

Title:

A shortened version of the Headache-Specific Locus of Control Scale in Spanish population

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Conflict:

No conflict.

Key Words:

Headache; locus of control; psychological assessment; Confirmatory Factor Analysis; Headache Specific Locus of Control Scale (HSLC); Headache Specific Locus of Control Scale-Short Form 9 (HSLC-SF9).

Financial support:

No financial support.

Abbreviations:

LOC: locus of control.

LOC-I: internal locus of control.

LOC-E: external locus of control.

LOC-P: powerful others locus of control.

LOC-C: chance locus of control.

HSLC: Headache Specific Locus of Control Scale.

HSLC-SF9: Headache Specific Locus of Control Scale-Short Form 9.

SOC: Spheres of Control Scale.

WLCS: Work Locus of Control Scale.

DBS: Dieting Beliefs Scale.

VLCS: Vocational Locus of Control Scale.

MHLC: Multidimensional Health Locus of Control.

PLOC: Pain Locus of Control.

MLPC: Multidimensional Pain Locus of Control.

IHS: International Headache Society

ICHD-2: International Classification of Headache Disorders-2.

INTRP: Inventory of Negative Thoughts in Response to Pain.

ASSQ: Anxious Self-statements Questionnaire.

ATQ: Automatic Thoughts Questionnaire.

PBQ: Pain Behavior Questionnaire.

CSQ: Coping Strategies Questionnaire.

HSES: Headache Self-efficacy Scale.

CFA: Confirmatory Factor Analysis.

LISREL: Linear Structural Relations.

RMSEA: Root Mean Square Error of Approximation.

t: Student's t-test.

ANOVA: Analysis of Variance.

SPSS: Statistical Package for the Social Sciences.

M: Mean.

SD: Standard Deviation.

Acknowledgments:

The present work could not have been completed without the disinterested collaboration of both healthcare professionals and patients from public healthcare centers, which is result of an agreement for scientific-technical cooperation between the University of Seville and the Seville Southern District of Primary Healthcare. I would also like to thank Kenneth Holroyd and Betsy Tseng for their important help in reviewing the manuscript.

Abstract

Background and objective: Further questions need to be addressed in the evaluation of locus of control in headaches, such as reducing scale length and adapting them to diverse cultural environments, as in the case of Spain.

Method: We perform a confirmatory factor analysis of the most outstanding items contained in the Headache Specific Locus of Control Scale in the responses of 118 patients suffering from headaches who received assistance at public healthcare centers in the province of Seville (Spain).

Results: The adjustment was positive, thus confirming the original structure of three factors: internal locus of control, healthcare professionals' locus of control and chance locus of control. Scale validation was performed by examining associations both with headache clinical parameters and psychological measures. The latter included self-efficacy, internal language, coping strategies and pain behaviors. LOC-C results deserve special mention, supporting the idea that it seems more important to avoid that patients develop LOC-C rather than boosting LOC-I and LOC-P expectations.

Conclusions: The so-called Headache-Specific Locus of Control Scale-Short Form 9 has turned out to be a parsimonious (9 items), valid and reliable measure of headache locus of control.

Introduction

Stress meanings are actively constructed during processes of event observation and management.¹

² One of the constructs most relevant to understanding the observation process is *locus of control* (LOC), which refers to a person's belief that they can control events. It was developed as part of Social Learning Theory as an individual cognitive difference.³ Rotter³ conceived LOC as one-dimensional and general: one-dimensional since people who believe that they have a greater degree of control over events are internals (LOC-I), as opposed to externals (LOC-E); these are general definitions since they are applicable to different situations and vital contexts. Based on events like these, Rotter developed the I-E scale, composed of 23 items of bipolar response to measure internal or external focuses.

Although subsequent research has broadly confirmed the usefulness of this scale, it has also disputed the way in which it is characterized. On one hand, Rotter's observations of the great quantity of persons who place themselves at the centre of the internal-external continuum marked the existence of two independent dimensions.⁴ In fact, the I-E scale was revised by Levenson,⁵ who not only incorporated both internal and external factors, but also a subdivision of the latter: external factors were expanded to include the action of *powerful others* (LOC-P) as well as *chance* (LOC-C). This was the structure of his IPC scale, comprised of 24 items with a 7-point Likert scale response. On the other hand, it has been suggested for some time that LOC —rather than a general and decontextualized definition— may function as a characteristic adaptation, that is, as a contextualized process.⁶ Thus, instruments for measuring LOC within specific contexts were developed, such as the Spheres of Control Scale (SOC),⁷ the Work Locus of Control Scale (WLCS),⁸ the Dieting Beliefs Scale (DBS),⁹ and the Vocational Locus of Control Scale (VLCS).¹⁰

The first authors to use the concept of LOC within the healthcare field were Wallston, Wallston, Kaplan, Maides *et al.*,¹¹ who developed the Multidimensional Health Locus of Control (MHLC) based on the Levenson's work.⁵ MHLC currently has three forms, A, B and C.¹² Forms A and B are parallel and contain 18 items each; these items are used to evaluate the three previously mentioned LOCs. Form C was developed subsequently so as to be applied for specific disorders; its structure only differs in terms of the external factor, which is divided into doctors LOC and powerful others LOC.¹³ There is evidence that LOC is an influential variable in healthcare. To mention one example, according to the 1970 British Cohort Study, when measured every ten years, the LOC is a significant predictor of different healthcare indicators at 30 years: people with a more internal locus of control score in childhood had a reduced risk of obesity, being

overweight, rating their health as only fair or poor, and psychological distress.¹⁴

Within the field of chronic pain, the main evidence of LOC is focused on its relationship to disorder impact and treatment efficiency.

Regarding disorder impact, LOC-I has been linked to lower pain¹⁵ and disability levels¹⁶ and higher life quality¹⁷ as well as to better psychosocial-adjustment levels,¹⁸ thus making it a reliable predictor of return to a work environment.^{19, 20} LOC-I is associated with greater coping abilities²¹ and to the use of more active²² and adaptive^{23, 24} coping strategies. In contrast, LOC-C and LOC-P are associated to greater severity of pain and to pain interference in everyday life,²⁵⁻²⁷ including reduced physical activity²⁸ and medication abuse.^{29,30} Likewise, persons with predominant LOC-C are more catastrophist³¹ and even more likely to suffer from post-traumatic stress,³² while persons with predominant LOC-P make use of a higher number of behavioral coping strategies.³¹

In terms of how it relates to other treatments, low LOC-I and high LOC-P levels are found when assessing stages of therapeutic change.³³ Once interventions have been performed, LOC-I acts as a moderating variable of therapeutic effectiveness in psychological,^{34, 35} multimodal,³⁶ physiotherapeutic²² and alternative³⁷ treatments. Furthermore, LOC-I has been used as a result variable in different kinds of treatment such as bio-feedback,³⁸ self-hypnosis,³⁹ physiotherapy⁴⁰ and especially multidisciplinary⁴¹⁻⁴³ treatments.

Regarding the tools for evaluating LOC in terms of chronic pain, aside from the MHLC Form C,⁴⁴⁻⁴⁶ all specific evaluation scales published so far are based on the MHLC to some extent; these include the Pain Locus of Control (PLOC), the Multidimensional Pain Locus of Control (MLPC) and the Headache-Specific Locus of Control (HSLC).

PLOC^{36, 47, 48} is a revision of MHLC applied to pain, based on previous works by Penzien *et al.*⁴⁹ and is composed of 36 items scored with a 6-point Likert scale, 12 for each of the 3 measured factors: internal, powerful and chance. MLPC,⁵⁰ the German validation of LPC (Locus of Pain Control),⁵¹ was performed with a sample containing 170 patients suffering from chronic headaches; it was comprised of 27 items scored according to an analogous visual scale. Its factorial structure has four dimensions: internal, chance, medical and medication. HSLC⁵² is measure-derived from MHLC containing items added by experts and reformulated for headaches. Its 33 items are divided into 3 factors: internal, healthcare professionals and chance. HSLC was validated with a sample of 207 undergraduates suffering from headaches. We know of the existence of

only one LOC evaluation scale in Spain adapted for chronic pain: it was developed by Pastor *et al.*,⁵³ who adapted PLOC with a sample of 96 rheumatic patients, obtaining a different factor structure that included internal LOC, chance LOC, healthcare-professionals LOC and destination LOC.

During research on psychological variables involved in headaches and chronic pain,⁵⁴ we had the need to measure LOC. We considered the alternatives proposed in the previous paragraph and decided to develop our own method for validation, given that the methods had not been adapted to Spain or had been developed with a reduced number of samples and/or were too specific and/or had been validated with non-clinical populations. In addition, although these scales do not have an excessive number of items, they are ultimately excessive for a population such as patients suffering from headaches, especially if—as is frequently the case—they are applied with other tests. This is a usual observation in clinical practice. In fact, the International Association for the Study of Pain considers it in the core curriculum for professional education in pain in the chapter *Pain Measurement in Humans*.⁵⁵ Therefore, the objective of the present work was to validate HSLC with a wide sample of patients suffering from headaches, especially to confirm the factors included in its structure, reducing its number of items in order to improve its clinical applicability.

Method

Sample and Procedure

The sample was comprised of 118 patients recruited in two public healthcare centers in the province of Seville (Spain). There were existing scientific-technical cooperation agreements with the different healthcare districts involved and the center selection was aimed at guaranteeing the participation of patients from urban, suburban and rural areas. Physicians at the centers invited all patients with any migraine or tension-type headache diagnosis to take part through an informed consent process; diagnoses were made by neurologists according to ICHD-2 criteria.⁵⁶ The study was presented as a part of their treatment process. Patients were only receiving pharmacological treatment (analgesics, antimigraine drugs, anti-anxiety drugs and/or antidepressants). Patients received no other kind of medical or psychological treatment. No pathologic screening was done and the sampling used was incidental. All individuals of age were invited to take part in the study for one month when they came to scheduled appointments with their physicians. Research was done according to universal ethic principles⁵⁷ and was approved by ethics committees in both the Southern Seville Healthcare District and the School of Psychology of the University

of Seville.

The sociodemographic and clinical information of the sample is shown on Table 1.

TABLE 1 WILL BE INSERTED HERE

Measures

To evaluate clinical headache parameters (as well as sociodemographic variables), semi-structured clinical interviews were held: chronicity (duration of the disorder in years), the duration of headache crises/episodes (hours per day), headache intensity (one a 10-point numerical scale), headache frequency (crises/events per month), headache interference (slight/moderate/acute) and the number of analgesics/antimigraine drugs taken daily.

HSLC was developed by Martin, Holroyd & Penzien⁵² to evaluate control beliefs in individuals suffering from headaches. Sixty-eight items were initially obtained, including 28 from headache therapists and 36 from the Multidimensional Health Locus of Control Scale (19 adapted items and 17 literal ones). After selection, the final number of items was 33. In response to the question "To what extent do you agree or disagree with the item-expressed belief on your headache?" the individual can rank their agreement on the following Likert scale: "1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; and 5 = Strongly agree." Exploratory factor analysis was performed using three factors. The structure obtained was consistent with that of MHLC. Each of the three factors (known as LOC-I, LOC-C and LOC-P) included 11 items. Instrument reliability was positive, with Cronbach's α of .86, .84 and .88 for each factor, respectively. The construct validity was evaluated by associating HSLC scores with different measures (depression, physical symptoms, disability, use of coping strategies, medication, preference for any particular kind of treatment and pain indicators). On one hand, LOC-C was positively correlated with high scores in depression, physical symptoms, disability, catastrophizing, intensity and headache frequency, as well as with a preference for medical treatment. On the other hand, LOC-P control was positively correlated to high physical symptoms, catastrophizing, medication, headache intensity and with a preference for medical treatment. On the contrary, LOC-I was not associated with catastrophizing, medication or headache intensity but was positively correlated with depression, physical symptoms, disability, headache frequency and with a preference for self-regulated treatment. Van de Creek & O'Donnell⁵⁸ replicated HSLC psychometric characteristics by using two samples: one contained 151 patients suffering from headaches in

a neurological clinic and the other was comprised of 192 individuals who did not need medical care for headaches. The HSLC factor structure was identical, including similar reliability coefficients. As far as we are concerned, we performed an English-Spanish translation of the scale without further difficulties.⁵⁴

We also used other instruments to evaluate variables involved in stress and the pain-management processes such as the Spanish adaptation of the Inventory of Negative Thoughts in Response to Pain (INTRP)⁵⁹ completed by Cano-García & Rodríguez-Franco,⁶⁰ with an internal consistency of .91; the Spanish adaptation of the Anxious Self-Statement Questionnaire (ASSQ)⁶¹ by Cano-García & Rodríguez-Franco,⁶² with an internal consistency of .91; the Spanish adaptation of the Automatic Thoughts Questionnaire (ATQ)⁶³ by Cano-García & Rodríguez-Franco,⁶² with an internal consistency of .97; the Spanish adaptation of the Pain Behavior Questionnaire (PBQ)⁶⁴ by Rodríguez-Franco, Cano-García & Blanco-Picabia,⁶⁵ with internal consistency indices ranging between .7 and .8; a Spanish adaptation of the Coping Strategies Questionnaire (CSQ)⁶⁶ by Rodríguez-Franco, Cano-García & Blanco-Picabia⁶⁷ with internal consistency indices ranging between .68 and .89, and finally, the Spanish adaptation of the Headache Self-Efficacy Scale (HSES)⁶⁸ by Cano-García,⁵⁴ with an internal consistency of .94. The INTRP measures negative automatic thoughts; the ASSQ measures anxious self-verbalizations; the ATQ evaluates depressive self-verbalizations; the PBQ measures pain behaviors, especially verbal and non-verbal complaints, stimuli and activity avoidance; the CSQ evaluates coping strategies, especially with regards to catastrophizing, distracting behaviors, ignoring pain, reinterpreting pain, coping self-statements, hope, faith and prayers, and cognitive distraction, and finally, the HSES measures expectations of perceived self-efficacy.

Data Analysis

A first-order confirmatory factor analysis (CFA) with three indicators for each factor was used to prove the HSLC factor structure. The selected items were those with greater weight (between .79 and .80) in the structure proposed by Martin *et al.*⁵² (see Table 2). The proposed model was estimated by using the LISREL 8.71 software application.

We used maximum likelihood as the estimation method.⁶⁹ Factor variance was fixed at unity. Error terms associated to each indicator and other factorial weights were used as free parameters in the model. Factor covariance was not allowed in the confirmatory factor analysis.

TABLE 2 WILL BE INSERTED HERE

The adequacy of the proposed model in terms of the matrix of observed variances-covariances was evaluated using the chi-square goodness of fit test and the index of Root Mean Square Error of Approximation (RMSEA). Chi-square values with $p > .05$ and RMSEA values $\leq .08$ were considered acceptable.⁷⁰ Apart from the goodness of fit in the whole model, we examined the significance of standardized factorial weights using the student's *t*-test. Absolute *t* values over 2 were considered appropriate.⁷¹

In order to characterize the scores in the scale, means and standard deviations were used. In order to ascertain its construct validity, we used Pearson's correlation coefficient *r* and one-way ANOVA with headache measures, disability, negative internal language, perceived self-efficacy, the use of coping strategies and pain behaviors. Software application SPSS version 16 was used in both cases.

Results

Table 3 shows the correlation matrix and descriptive statistics of the nine items used. Besides the expected inter-correlations, item 11 (LOC-I) was associated to items 8 and 16 (LOC-P).

TABLE 3 WILL BE INSERTED HERE

Figure 1 shows standardized path coefficients for the first-order factor-analysis model including correlations among factors.

FIGURE 1 WILL BE INSERTED HERE

The model adjustment was good: $\chi^2 = 46.02$ ($df = 27$, $p = .013$); RMSEA = .078. All estimated factorial weights were statistically significant for a $p < .05$ significance level. Scores for each factor were calculated as the sum of their items. The average score of LOC-P was 9.98 (DT = 2.65), while that of LOC-I was 10.7 (DT = 2.52) and that of LOC-C was 8.55 (DT = 2.69).

Table 4 presents the validity indicators for each factor. Firstly, major correlations can be observed between the three LOCs with the same factors in the full scale. Then, it is important to note the existence of statistically significant associations with almost all variables (both clinical and psychological). LOC-C shows a greater amount and intensity in associations. In addition, it is linked to a greater impact of the disorder: LOC-C is associated to more negative internal language, a lower perception of self-efficacy, a less frequent use of adaptive coping strategies, a greater use of disadaptive coping strategies and a greater frequency of pain behaviors. The average score for LOC-C was greater

among patients with severe disability, although not in a statistically significant manner. LOC-I is linked to negative inner language and non-verbal complaints. LOC-P associations appear with medication and passive coping strategies.

TABLE 4 WILL BE INSERTED HERE

Discussion

The purpose of the present study was to obtain a brief, valid and reliable measure of headache-specific locus of control in Spanish patients suffering from headaches, and therefore, we opted to confirm the HSLC factor structure through CFA.

The adjustment data in the confirmatory factor model were good. According to our study, the included items corresponded to their respective factors, as it had occurred in both the original study⁵² and in the validation study.⁵⁸ The same also occurred during the development of MHLC.¹³ We could not find any references in previous studies to correlations between items from LOC-I and from LOC-P. However, positive correlations between factors LOC-I and LOC-P factors were found in the development of MHLC-Form C¹³ and in the Spanish validation of this scale.⁵³ This may be due to the setting of these studies i.e. healthcare centers. Patients seeking treatment might be characterized as “believers in control”: they displayed high LOC-I, LOC-P and low LOC-C.⁷²

The validity of the confirmed factors was based on their associations with both sensory parameters of headaches and variables related to relevant psychological processes inherent to headache experience. None of the reviewed studies included as many measures as ours.

Regarding the first kind of indicators, our results agreed with those obtained in other studies with respect to greater disorder-impact associated with higher LOC-C scores,^{13, 52, 53} unlike it happens —although to a lower extent— with LOC-P, of which there is also certain evidence^{13, 52}.

Regarding the second kind of indicators, LOC-C was linked to psychological-distress indicators such as negative internal language, a minimal perception of self-efficacy, disadaptive coping strategies and pain behaviors. Similar results were found with LOC-P and LOC-I, although with associations of considerably lower intensity. Both results concur with evidence obtained in the cited works.^{13, 52, 53}

Under clinical perspective, our results support the idea that it is more important to keep patients from developing LOC-C rather than boosting LOC-I and LOC-P expectations. According to that supported by

Seville & Robinson,⁷³ the data on LOC do not allow for further conclusions; of course, no simple interpretations can be made, but rather—as emphasized by Buckelew *et al.*⁴⁵—interpretations must take into account the scores of the three LOC factors in each case of a headache. As noted above, Wallston & Wallston⁷² found eight patterns of health locus of control based on whether an individual is relatively high or low in terms of each of the three dimensions. Apart from the “believers in control,” there are three pure patterns (“pure internal”, “pure powerful others”, “pure chance external”); each consists of patients who endorse one of the three dimensions. Two patterns are “yea-sayers” and “nay-sayers” i.e. people who indiscriminately agree or do not agree with the items. One pattern, the “double external” reflects disagreement with LOC-I statements. Finally, a high pattern of LOC-I, LOC-C and a low pattern of LOC-P is theoretically possible but probably does not exist. Unfortunately this research line has not much continuity. We believe that this research line—that of LOC patterns—may improve our knowledge on how this expectation influences psychological adjustment to chronic pain. Our own data may be appropriate for this purpose.

One of the main limitations of the study stems from the incidental sampling, which does not allow for a randomization of individuals. In our case, for instance, all individuals had consulted healthcare professionals for their headache problems. However, there is evidence, for instance, that 62% of migraines remain undiagnosed.⁷⁴ On the other hand, due to limited funding for the study, it was not possible to perform psychopathological screening, which at least would have allowed us to control this variable, which potentially influences LOC. Finally, with a larger and more representative sample, it would have been possible to conduct the analysis of LOC patterns described above.

To conclude, HSLC-SF9 obtained by CFA on HSLC items has been proven as a parsimonious, reliable and valid measure to evaluate LOC in patients suffering from headaches.

References

1. Lazarus RS. *Psychological stress and the coping process*. New York: McGraw Hill; 1966.
2. Lazarus RS. *Stress and emotion. A new synthesis*. New York: Springer; 1999.
3. Rotter JB. *Generalized expectancies for internal versus external control of reinforcement*. *Psychological Monographs: General & Applied* 80(1) 1966, 1-28; 1966.
4. Fournier G, Jeanrie C. Locus of control: Back to basics. In. *Positive psychological assessment: A handbook of models and measures*. Washington, DC: American Psychological Association; 2003, pp. 139-154.
5. Levenson H. Activism and powerful others: Distinctions within the concept of internal-external control. *Journal of Personality Assessment*. 1974;38:377-383.
6. Mischel WH, Mischel HN. self control and the self. In: Mischel T, ed. *The self: Psychological and philosophical issues*. New York: Holt, Rinehart and Winston; 1979, pp. 31-64.
7. Paulhus DL. Sphere-specific measures of perceived control. *Journal of Personality and Social Psychology*. 1983;44:13.
8. Spector PE. Development of the Work Locus of Control Scale. *Journal of Occupational Psychology*. 1988;61:6.
9. Stotland S, Zuroff DC. A New Measure of Weight Locus of Control: The Dieting Beliefs Scale. *Journal of Personality Assessment*. 1990;54:191 - 203.
10. Fournier G, Jeanrie C. Validation of a five-level locus of control scale. *Journal of Career Assessment*. 1999;7:24.
11. Wallston BS, Wallston KA, Kaplan GD, Maides SA. Development and validation of the Health Locus of Control (HLC) Scale. *Journal of Consulting and Clinical Psychology*. 1976;44:580-585.
12. Wallston KA. Multidimensional Health Locus of Control (MHLC) Scales. In. Nashville; 2008.
13. Wallston KA, Stein MJ, Smith CA. Form C of the MHLC scales: A condition-specific measure of locus of control. *Journal of Personality Assessment*. 1994;63:534-553.
14. Gale CR, Batty G, Deary IJ. Locus of control at age 10 years and health outcomes and behaviors at age 30 years: The 1970 British Cohort Study. *Psychosomatic Medicine*. 2008;70:397-403.
15. Conant LL. Psychological variables associated with pain perceptions among individuals with chronic spinal cord injury pain. *Journal of Clinical Psychology in Medical Settings*. 1998;5:71-90.

16. Trafimow D, Trafimow J-H. Predicting back pain sufferers' intentions to exercise. *Journal of Psychology: Interdisciplinary and Applied*. 1998;132:581-592.
17. Zaharoff AD. The relationship between fibromyalgia and emotional expressivity and its influence on locus of control, ways of coping, and quality of life. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 2005;65.
18. Cheng SK, Leung F. Catastrophizing, locus of control, pain, and disability in Chinese chronic low back pain patients. *Psychology and Health*. 2000;15:721-730.
19. Haldorsen EM, Indahl A, Ursin H. Patients with low back pain not returning to work. A 12-month follow-up study. *Spine*. 1998;23:1202-1207.
20. Selander J, Marnetoft SU, Asell M. Predictors for successful vocational rehabilitation for clients with back pain problems. *Disability and Rehabilitation: An International, Multidisciplinary Journal*. 2007;29:215-220.
21. Worsham SL. The effects of perceived locus of control and dispositional optimism on chronic pain treatment outcomes. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 2005;65.
22. Harkapaa K. Relationships of psychological distress and health locus of control beliefs with the use of cognitive and behavioral coping strategies in low back pain patients. *The Clinical journal of pain*. 1991;7:275-282.
23. Fisher K, Johnston M. Emotional distress and control cognitions as mediators of the impact of chronic pain on disability. *British Journal of Health Psychology*. 1998;3:225-236.
24. Melding PS. How do older people respond to chronic pain? A review of coping with pain and illness in elders. *Pain Reviews*. 1995;2:65-75.
25. Gonzalez E. The role of negative affectivity, positive affectivity, and locus of control in the stress-coping process and the persistence of chronic headaches. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 1997;57.
26. Scharff L, Turk DC, Marcus DA. The relationship of locus of control and psychosocial-behavioral response in chronic headache. *Headache: The Journal of Head and Face Pain*. 1995;35:527-533.
27. Pastor MA, Salas E, Lopez S, Rodriguez J, Sanchez S, Pascual E. Patients' beliefs about their lack of pain control in primary fibromyalgia syndrome. *British journal of rheumatology*. 1993;32:484-489.
28. Mackenbach JP, Borsboom GJ, Nusselder WJ, Looman CW, Schrijvers CT. Determinants of levels

and changes of physical functioning in chronically ill persons: results from the GLOBE Study. *Journal of epidemiology and community health*. 2001;55:631-638.

29. Primavera JP, Kaiser RS. The relationship between locus of control, amount of pre-admission analgesic/ergot overuse, and length of stay for patients admitted for inpatient treatment of chronic headache. *Headache: The Journal of Head and Face Pain*. 1994;34:204-208.

30. Roome P, Humphrey M. Personality factors in analgesic usage. *Stress Medicine*. 1992;8:237-240.

31. Murphy JP. Partners in pain: The relationship between spousal locus-of-control and chronic pain patients' coping behavior. *Dissertation Abstracts International Section A: Humanities and Social Sciences*. 1994;55.

32. DeCarvalho LT. Predictors of posttraumatic stress disorder in chronic low back pain patients. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 2004;64.

33. Hadjistavropoulos H, Shymkiw J. Predicting Readiness to Self-manage Pain. *Clinical Journal of Pain*. 2007;23:259-266.

34. Lake AE, 3rd. Behavioral and nonpharmacologic treatments of headache. *Medical clinics of North America, The*. 2001;85:1055-1075.

35. Malinoski PT. Mediators and moderators of stress management and antidepressant treatment for chronic tension-type headache. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 2001;62.

36. Harkapaa K, Jarvikoski A, Estlander AM. Health optimism and control beliefs as predictors for treatment outcome of a multimodal back treatment program. *Psychology and Health*. 1996;12:123-134.

37. Crone KT. Predicting alternative treatment use and satisfaction in patients diagnosed with fibromyalgia. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 1999;60.

38. Corrado PE. The effect of biofeedback training on locus of control in chronic pain patients. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. 1998;58.

39. James FR, Large RG, Beale IL. Self-hypnosis in chronic pain. A multiple baseline study of five highly hypnotisable subjects. *Clinical journal of pain, The*. 1989;5:161-168.

40. Jay GW, Brunson J, Branson SJ. The effectiveness of physical therapy in the treatment of chronic daily headaches. *Headache*. 1989;29:156-162.

41. Lipchik GL, Milles K, Covington EC. The effects of multidisciplinary pain management treatment on

- locus of control and pain beliefs in chronic non-terminal pain. *Clinical journal of pain, The*. 1993;9:49-57.
42. Coughlin AM, Badura AS, Fleischer TD, Guck TP. Multidisciplinary treatment of chronic pain patients: its efficacy in changing patient locus of control. *Archives of physical medicine and rehabilitation*. 2000;81:739-740.
43. Biurrun-Unzue A, Fernandez-Cuadrado MV, Jusue-Erro G. Efectos de la aplicacion de un programa de tratamiento cognitivo-conductual en el locus de control de pacientes con dolor cronico / Effects of the application of a cognitive-behavioural treatment on locus of control in chronic pain patients. *Anales de Psiquiatria*. 2002;18:407-410.
44. Crisson JE, Keefe FJ. The relationship of locus of control to pain coping strategies and psychological distress in chronic pain patients. *Pain*. 1988;35:147-154.
45. Buckelew SP, Shutty MS, Hewett J, Landon T, et al. Health locus of control, gender differences and adjustment to persistent pain. *Pain*. 1990;42:287-294.
46. Edwards LC, Pearce SA, Turner-Stokes L, Jones A. The Pain Beliefs Questionnaire: An investigation of beliefs in the causes and consequences of pain. *Pain*. 1992;51:267-272.
47. Toomey TC, Mann JD, Abashian S, Thompson-Pope S. Relationship between perceived self-control of pain, pain description and functioning. *Pain*. 1991;45:129-133.
48. Toomey TC, Mann JD, Abashian SW, Carnrike CL, Jr., Hernandez JT. Pain locus of control scores in chronic pain patients and medical clinic patients with and without pain. *Clinical journal of pain, The*. 1993;9:242-247.
49. Penzien DB, Moseley T, Knowlton G, Slipman c, Holm JE, Curtis K. Psychometric characteristics of the Pain Locus of Control Scale. *Proceedings of the American Pain Society*. 1989;8:68.
50. ter Kuile MM, Linssen A, Spinhoven P. The development of the Multidimensional Locus of Pain Control questionnaire (MLPC): Factor structure, reliability, and validity. *Journal of Psychopathology and Behavioral Assessment*. 1993;15:387-404.
51. Engstrom D. Cognitive-behavioral therapy methods in chronic pain treatment. In: Bonica JJ, Jones LE, Benedetti C, eds. *Advances in pain research and therapy*. New York: Raven Press; 1983, pp. 829-838.
52. Martin NJ, Holroyd KA, Penzien DB. The Headache-Specific Locus of Control Scale: Adaptation to recurrent headaches. *Headache: The Journal of Head and Face Pain*. 1990;30:729-734.
53. Pastor MA, López S, Rodríguez J, Sánchez S, Salas E, Pascual E. Expectativas de control sobre la

experiencia de dolor: adaptación y análisis preliminar de locus de control de salud. *Revista de Psicología de la Salud*. 1990;2:91-111.

54. Cano-García FJ. Variables psicológicas implicadas en migraña y cefalea tensional. Un estudio comparativo con otros trastornos por dolor crónico. In. *Departamento de Personalidad, Evaluación y Tratamiento Psicológicos*. Sevilla: Universidad de Sevilla; 2007, pp. 632.

55. IASP. Pain Measurement in Humans. In: Charlton JE, ed. *Core Curriculum for Professional Education in Pain*. Seattle: IASP Press; 2005.

56. IHS. The international classification of headache disorders ICHD-2. *Cephalalgia*. 2004;24:1-160.

57. Emanuel EJ, Wendler D, Grady C. What makes clinical research ethical? *Journal of the American Medical Association*. 2000;283:2701-2711.

58. VandeCreek L, O'Donnell F. Psychometric characteristics of the Headache-Specific Locus of Control scale. *Headache: The Journal of Head and Face Pain*. 1992;32:239-241.

59. Gil KM, Williams DA, Keefe FJ, Beckham JC. The relationship of negative thoughts to pain and psychological distress. *Behavior Therapy*. 1990;21:349-362.

60. Cano-García FJ, Rodríguez-Franco L. Pensamientos automáticos negativos en el dolor crónico. *Psiquis*. 2003;24:137-145.

61. Kendall PC, Hollon SD. Anxious self-talk: Development of the Anxious Self-Statements Questionnaire (ASSQ). *Cognitive Therapy and Research*. 1989;13:81-93.

62. Cano-García FJ, Rodríguez-Franco L. Evaluación del lenguaje interno ansiógeno y depresógeno en la experiencia de dolor crónico. *Apuntes de Psicología*. 2002;20:329-346.

63. Hollon SD, Kendall PC. Cognitive self-statements in depression: Development of an automatic thoughts questionnaire. *Cognitive Therapy and Research*. 1980;4:383-395.

64. Appelbaum KA, Radnitz CL, Blanchard EB, Prins A. A global report of pain behavior in chronic headache. *Biofeedback and Self-Regulation*. 1988;13:54-55.

65. Rodríguez-Franco L, Cano-García FJ, Blanco-Picabia A. Conductas de dolor y discapacidad en migrañas y cefaleas tensionales. Adaptación española del Pain Behavior Questionnaire (PBQ) y del Headache Disability Inventory (HDI). *Análisis y Modificación de Conducta*. 2000;26:729-762.

66. Rosenstiel AK, Keefe FJ. The use of cognitive coping strategies in chronic low back pain patients: relationship to patient characteristics and current adjustment. *Pain*. 1983;17:33-44.

67. Rodríguez Franco L, Cano-García FJ, Blanco Picabia A. Assessment of chronic pain strategies. *Actas Españolas de Psiquiatría*. 2004;32:29-39.
68. Martin NJ, Holroyd KA, Rokicki LA. The Headache Self-Efficacy Scale: Adaptation to recurrent headaches. *Headache*. 1993;33:244-248.
69. Long JS. *Covariance structure models*. Beverly Hills and London: Sage Publications, Inc.; 1983.
70. Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long JS, eds. *Testing structural equation models*. Beverly Hills, CA: Sage; 1993, pp. 136-162.
71. Bollen KA. *Structural equations with latent variables*. New York: John Wiley & Sons; 1989.
72. Wallston KA, Wallston BS. Who is responsible for your health? The construct of health locus of control. In: Sanders G, Suls J, eds. *Social Psychology of Health and Illness*. NJ: Erlbaum, Hillsdale; 1982, pp. 65-95.
73. Seville JL, Robinson AB. Locus of control in the patient with chronic pain. 2000:165-179.
74. Lipton RB, Silberstein SD, Stewart WF. An update on the epidemiology of migraine. *Headache*. 1994;34:319-328.

Table 1. Sociodemographic and clinical data of the sample

Gender	Female 85.6%; male 14.4%
Age*	39 (10) [18-55]
Education	Illiterate or unfinished primary studies 21%; primary 44%; secondary 24%; university 11%
Marital status	Single 16%; married/cohabitated 82%; others 2%
Laboral status	Housewife 56%; working 26%; incapacity 3%; student 9%; unemployed 6%
Per capita income*	US\$5,162.59 (4,314.03) [531.843-US\$22,197.05]**
Diagnosis	Migraine without aura 41%; chronic tension-type headache 20%; frequent episodic tension type headache 16%; migraine with aura 11%; migraine without aura and chronic migraine 8%; probable migraine with aura 4%
Chronicity (years)*	15 (11) [1-44]
Pain duration (hours)*	28 (19) [2-72]
Frequency (days/month)*	11 (11) [1-30]
Average Intensity (0-10)*	6.7 (2)
Interference	Light 9%; moderate 67%; severe 24%
Daily analgesics/antimigraine drugs*	2.24 (2.4) [0-12]

Notes: *Mean (standard deviation) [range]. **Spanish per capita income=US\$35,331 (International Monetary Fund, 2008).

Table 2. Selected items from HSLC (English/Spanish) included in the HSLC-SF9

Number	Item	Factor	Factor loadings
16	Following the doctor's medication regimen is the best way for me not to be laid-up with a headache / La mejor forma de que no me duela la cabeza es hacer lo que me dice el medico	LOC-P	.79
17	When I drive myself too hard I get headaches / Cuando me exijo demasiado me aparece el dolor de cabeza	LOC-I	.79
30	Health professionals keep me from getting headaches / Los profesionales de la salud impiden que me duela la cabeza	LOC-P	.77
8	My headaches can be less severe if medical professionals (doctors, nurses, etc.) take proper care of me / Me puede doler menos la cabeza si me pongo en manos de los profesionales de la salud (médicos, enfermeras, etc.)	LOC-P	.76
19	By not becoming agitated or overactive I can prevent many headaches / Puedo prevenir muchos dolores de cabeza si no me disgusto ni intento hacer demasiadas cosas a la vez	LOC-I	.73
11	When I worry or ruminate about things I am more likely to have headaches / Cuando me preocupo o tengo la cabeza llena de cosas es más probable que aparezca el dolor de cabeza	LOC-I	.71
1	When I have a headache, there is nothing I can do to affect its course / Cuando me duele la cabeza no puedo hacer nada para remediarlo	LOC-C	.70
9	My headaches are beyond all control / Mi dolor de cabeza no se puede controlar	LOC-C	.70
23	I'm likely to get headaches no matter what I do / Si es probable que me duela la cabeza no puedo hacer nada por evitarlo	LOC-C	.68

Table 3. Correlation matrix and descriptive statistics of the items

	hslc1	hslc8	hslc9	hslc11	hslc16	hslc17	hslc19	hslc23	hslc30
hslc1	1								
hslc8	-.02	1							
hslc9	.53**	.04	1						
hslc11	-.01	.35**	-.07	1					
hslc16	.14	.57**	-.07	.25**	1				
hslc17	-.01	-.02	.14	.35**	-.06	1			
hslc19	.05	.04	.09	.46**	-.03	.41**	1		
hslc23	.46**	-.02	.49**	-.01	.02	-.08	-.07	1	
hslc30	-.09	.45**	-.18	.17	.54**	-.10	-.01	-.11	1
M	2.7	3.55	2.63	3.96	3.46	3.62	3.13	3.22	2.97
SD	1.19	1.07	1.08	1	1	1.06	1.17	1.03	1.10

Notes: M, mean; SD, standard deviation; *p < .05; **p < .01

Figure 1. Estimated standardized parameters in the model

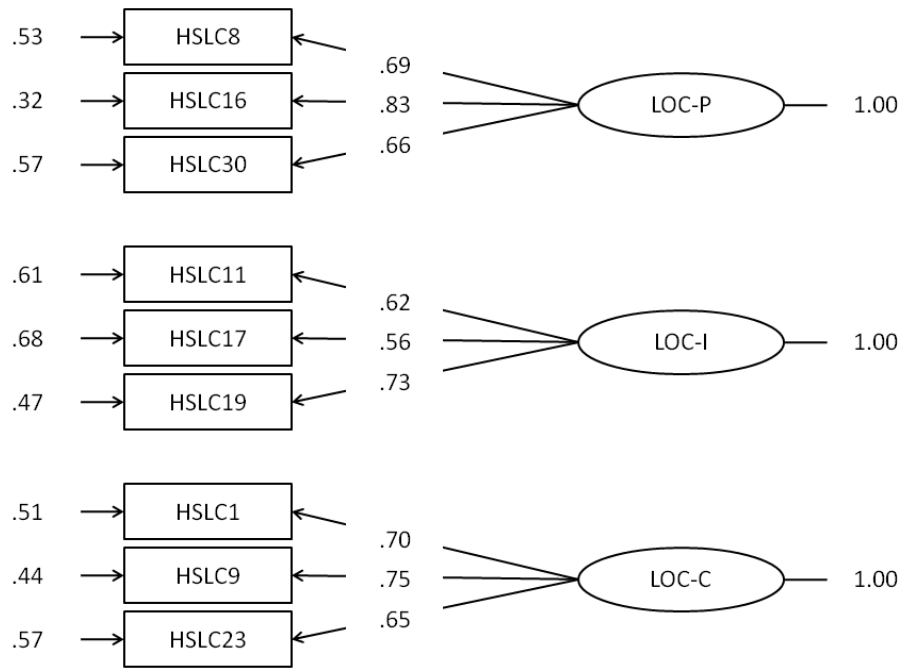


Table 4. Correlations of LOC, clinical parameters of pain and psychological variables (HSLC-SF9)

	LOC-P	LOC-I	LOC-C
<i>Pain</i>			
Frequency	-	-	-
Intensity	-	-	.29**
Medication	.19*	-	.25**
<i>Psychological variables</i>			
LOC-P (full HSLC)	.90**	-	-
LOC-I (full HSLC)	-	.88**	-
LOC-C (full HSLC)	-	-	.87**
Negative thoughts (INTRP)	-	.27**	.53**
Anxious self-statements (ASSQ)	-	.25**	.56**
Depressive self-statements (ATQ)	-	.29**	.47**
Self-efficacy (HSES)	-	-	-.30**
Catastrophizing (CSQ)	-	-	.63**
Distractor behaviors (CSQ)	-	-	-.31**
Self-instructions (CSQ)	-	-	-.43**
Ignoring the pain (CSQ)	-	-	-.43**
Reinterpreting the pain (CSQ)	-	-	-.27**
Hoping (CSQ)	.40**	-	-
Faith and praying (CSQ)	.21*	-	.18*
Cognitive distraction (CSQ)	-	-	-.27**
Adaptive coping (CSQ)	-	-	-.42**
Disadaptive coping (CSQ)	-	-	.55**
Non-verbal complaint (PBQ)	-	.22**	.33**
Verbal complaint (PBQ)	-	-	.27**
Avoid activities (PBQ)	-	-	.35**
Avoid stimuli (PBQ)	-	-	-

Notes: Pearson r; *p < .05; **p < .01