicated an inadequate fit of the 3-factor model (χ^2 = 407.75 (*df* = 132); $p < 0.001$; CFI = 0.83; RMSEA = 0.08; SRMR = 0.07), whereas the 4-factor model provided the best overall fit according with the criteria above established (χ^2 =

283.93 (*df* = 129); p < 0.001; CFI = 0.91; RMSEA = 0.06; SRMR = 0.05), with the factor loadings of each item ranging from 0.56 to 0.79 (see Table 1 for a summary of the results of the CFA for the two models). The results regarding the reliability and validity of the MHLC-C scales, described below, are based on the 4-factor solution because this solution evidenced the best fit.

[Insert Table 1 about here]

Reliability –internal consistency

The Cronbach's alphas indicated an adequate internal consistency for three of the scales (Internal = 0.72, Chance = 0.75, Doctors = 0.70) and marginal reliability for one of scales (Other People = 0.69).

Validity

As hypothesized, scores on the MHLC-C Internal scale correlated positively with scores of self-efficacy as measured by the PSEQ (r = 0.52; p < 0.01) and negatively with a measure of pain-related anxiety (r = -0.47; p < 0.01). Moreover, and consistent with the study hypotheses, scores on the Chance, Doctors and Other People scales were associated negatively with self-efficacy (r = -0.34, r = -0.42 and r = -0.38, respectively; all ps < 0.01), and positively with pain-related anxiety (rs = 0.43 [p < 0.001], 0.31 [p < 0.05] and 0.39 [p < 0.01], respectively). In addition, and also as hypothesized, Internal Locus of Control was associated positively with adaptive coping strategies (r = 0.59, p < 0.01) and the scores on the Chance, Doctors and Others People scales, assessing external locus of control, were all related positively with maladaptive coping strategies (r = 0.46, r = 0.26 and r = 0.36, respectively; all ps < .0.05).

Discussion

In this study we examined the factor structure, reliability and validity of the Form C of the Multidimensional Health Locus of Control scales (MHLC-C). Our work provides several important and unique findings about the use of the MHLC-C when used to assess pain-related locus of control beliefs in adolescents.

The results supported a 4-factor solution to the items of the MHLC-C scales. This is consistent with the factor model proposed by the authors of the original questionnaire (Wallston et al., 1994), which was subsequently replicated in samples of adults with different medical conditions (De Las Cuevas et al., 2015; Lundgren et al., 2007; Pereira et al., 2011; Ubbiali et al., 2008). The validity of the MHLC-C scales scores was supported by moderate and significant correlations with the scores on pain-related anxiety, self-efficacy and coping measures. Specifically, and as hypothesized, adolescents who believed that the control of their pain depends on internal factors showed higher levels of self-efficacy and lower levels of pain-related anxiety. Also according to the study hypotheses, adolescents who believed that their pain is controlled by external factors showed lower levels of self-efficacy and higher levels of pain-related anxiety. In addition, pain coping strategies considered to be adaptive were associated with an internal locus of control, whereas those thought to be maladaptive were associated with an external locus of control.

The findings have important clinical implications, as pain beliefs and attitudes have been suggested to be important factors in the maintenance of pain-related problems in young people (Miró et al., 2007). Available research suggests that HLOC beliefs can influence health behavior and thus can have an impact on what people do (or not do) to improve their health status (Thompson et al., 2015). For example, Farin, Gramm, &

Schmidt (2013) found external locus of control to be a risk factor for the improvement in a sample of adults with chronic low back pain who attended to a rehabilitation program. Other studies have also highlighted the locus of control beliefs as important factors that influence patient's adherence to pain treatment protocols (Keedy et al., 2014; Taddeo et al., 2008). Adolescents with a predominant internal locus of control may think that something can be done to improve their pain problems and they can be more motivated to follow recommendations from a health professional. A very different situation would be that of an adolescent who believes that his/her pain status and recovery depends on chance; believing that he/she can do nothing to help ease their pain, it is unlikely that he/she would be motivated to adhere to what the health professional suggests for him/her to do. With the availability of a measure of HLOC beliefs that has been shown to provide valid ratings in adolescents, researchers can now examine the role of these beliefs in adjustment to chronic pain in this population, including the potential modifiability of these beliefs with treatment and the impact of changes in these beliefs on subsequent function and quality of life.

The study has a number of limitations that should be considered when interpreting the results. The major limitation is that participants are from a convenience sample of generally healthy adolescents, many of whom did not have chronic pain. An important next step is to replicate these findings in other samples of adolescents with chronic pain to evaluate the generalizability of the current results to populations of youths with various chronic pain conditions. Such research will be useful to continue increasing our knowledge about the role of pain locus of control beliefs in the maintenance of pain problems in youth. Second, because of the use of a cross sectional design, we were unable to evaluate the test-retest stability of the MHLC-C scales, or their responsiveness to treatment. Further research to evaluate these additional

psychometric properties in samples of adolescents would be useful. Finally, because of the limited sample size, we were not able to evaluate how locus of control beliefs might vary as a function of age, and if age moderates the association between locus of control beliefs and various function domains. "Adolescents" comprise a large age range (i.e., 12 to 18 years) during which conceptions about pain management and attributions might evidence important changes. Research to more closely examine these potential changes is needed.

Despite the study limitations, our study supports the reliability and validity of the MHLC-C scales when used to assess pain locus of control beliefs in adolescents. Furthermore, the findings support the original 4-factor structure of the questionnaire. Its widespread use in adults, when considered in light of the data supporting its psychometric properties here, makes the MHLC-C scales a good choice for researchers who wish to evaluate the role that health locus of control beliefs play in adjustment to pain in adolescents.

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REFERENCES

Astrøm AN and Blay D (2002) Multidimensional health locus of control scales: applicability among Ghanaian adolescents. *East African medical journal* 79(3):

128–33.

Crisson JE and Keefe FJ (1988) The relationship of locus of control to pain coping strategies and psychological distress in chronic pain patients. *Pain* 35(2): 147–54.

Cronbach LJ (1990) *Essentials of psychological testing*. New York : Harper Collins.

De Las Cuevas C, Peñate W, Betancort M, et al. (2015) What do psychiatric patients believe regarding where control over their illness lies?: validation of the multidimensional health locus of control scale in psychiatric outpatient care. *The Journal of nervous and mental disease* 203(2): 81–6.

Farin E, Gramm L and Schmidt E (2013) The patient-physician relationship in patients with chronic low back pain as a predictor of outcomes after rehabilitation. *Journal of behavioral medicine* 36(3): 246–58.

French DJ, Holroyd KA, Pinell C, et al. (2000) Perceived self-efficacy and headache-related disability. *Headache* 40(8): 647–56.

Gibson SJ and Helme RD (2000) Cognitive factors and the experience of pain and suffering in older persons. *Pain* 85(3): 375–83.

Gold JI, Yetwin AK, Mahrer NE, et al. (2009) Pediatric chronic pain and health-related quality of life. *Journal of pediatric nursing* 24(2): 141–50.

Goodman JE, McGrath PJ and Forward SP (1997) Aggregation of pain complaints and pain-related disability and handicap in a community sample of families. In: Jensen TS, Turner JA, and Wiesenfeld Z (eds), *Proceedings of the World Congress in Pain, Progress in Pain and Pain Research*, Seattle, WA: IASP Press, pp. 673–682.

Härkäpää K, Järvikoski A, Mellin G, et al. (1991) Health locus of control beliefs and psychological distress as predictors for treatment outcome in low-back pain patients: results of a 3-month follow-up of a controlled intervention study. *Pain* 46(1): 35–41.

Hudzinski LG and Levenson H (1985) Biofeedback behavioral treatment of headache with locus of control pain analysis: a 20-month retrospective study. *Headache* 25(7): 380–6.

Huguet A and Miró J (2008) The severity of chronic pediatric pain: an epidemiological study. *The Journal of Pain* 9(3): 226–236.

Huguet A, Miró J and Nieto R (2009) The factor structure and factorial invariance of the Pain-Coping Questionnaire across age: evidence from community-based samples of children and adults. *European journal of pain* 13(8): 879–89.

Huguet A, Eccleston C, Miro J, et al. (2009) Young people making sense of pain: cognitive appraisal, function, and pain in 8-16 year old children. *European journal of pain* 13(7): 751–759.

Ip WY and Martin CR (2006) The Chinese version of the multidimensional health locus of control scale form C in pregnancy. *Journal of psychosomatic research* 61(6): 821–7.

Jomeen J and Martin CR (2005) A psychometric evaluation of form C of the Multi-dimensional Health Locus of Control (MHLC-C) Scale during early pregnancy. *Psychology, Health & Medicine* 10(2): 202–214.

Keedy NH, Keffala VJ, Altmaier EM, et al. (2014) Health locus of control and self-efficacy predict back pain rehabilitation outcomes. *The Iowa orthopaedic journal* 34: 158–65.

King S, Chambers CT, Huguet A, et al. (2011) The epidemiology of chronic pain in children and adolescents revisited: A systematic review. *Pain* 152(12): 2729–2738.

Konkolÿ Thege B, Rafael B and Rohánszky M (2014) Psychometric properties of the multidimensional health locus of control scale form C in a non-Western culture. *PloS one* 9(9): e107108.

Lundgren S, Eurenius E, Olausson Å, et al. (2007) The Swedish version of the Multidimensional Health Locus of Control scales, form C. Aspects of reliability and validity in patients with rheumatoid arthritis. *Advances in Physiotherapy* 9(1): 16–22.

Lynch AM, Kashikar-Zuck S, Goldschneider KR, et al. (2007) Sex and age differences in coping styles among children with chronic pain. *Journal of pain and symptom management* 33(2): 208–16.

Merskey H and Bogduk N (eds) (1994) *Classification of chronic pain : descriptions of chronic pain syndromes and definitions of pain terms*. Seattle : IASP Press.

Miró J (1997) Translation, validation, and adaptation of an instrument to assess the information-seeking style of coping with stress: the Spanish version of the Miller Behavioral Style Scale. *Personality and Individual Differences* 23(5): 909–912.

Miró J, Huguet A and Nieto R (2007) Predictive factors of chronic pediatric pain and disability: a Delphi poll. *The journal of pain* 8(10): 774–92.

Nada-Raja S, McGee R and Williams S (1994) Health beliefs among New Zealand adolescents. *Journal of paediatrics and child health* 30(6): 523–9.

Nicholas MK (2007) The pain self-efficacy questionnaire: Taking pain into account. *European journal of pain* 11(2): 153–63.

Nicholson RA, Houle TT, Rhudy JL, et al. (2007) Psychological risk factors in headache. *Headache* 47(3): 413–26.

Ozolins AR and Stenström U (2003) Validation of health locus of control patterns in Swedish adolescents. *Adolescence* 38(152): 651–7.

Pagé MG, Fuss S, Martin AL, et al. (2010) Development and preliminary validation of the Child Pain Anxiety Symptoms Scale in a community sample. *Journal of pediatric psychology* 35(10): 1071–82.

Pereira LS, Araújo LG, Sampaio RF, et al. (2011) Factorial analysis of the Multidimensional Health Locus of Control Scale--Form C for elderly. *Revista brasileira de fisioterapia* 15(5): 363–70.

Reid GJ, Gilbert C and McGrath PJ (1998) The Pain Coping Questionnaire: preliminary validation. *Pain* 73(1-2): 83–96.

Sánchez-Rodríguez E, Tomé-Pires C, Castarlenas E, et al. (2016) Assessing Pain Anxiety in Adolescents: Further Evidence for the Utility of the Child Pain Anxiety Symptoms Scale. *The Clinical journal of pain*.

Schweizer K (2010) Some Guidelines Concerning the Modeling of Traits and Abilities in Test Construction. *European Journal of Psychological Assessment* 26(1): 1–2.

Shuster J, McCormack J, Pillai Riddell R, et al. (2009) Understanding the psychosocial profile of women with fibromyalgia syndrome. *Pain research & management* 14(3): 239–45.

Stanton WR, Nada Raja S and Langley J (1995) Stability in the structure of health locus of control among adolescents. *The British journal of clinical psychology* 34 (Pt 2): 279–87.

Stinson J, Yamada J, Dickson A, et al. (2008) Review of systematic reviews on acute procedural pain in children in the hospital setting. *Pain research & management* 13(1): 51–7.

Taddeo D, Egedy M and Frappier J-Y (2008) Adherence to treatment in adolescents. *Paediatrics & child health* 13(1): 19–24.

Thastum M, Zachariae R and Herlin T (2001) Pain experience and pain coping strategies in children with juvenile idiopathic arthritis. *The Journal of rheumatology* 28(5): 1091–8.

Thompson E, Broadbent J, Bertino MD, et al. (2015) Do Pain-related Beliefs Influence

Treatment adherence? A Systematic Review. *The Clinical journal of pain*. Epub ahead of print 23 Mar 2015. DOI: 10.1097/AJP.0000000000000235

Ubbiali A, Donati D, Chiorri C, et al. (2008) The usefulness of the Multidimensional Health Locus of Control Form C (MHLC-C) for HIV+ subjects: an Italian study. *AIDS care* 20(4): 495–502.

Wallston KA (2005) The validity of the multidimensional health locus of control scales. *Journal of health psychology* 10(5): 623–31.

Wallston KA and Wallston BS (1982) Who is responsible for your health: The construct of health locus of control. In: Sanders GS and Suls JM (eds), *Social psychology of health and illness*, Hillsdale, N.J. : L. Erlbaum Associates, pp. 65–96.

Wallston KA, Wallston BS and DeVellis R (1978) Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Education & Behavior* 6(1): 160–170.

Wallston KA, Stein MJ and Smith CA (1994) Form C of the MHLC scales: a condition-specific measure of locus of control. *Journal of personality assessment* 63(3): 534–53.

Table 1. *Results of the Confirmatory Factor Analysis for the 3-factor model and the 4-factor model.*

3-FACTOR MODEL	**4-FACTOR MODEL**
Goodness of fit indices	**Goodness of fit indices**

χ^2 = 407.75 (df = 132; p < 0.001) CFI = 0.83 RMSEA = 0.08 SRMR = 0.07	χ2 = 383.93 (df = 129; p < 0.001) CFI = 0.91 RMSEA = 0.06 SRMR = 0.05
Factor loadings *Internal scale* Item 1 0.56 Item 6 0.67 Item 8 0.71 Item 12 0.63 Item 13 0.69 Item 17 0.65 Chance scale Item 2 0.64 Item 4 0.63 Item 9 0.78 Item 11 0.75 Item 15 0.60 Item 16 0.71 Doctors/Other people scale Item 3 0.51 Item 5 0.56 Item 14 0.59 Item 7 0.60 Item 10 0.52 Item 18 0.51	**Factor loadings** Internal scale Item 1 0.56 Item 6 0.67 Item 8 0.71 Item 12 0.63 Item 13 0.69 Item 17 0.65 Chance scale Item 2 0.64 Item 4 0.63 Item 9 0.79 Item 11 0.76 Item 15 0.60 Item 16 0.72 Doctors scale Item 3 0.57 Item 5 0.70 Item 14 0.71 Other people scale Item 7 0.70 Item 10 0.64 Item 18 0.58

Table 2. Criterion validity of the MHLC-C scales

Measures	Pearson correlation
Internal scale – self-efficacy	r = 0.52**
Internal scale – pain-related anxiety	r = -0.47**
Internal scale – adaptive coping strategies	r = 0.59**
Chance scale – self-efficacy	r = -0.34**
Chance scale – pain-related anxiety	r = 0.43***
Chance scale – maladaptive coping strategies	r = 0.46*
Doctors scale – self-efficacy	r = -0.42**
Doctors scale – pain-related anxiety	r = 0.31*
Doctors scale – maladaptive coping strategies	r = 0.26*
Other people scale – self-efficacy	r = -0.38**
Other people scale – pain-related anxiety	r = 0.39**
Other people scale – maladaptive coping strategies	r = 0.36*

*p < 0.05
**p < 0.01
***p<0.001