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ARTICLE

Who is in charge when I have a headache? Brazilian version of the Headache-Specific Locus of Control Scale

Quem está no comando quando tenho uma cefaleia? Versão brasileira de Escala de Lócus de Controle Específica para Cefaleia

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ABSTRACT

Background: Headache-Specific Locus of Control (LOC) refers to individuals' beliefs about their control over the onset, course and consequences of headaches. LOC beliefs have been associated with depression, coping strategies, headache-related disability and treatment outcomes. **Objective:** To test the cross-cultural adaptation and psychometric properties of a Brazilian version of the Headache-Specific Locus of Control Scale (HSLC). **Methods:** One hundred and thirty-four migraine outpatients completed the HSLC and provided measurements of psychopathological symptoms, pain catastrophizing, depression, anxiety, quality of life and headache-related disability. **Results:** The three-factor structure of the HSLC (LOC-P, LOC-C and LOC-I) was confirmed in the Brazilian sample. The instrument showed good internal consistency, with Cronbach's α of 0.77 for total HSLC and 0.70, 0.83 and 0.87, for LOC-P, LOC-C and LOC-I, respectively. LOC-C correlated with headache frequency and headache intensity. Along with headache intensity, depression and pain catastrophizing, LOC-I accounted for 45% of the variance (adjusted R^2=0.45; F=12.97; p<0.01) in headache-related disability. **Conclusions:** The Brazilian version of the HSLC is a valid and reliable measure of headache-specific LOC beliefs. It is important to consider the balance between the three LOCs for each individual, instead of interpreting them separately.

Keywords: Migraine Disorders; Validation Study; Depression; Anxiety; Catastrophization.

RESUMO

Introdução: O lócus de controle específico para a dor de cabeça (LOC) refere-se às crenças dos indivíduos acerca de seu controle sobre o início, o curso e as consequências das dores de cabeça. As crenças sobre LOC têm sido associadas à depressão, às estratégias de enfrentamento, à incapacidade relacionada às dores de cabeça e aos resultados do tratamento. **Objetivo:** Testar a adaptação transcultural e as propriedades psicométricas de uma versão brasileira da Escala de Lócus de Controle Específico para Dor de Cabeça (HSLC). **Método:** Cento e trinta e quatro pacientes ambulatoriais com enxaqueca completaram a HSLC e medidas de sintomas psicopatológicos, catastrofização da dor, depressão, ansiedade, qualidade de vida e incapacidade relacionada à dor de cabeça. **Resultados:** A estrutura de 3 fatores da HSLC (LOC-P, LOC-C e LOC-I) foi confirmada na amostra brasileira. O instrumento demonstrou boa consistência interna, com α de Cronbach de 0,77 para HSLC total e de 0,70, 0,83 e 0,87 para LOC-P, LOC-C e LOC-I, respectivamente. LOC-C correlacionou-se com a frequência e a intensidade da dor de cabeça. Acompanhado de intensidade da dor de cabeça, depressão e catastrofização da dor, o LOC-I foi responsável por 45% da variância (R^2 ajustado=0,45; F=12,97; p<0,01) na incapacidade relacionada à dor de cabeça. **Conclusões:** A versão brasileira da HSLC é uma medida válida e confiável de crenças de LOC específicas para dor de cabeça. É importante considerar o equilíbrio entre os três LOCs para cada indivíduo, em vez de interpretá-los separadamente.

Palavras-chave: Transtornos de Enxaqueca; Estudo de Validação; Depressão; Ansiedade; Catastrofização.

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INTRODUCTION

Locus of control (LOC) can be defined as a belief about the direction of control that individuals have about various events in their lives. Individuals whose locus is internal (LOC-I) believe that they can exert some influence on events through their own actions, characteristics and competencies. These individuals can draw a causal relationship between their behaviors and certain outcomes. In contrast, individuals whose locus of control is external (LOC-E) believe that outcomes from events depend on luck, fate or other individuals (powerful others), occurring independently of their own actions[1].

Health-related locus of control beliefs have been correlated with indicators of physical and mental health[2,3,4], treatment adherence[5], health-related behavior[6], return to work[7] and quality of life[8]. Several authors have pointed out that pain beliefs and coping strategies influence chronic pain and that those factors should be included among treatment targets[9]. Along with self-efficacy, locus of control is one of the cognitive factors that ought to be evaluated in all patients with chronic headache[10]. Furthermore, chance locus of control (LOC-C) is among the psychological factors associated with chronic migraine that are susceptible to modification[11]. While higher LOC-I (internal) is linked to higher overall migraine-related quality of life, higher LOC-P and LOC-C (medical professionals and chance) are associated with impairments in migraine-related quality of life[12].

Locus of control also moderates the relationship between headache pain and depression. In a study conducted by Heath, Saliba, Mahmassabi, Major and Khoury[13], 71 headache patients were evaluated to examine in detail the relationship between the severity of self-reported headache pain, depression and coping styles. The results showed that higher levels of LOC-I were associated with lower levels of depression. Also, LOC-I played a protective role in the model tested, thus reducing the strength of the relationship between pain severity and depression.

Evaluation of LOC beliefs in the context of headache was put into operation through construction of the Headache-Specific Locus of Control Scale (HSLC). In the study on the construction and validation of the HSLC[14], LOC-C was positively associated with higher levels of depression, physical complaints, catastrophizing as a strategy for coping with pain and increased disability. Moreover, LOC-P was positively associated with higher levels of drug use and preference for medical treatment and LOC-I was positively associated with a preference for self-regulation treatments, such as biofeedback and relaxation training. All of these correlations remained significant even after statistically controlling for intensity and frequency of headaches. These results support the hypothesis that adaptation to headache-related problems is influenced not only by the frequency and severity of headache episodes but also by headache-specific locus of control beliefs.

Although the literature in this field indicates that it is relevant to investigate locus of control among headache patients, there is a lack of instruments in Brazil to evaluate this construct. The goal of this study was to test the cross-cultural adaptation and psychometric properties of a Brazilian version of the HSLC on a sample of patients at three tertiary-level headache centers in Brazil.

METHODS

Sample and procedure

The sample was composed of 134 migraine patients whose diagnosis was made by experienced neurologists in accordance with the International Classification of Headache Disorders 3rd Edition – Beta version[15]. The exclusion criterion was the presence of medical conditions stated in the patients' medical records that could lead to difficulties in understanding or filling out the instruments, such as a previous diagnosis of a psychotic disorder or cognitive impairment. The participants' ages ranged from 18 to 65 years (M=43.70; SD=12.74). Participants were selected from outpatients registered at two public hospitals and one private hospital in southern Brazil. All of these headache centers are located in the city of Porto Alegre, Rio Grande do Sul, Brazil.

The participants were found through the patient lists at the three hospitals' headache clinics. The inclusion period ran from April 2016 to March 2017. The instruments were applied in a single session, on the same day as the patients' routine doctor's appointment. All the participants gave their informed consent prior to their inclusion in the study. The study received approval from each hospital's institutional review board. Table 1 shows the sociodemographic and clinical information of the sample. The HSLC was translated forward and backward using standard guidelines for cross-cultural adaptation[16,17].

Measures

A semi-structured interview was conducted to characterize the sample and to evaluate clinical headache parameters, such as duration of disorder in years (DD), patient's time under treatment (DT), headache frequency during the last three months (HF), headache intensity during the last three months (HI) and screening for a diagnosis of medication overuse headache.

Headache-Specific Locus of Control Scale

This instrument was developed by Martin, Kenneth and Penzien[14] and aims to evaluate individuals' perception that their headache is determined mainly by internal factors, such as their own behavior, or external factors, such as health-care professionals or chance (for example, hormone fluctuation or genetically inherited vulnerability). HSLC items were generated by professionals with experience in headache

Table 1. Sociodemographic and clinical data on the sample (n=134).

Factor	Distribution
Gender, n (%)	Female 119 (88.8%); male 15 (11.2%)
Age, years (SD)	44.5 (12.8)
Education, *f* (%)	Elementary=45 (33.6%); high school=47 (35%); professional=11 (8.2%); university/college=17 (12.7%); postgraduate=14 (10.5%)
Income (in current minimum monthly wages), n (%)	Up to 1 minimum wage=12 (9%); from 1 to 3=61 (45.5%); from 3 to 5=42 (31.3%); from 5 to 10=13 (9.7%); more than 10=6 (4.5%)
Labor status, n (%)	Employed=67 (50%); unemployed=67 (50%)
Marital status, n (%)	Single=34 (25.4%); married=55 (41%); living with partner=24 (17.9%); divorced=16 (11.9%); widowed=5 (3.7%)
Diagnosis, n (%)	Episodic migraine=102 (76.1%); chronic migraine=18 (13.4%); medication overuse headache=14 (10.4%)
DD (years)/DT (years)	21.78 (14.67)/10.07 (10.72)
HF/HI	27.59 (24.43)/8.17 (2.01)

Mean (standard deviation); DD: duration of disease (in years); DT: duration of treatment (in years); HF: headache frequency over the last three months in days; HI: headache intensity attributed by the participants regarding their pain over the last three months on a scale ranging from 0–10.

treatment and items from the Multidimensional Health Locus of Control scale (MHLC). After statistical procedures, the scale resulted in 33 items. The HSLC is composed of three subscales (internal, chance and healthcare professionals) with 11 items each, evaluated on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument shows good reliability, with Cronbach's alpha of 0.84, 0.86, and 0.88 for each subscale, respectively.

Self-Reporting Questionnaire

This is a questionnaire for screening of psychiatric disorders at the primary care level developed by Harding et al.[18] and validated in Brazil by Mari and Willians[19]. It is composed of 24 questions divided into two sections: 20 questions are aimed at detection of "neurotic" disorders and the remaining four questions assess "psychotic" disorders. The "neurotic" disorders comprise mood, anxiety and somatoform disorders, assessed through the SCID-IV-TR (Structured Clinical Interview for DSM-IV-TR)[20]. In the present study, only the first section (neurotic disorders) was used. By scoring 7 or more points on this subscale, individuals fulfill the criterion for a possible neurotic disturbance.

Short form Health Questionnaire

The instrument is an indicator of overall health status and has eight scaled scores: vitality (VT), physical functioning (PF), bodily pain (BP), general health perceptions (GH), physical role functioning (PR), emotional role functioning (ER), social role functioning (SF) and mental health (MH)[21,22]. The Brazilian version of the SF-36 is considered to be a reliable and valid measure of quality of life[23].

Headache Impact Test

This is a six-item questionnaire developed by Kosinski et al.[24] that is used to measure the impact of headaches on daily activities, including work, school, social activities, pain intensity, fatigue and bedtime, frustration and concentration difficulties. Each item is answered on a five-point Likert scale (6=never, 8=rarely, 10=sometimes, 11=very often and 13=always). The higher the score obtained is, the greater the degree of impact also is. Martin et al.[25] examined the psychometric properties of the HIT-6 in 11 languages and 14 countries and showed that the Portuguese version has good reliability, comparable with the original version. The instrument has good internal consistency, with Cronbach's alpha of 0.79.

Pain Catastrophizing Scale

This instrument was originally developed by Sullivan et al.[26] to assess catastrophizing as a style of negative cognition relating to pain. Catastrophizing refers to a single construct that is evaluated in three dimensions: magnification, rumination and helplessness. In Brazil, the scale was adapted and validated by Sehn et al.[27] and shows a good level of internal consistency, with Cronbach's alpha ranging from 0.86 to 0.93 among the magnification, rumination and helplessness subscales.

Patient Health Questionnaire and Generalized Anxiety Disorder 7

The PHQ-9 and GAD-7 are instruments for evaluating depression and anxiety in accordance with the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), respectively. The PHQ-9 is composed of nine items, evaluated on a four-point Likert scale (0=not at all, 1=several days, 2=more than half the days and 3=nearly every day). The total score can range from 0 to 27, and values greater than or equal to 10 are considered to be a positive indicator of major depression. The PHQ-9 is considered to be a reliable and valid measure of depression severity[28]. In Brazil, this instrument was validated by Osório et al.[29] in the context of primary healthcare. The GAD-7 was developed by Spitzeret al.[30] and validated by Löwe et al.[31]. It is composed of seven items, evaluated on a four-point Likert scale (0=not at all, 1=several days, 2=more than half the days and 3=nearly every day). The sum of the scores ranges from 0 to 21. Values greater than or equal to 10 are positive indicators of anxiety disorders. In the context of headache studies, both the PHQ-9 and the GAD-7 are considered to be reliable and valid screening instruments for major

depressive disorders and generalized anxiety disorders in patients with migraine[32,33].

Data analysis

Descriptive statistical analyses were performed on the sociodemographic and clinical data. The psychometric properties of the Brazilian version of the HSLC were analyzed using confirmatory factor analysis (CFA), internal consistency and convergent validity. In the CFA, the maximum likelihood (ML) estimation method was chosen, using the R Studio software. We used the following adjustment indices with their respective reference values: root mean square error of approximation (RMSEA≤0.05 or ≤0.08 with a 90% confidence interval) and statistical significance using the chi-square test (p≥0.05). Internal consistency was analyzed using the Cronbach's α coefficient and composite reliability[34], considering the standard factorial loads of the items. Values greater than or equal to 0.7 were considered adequate. Convergent validity was investigated by correlating HSLC scores with the Self-Reporting Questionnaire (SRQ), SF-36, Headache Impact Test (HIT-6), Pain Catastrophizing Scale (PCL), PHQ-9 and GAD-7. Additionally, multiple regression analysis was conducted to examine the relative contributions of headache frequency, headache intensity, depression, anxiety and LOC beliefs to the prediction of headache-related disability. Inferential statistics were run using Statistical Package for the Social Sciences (SPSS), version 22, adopting a 5% significance level.

RESULTS

A total of 134 patients were included. Because some patients could not fill out all instruments, the number of patients included in the computations varied from 106 to 134 for each measure. Table 1 shows the sociodemographic and clinical data for the sample. Descriptive statistics for study measures are presented in Table 2.

The three-factor structure of the HSLC (LOC-P, LOC-C and LOC-I) was confirmed through confirmatory factor analysis (CFA). The model was adjusted to the empirical data (X^2/d.f.=1.77, RMSEA=0.07 and SRMR=0.09), with factor loadings of between 0.35 and 0.72 for LOC-C; 0.55 and 0.69 for LOC-I and 0.40 to 0.63 for LOC-P. For LOC-P, item 27 ("When my doctor makes a mistake, I am the one to suffer from headaches"), item 12 ("Just seeing my doctor helps my headaches") and item 30 ("Health professionals keep me from getting headaches") exhibited lower factor loadings: 0.17, 0.23 and 0.32 respectively. Thus, the structure of the original version of the scale was retained in the Brazilian version.

Table 3 shows item correlations with the scale scores and Cronbach's α of each HSLC subscale. The Brazilian version of the HSLC showed good internal consistency, with Cronbach's α of 0.77.

Table 2. Descriptive statistics on study measures.

Measure	Mean (SD)	Range
LOC-I (n=134)	36.34 (5.97)	29
LOC-P (n=134)	35.32 (5.75)	27
LOC-C (n=134)	40.60 (7.16)	35
PHQ-9 (n=133)	10.26 (6.71)	27
GAD-7 (n=134)	10.15 (6.15)	21
PCS (n=133)	42.80 (12.12)	46
SRQ (n=133)	10.15 (4.97)	20
HIT-6 (n=133)	62 (7.99)	38
PF	62.91 (29.32)	100
PR	39.92 (42.71)	100
BP	39.40 (22.27)	90
GH	8.17 (2.01)	8
VT	12.38 (3.80)	18
SF	57.56 (28.80)	100
ER	38.06 (43.48)	100
MH	55.01 (10.88)	68

SD: standard deviation; LOC-I: internal locus of control; LOC-P: healthcare professional locus of control; LOC-C: chance locus of control; PHQ-9: Patient Health Questionnaire 9; GAD-7: Generalized Anxiety Disorder; PCS: Pain Catastrophizing Scale; HIT-6: Headache Impact Test; PF: physical functioning; PR: physical role functioning; BP: bodily pain; GH: general health perceptions; VT: vitality; SF: social role functioning; ER: emotional role functioning; MH: mental health.

Table 3. Item correlations with scale scores and Cronbach's α of Headache-Specific Locus of Control items.

HSLC subscale	Corrected item — total correlation, mean (range)	Cronbach's α
Internal	0.58 (0.50-0.68)	0.87
Healthcare professionals	0.35 (0.16-0.52)	0.70
Chance	0.50 (0.35-0.64)	0.83

HSLC: Headache-Specific Locus of Control.

Convergent validity was evaluated by correlating HSLC scores with other study measures. Table 4 depicts the correlation matrix. Several correlations between study measures and both LOC-I and LOC-P were statistically significant, such as psychopathological symptoms, depression, anxiety, pain catastrophizing, headache-related disability and SF-36 domains. Unlike the other subscales, LOC-C correlated only with headache frequency and headache intensity. All three HSLC subscales (LOC-P, LOC-I and LOC-C) showed strong and statistically significant correlations with total HSLC.

Table 5 shows the results from a multiple regression analysis that was conducted to test the contributions of headache frequency, headache intensity, psychopathological symptoms, depression, anxiety, pain catastrophizing and LOC beliefs to prediction of headache-related disability.

Table 4. Correlations between Headache-Specific Locus of Control Subscales and other studies.

	1	2	3
HSLC	0.89**	0.68**	73**
LOC-P	-		
LOC-I	0.56**	-	
LOC-C	0.51**	0.08	-
SRQ	0.42**	0.41**	0.11
Depression	0.37**	0.40**	0.05
Anxiety	0.34**	0.37**	0.19
Pain catastrophizing	0.30**	0.39**	0.02
Headache frequency	-0.09	-0.06	0.23**
Headache intensity	0.07	0.09	0.27**
HIT-6	0.26**	0.40**	0.01
SF-36 domains			
PF	-0.20*	-,33**	-0.04
PR	-0.37**	-,38**	-0.08
BP	-0.29**	-0.30**	-0.12
GH	-0.34**	-0.46**	0.02
VT	-0.34**	-0.12	-0.12
SF	-0.28**	-0.37**	-0.05
ER	-0.29**	-0.26**	-0.07
MH	-0.10	-0.23**	-0.04

*p<0.05; **p<0.01; HSLC: Headache-Specific Locus of Control scale; LOC-P: healthcare professional locus of control; LOC-I: internal locus of control; LOC-C: chance locus of control; SRQ: Self-Reporting Questionnaire; HIT-6: Headache Impact Test; PF: physical functioning; PR: physical role functioning; BP: bodily pain; GH: general health perceptions; VT: vitality; SF: social role functioning; ER: emotional role functioning role; MH: mental health.

Table 5. Regression analysis for headache-related disability (n=134).

	Beta	t	Sig
HF	0.09	1.34	0.18
HI	0.31	4.31	0.00**
SRQ	0.13	1.18	0.24
PHQ-9	0.28	2.34	0.02*
GAD-7	-0.10	-0.52	0.60
PCS	0.20	2.6	0.01*
LOC-I	0.19	2.18	0.03*
LOC-P	-0.18	-1.86	0.07
LOC-C	0.10	0.75	0.45

*p<0.05; **p<0.01. Method Enter. Durbin Watson: 2.12; HF: headache frequency; HI: headache intensity; SRQ: Self-Reporting Questionnaire; PHQ-9: Patient Health Questionnaire 9; GAD- 7: Generalized Anxiety Disorder; PCS: Pain Catastrophizing Scale; LOC-P: healthcare professional locus of control; LOC-I: internal locus of control; LOC-C: chance locus of control.

Along with headache intensity, depression and pain catastrophizing, LOC-I accounted for 45% of the variance in headache-related disability (R_2 adjusted=0.45; F=12.97; p<0.01).

DISCUSSION

The present study aimed to test the cross-cultural adaptation and psychometric properties of a Brazilian version of the HSLC on a sample of patients from three tertiary-level headache centers. In a CFA, the Brazilian version of the HSLC maintained the three-factor structure from the original instrument and showed good internal consistency, with Cronbach's α of 0.77 for the full scale and 0.70, 0.83 and 0.87 for LOC-P, LOC-C and LOC-I respectively.

LOC-I and LOC-P showed statistically significant correlations with psychopathological symptoms (SRQ), depression (PHQ-9), anxiety (GAD-7), pain catastrophizing (PCS), headache-related disability (HIT-6) and seven of the eight quality of life domains (SF-36). Unlike the other subscales, LOC-C correlated only with headache frequency and headache intensity. As in the HSLC original study[14], LOC-I scores were positively correlated with depression and headache-related disability and LOC-P scores were positively correlated with pain catastrophizing and headache-related disability. The direction and degree of those correlations were in line with the results found in validation studies on other clinical populations[35,36]. Moreover, the lack of correlations between the three LOCs and sociodemographic variables (age, education labor status, income and marital status) demonstrates the relevance of considering correlations with other psychological variables with which LOC beliefs were associated.

The current results require a return to the conceptual issues of the construct investigated in this study. "Internal believers" might feel responsible for both successes and failures that happen to them. "External believers" might attribute their successes to other people's actions or to good fortune, or also blame other people, facts or fate for their failures. In the case of headache patients, extreme internal believers may display cognitive distortions such as personalization, blame or labeling regarding their treatment or disease. Moreover, extreme external believers might become fatalistic and display psychological distress, such as depressive and anxiety symptoms associated with helplessness. Ultimately, LOC-I means engaging more frequently in actions that decrease the risk of triggering a new episode of headache, LOC-P means relying on others and on their knowledge to learn how to better manage headaches and LOC-C means accepting the impossibility of having total control over all headache triggers. The healthiest way to deal with headaches and their impact is by balancing all three LOCs. It is important to consider the balance between the three LOCs for each individual, thereby avoiding the risk of separate interpretation of LOC factors[37].

Along with headache intensity, depression and pain catastrophizing, LOC-I accounted for 45% of the variance in headache-related disability. The inclusion of the internal locus of control as a predictor of headache-related

disability reinforces the need for interventions in those beliefs. Patients need to have a sense of agency, for important risk factors for chronic migraine to be modified. These factors include overuse of acute migraine medication, ineffective acute treatment, obesity, depression and stress life events[38]. As stated previously, LOC beliefs have been considered to be a relevant psychological factor for all chronic headache patients[10].

The present study had some limitations that should be mentioned. All the patients in the study were treated in tertiary-level healthcare centers and came from the southern region of Brazil. Future studies on patients in different regions in Brazil and on people who are not under routine treatment could provide further evidence of validity for the HSLC and decrease the selection bias of the sample.

The Brazilian version of the HSLC was considered to be a valid and reliable measure of headache-specific LOC beliefs. The instrument showed good internal consistency, was significantly correlated with a variety of relevant clinical measures and was considered to be a significant predictor of headache-related disability.

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