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Original Research

Type of health locus of control predicting pain, function, and global perceived effect in patients with chronic low back pain receiving active versus passive interventions: an observational study

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ABSTRACT

Introduction: Chronic nonspecific low back pain (CNLBP) is the leading cause of disability worldwide. The health locus of control (HLC) refers to the individual's perception of control over their health, which can be internal (personal control), external (control attributed to others), or chance (determined by luck, fate, or chance).
Objective: To investigate whether the HLC predicts pain, functional ability, and global perceived effect in patients with CNLBP treated with active versus passive interventions.
Methods: Longitudinal observational study following two different treatments groups delivered by physical therapists: active group (exercise-based intervention) and passive group (manual therapy-based intervention). The HLC was assessed with the Multidimensional Health Locus of Control Scale (MHLCS), pain with the Pain Numerical Rating Scale (PNRS), functional ability with the Patient-Specific Functional Scale (PSFS), and global perceived effect by the Global Perceived Effect Scale (GPES). The relationship between the types of HLC at baseline and after the intervention was analyzed by the Chi-square test, and the prediction of outcomes by linear regression ($p < 0.05$).
Results: Fifty-eight individuals participated, with a mean age of 51.2 (5.6) years. There was no impact of baseline HLC on pain, functional ability, or global perceived effect ($p > 0.05$), and there were no significant changes in HLC at the endpoint of observation ($p = 0.75$).
Conclusion: HLC was not a predictor for the evaluated outcomes, with no significant changes between baseline and the endpoint of observation.

Introduction

Low back pain is the leading cause of disability worldwide and continues to grow as the population ages.[1,2] Chronic nonspecific low back pain (CNLBP) occurs between the lower margins of the ribs and gluteal folds, lasting for 3 months or more, when the cause of the pain is undetermined.[1,2] CNLBP is linked to emotional distress and/or functional disability, so the biopsychosocial model is recommended to guide clinical decisions, considering the associations between behavioral, psychological, and social factors.[1,3,4]

Among the biopsychosocial factors often studied in patients with CNLBP is the health locus of control (HLC). This construct relates to how individuals perceive their health and influences their coping strategies.[5,6] HLC can be classified into three types: internal locus, external locus, and chance locus. Those with an internal HLC believe control depends on themselves, viewing their health condition as a result of their behavior; external HLC individuals attribute control to others; and those with chance HLC believe health depends on chance.[6,7] Individuals with external HLC tend to have worse prognoses, potentially perpetuating their pain, while those with internal HLC experience less negative impact from chronic pain and better outcomes.[5,7,8] HLC may be an important predictor of treatment success for patients with CNLBP.[5]

Several treatments are recommended for CNLBP, including health education, physical exercise, traditional Chinese medicine, spinal

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1413-3555/© 2025 Associação Brasileira de Pesquisa e Pós-Graduação em Fisioterapia. Published by Elsevier España, S.L.U. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

manipulation, ultrasound, electrical stimulation, cognitive therapies, and drugs. However, current guidelines suggest prioritizing active treatments over passive ones, with a focus on non-pharmacological interventions as the first line.[9,10] Manual Therapy (joint manipulation) and physical therapy (physical training, multimodal exercises, specific muscle activation, aerobic exercises, aquatic exercises, and general exercises) are classified as Concept A - Strong recommendations.[11]

The primary objective of this study was to determine whether HLC predicts changes in pain intensity, functional ability, or global perceived effect in CNLBP patients receiving active (exercise based) versus passive (manual therapy based) interventions. The secondary objective was to identify if a specific HLC type was predominant in either treatment group and whether HLC changed at the endpoint of observation. The hypothesis is that the internal HLC predicts reduced pain, improved function, and better global perceived effect compared to external and chance HLC. Additionally, it is expected that HLC will change after treatment, with internal HLC being more common in the active group, given its active intervention nature, and external and chance HLC being more common in the passive group, due to its passive intervention approach.

Methods

Study design

This is a longitudinal observational study. Participants were observed in two different treatment groups: active group, care focusing on exercises, representing an active approach to treatment, and passive group, care focusing on manual therapy techniques, representing a passive approach to treatment. Allocation to groups was based on participants' spontaneous demand at the clinic schools where the interventions were provided, rather than random assignment by the researchers. They were observed at two time points: at the beginning of treatment, corresponding to baseline, and at discharge, or after three months of intervention if the participant was not discharged from physical therapy by this period, defined as the endpoint. The study did not aim to compare interventions, but to observe the impact of HLC in each group, before and at the endpoint of observation. The Strengthening the Reporting of Observational Studies in Epidemiology – STROBE was used to describe the methodology and report the findings of this study.[12]

Setting

Volunteers were recruited between April and December 2023, at the physical therapy school clinic and chiropractic school clinic of ASCE United Colleges, at the Amarina Motta School Clinic of the Augusto Motta University Center, and at the Institute of Chiropractic and Posturology, institutions located in the city of Rio de Janeiro, RJ, Brazil. The project was approved by the Human Research Ethics Committee of the Augusto Motta University Center (CAAE 67,292,323.1.0000.5235).

Population

Participants with CNLBP, located between the margins of the last ribs and the gluteal fold, which persists for three months or more and without a defined cause, of both sexes, aged 18 years or older, and who were able to understand Portuguese well enough to be able to complete the questionnaires, were recruited. Individuals with rheumatological, neurological, psychological, systemic inflammatory diseases, osteoporosis, and self-reported structural deformities, history of cancer, recent abdominal or spinal surgery (regardless of time), and recent fractures or violent trauma were excluded.

Measurement procedures and instruments

The principal investigator approached potential participants seeking physical therapy and chiropractic care at the school clinic during the assessment. The sample was selected by convenience, meaning participants came to the clinic on their own initiative, without specific recruitment. Participants who they met the selection criteria were invited to participate in the study. After verbal acceptance, they signed an Informed Consent Form and were informed about the study's development.

Participants in the active group were treated by physical therapists with expertise in primary care and trauma-orthopedics. Participants in the passive group received interventions from physical therapists with expertise in chiropractic practice.

Outcome measures

The assessment at the beginning of treatment serves as the baseline for data and variables analyzed throughout the research. This moment marked the first contact between the researcher and participant, during which sociodemographic data were collected, and printed questionnaires and scales were provided for self-completion, under the main researcher's guidance.

The Multidimensional Health Locus of Control Scale (MHLCS)[6,13] was used to verify the type of HLC (internal, chance, or external). It consists of a questionnaire with 18 questions, each with a score from 1 to 6, being: 1) I strongly disagree, 2) I moderately disagree, 3) I slightly disagree, 4) I slightly agree, 5) I moderately agree, and 6) I strongly agree, and the score of this questionnaire is determined by the sum of the scores of each subscale. The Pain Numerical Rating Scale (PNRS)[14] was used to assess pain intensity, and consists of a ruler divided into 11 equal parts, from 0 to 10, which the participant equates according to their pain, where 0 indicates "no pain" and 10 "unbearable pain". The Patient-Specific Functional Scale (PSFS)[14] was used to assess the participant's level of functional ability, consisting of 3 spaces for the participant to identify up to three important activities they have difficulty with or cannot perform due to CNLBP. The participant evaluates their current ability for each activity on an 11-point scale, with 0 being "unable to perform" and 10 "performing at pre-injury level". The score is the arithmetic mean of the points assigned by the participant.

At the time of discharge from physical therapy or after three months of treatment, the researcher asked the participant to fill out the MHLCS, the PNRS, and the PSFS again, as well as the Global Perceived Effect Scale (GPES)[14] to assess the participant's global perceived effect, which consists of an 11-point Likert scale ranging from −5 to 5. A negative score indicates that the participant's condition is worse than it was at the beginning, while a positive score indicates that the participant is better. In both meetings, participants had the time needed to complete the questionnaires, and the main researcher was available to clarify any doubts.

Data analysis

The G*Power 3.1.9.7 program was used to calculate the sample size. Two sample calculations (Multivariate Linear Regression and Logistic Regression) were performed based on the study objectives, with the largest sample size being considered as the sample size. A probability of error level α of 0.05 and a statistical power of 80 % (error probability 1β) were adopted as parameters, resulting in a total of 54 participants. Considering a possible sample loss, 10 % was added to the initial number, resulting in a total of 60 participants, with 30 participants per group.

A descriptive analysis was performed, presenting the results as mean ± SD and frequency (%) for numerical and categorical variables, respectively. To determine whether the type of HLC serves as a predictor of improvements in the primary outcomes within each follow-up group, a predictive analysis was conducted using linear regression. To evaluate the distribution of HLC types at baseline and after the treatment within each treatment group, the Chi-square test was used. This analysis aimed

to compare the overall frequencies of HLC types at each time point, rather than assess individual transitions. Differences between the means of the primary outcomes (pain intensity and functional ability) at baseline and the endpoint of observation were analyzed with the paired-sample *t*-test, and the secondary outcome (global perceived effect) was analyzed with the independent-sample *t*-test at the endpoint of observation. A significance level of 95 % ($p < 0.05$) was considered. All analyses were performed using JASP (version 0.16.2.0).

Results

Sixty participants were initially evaluated at baseline. However, two participants (one from each group: active and passive) discontinued treatment, and the endpoint of observation data could not be collected. The final sample consisted of 58 individuals with a mean (SD) age of 51.2 (15.6) years, as shown in Table 1.

Baseline

At baseline, 32 (55 %) participants had the internal HLC type, 25 (43 %) the external HLC type, and 1 (2 %) the chance HLC type. To enable the statistical test, the chance HLC type was incorporated into the external HLC type, considering that it comprises the same psychosocial trait. The sample characteristics are shown in Table 1.

Primary objective

Table 2 presents the interaction between treatment groups and types of HLC as predictors of pain intensity and functional ability. No significant interaction was observed between treatment group and HLC type for predicting pain intensity ($B = -1.77$, 95 % CI: −3.92, 0.37, $p = 0.10$) or functional ability ($B = 2.25$, 95 % CI: −0.23, 4.73, $p = 0.07$). Similarly, there was no significant main effect of treatment group on pain intensity ($B = -1.54$, 95 % CI: −3.37, 0.28, $p = 0.09$) or functional ability ($B = 1.75$, 95 % CI: 0.16, 3.35, $p = 0.05$). The type of HLC also did not significantly predict pain intensity ($B = -1.10$, 95 % CI: −2.85, 0.64, $p = 0.21$) or functional ability ($B = 0.68$, 95 % CI: −0.70, 2.07, $p = 0.32$).

An additional evaluation of the primary outcomes was conducted comparing baseline and the endpoint of observation measurements. This analysis revealed significant differences in mean pain intensity and degree of functional ability ($p < 0.001$), with large effect sizes ($d = 1.282$ and $d = 1.090$, respectively), indicating clinically meaningful improvements. These improvements occurred regardless of the intervention group to which participants were assigned, and no significant associations were found with the HLC type at baseline or the endpoint of observation measurements (Table 3).

In Table 4, when evaluating the secondary outcome (GPE), no significant difference was found regarding the type of HLC ($p = 0.75$). Also, no significant difference was found when comparing the treatment groups in the GPE ($p = 0.70$).

Table 1
Sample characterization ($n = 58$).

Variable	n	%
Sex		
Female	39	67
Male	19	33
Ethnicity		
White	26	45
Black	15	26
Brown	17	29
Schooling		
No	1	2
Incomplete primary education	6	10
Complete primary education	5	9
Incomplete secondary education	1	2
Complete secondary education	20	34
Incomplete higher education	5	9
Complete higher education	20	34
Monthly income		
Up to 2 min. wages	34	59
2 to 6 min. wages	19	33
More than 6 min. wages	5	9
HLC type		
Internal	32	55
External	25	43
Chance	1	2
Active group		
Kinesiotherapy	29	79
Pilates	6	21
Electrotherapy	3	10
Myofascial maneuvers	3	10
Passive group		
Palmer's Diversified	25	86
Janse's Diversified	7	24
Thompson terminal point	5	17
Activator	4	14
Upper cervical technique	1	3

Individual minimum wage equivalent to R$1320.00 (Brazilian Currency).

Table 2
Prediction analysis between groups and locus in the primary outcomes.

Outcome	Regression (p-value)		Beta	95 % CI	
				low	high
PNRS	Interaction	0.07	2.25	−0.23	4.73
	Group	0.09	−1.54	−3.37	0.28
	Locus	0.21	−1.10	−2.85	0.64
PSFS	Interaction	0.10	−1.77	−3.92	0.37
	Group	0.05	1.75	0.16	3.35
	Locus	0.32	0.68	−0.70	2.07

Linear Regression Test.
CI, confidence interval; PNRS, pain numerical rating scale; PSFS, patient-specific functional scale.

Secondary objective

To verify whether there was a predominance of any specific HLC type within the treatment groups, the distribution of HLC types at baseline was analyzed. The results showed that participants were relatively evenly distributed among the internal, external, and chance HLC categories within both the active and passive groups. No predominance of a particular HLC type was observed in either group. A chi-square test did not detect evidence of an association between the groups in terms of HLC type distribution ($p = 0.291$), indicating baseline comparability regarding this variable.

When comparing the HLC types between baseline and the endpoint of observation, in the active group, 23 (79 %) participants had the HLC type maintained, 3 (10 %) had the HLC type changed from internal to external, and 3 (10 %) had the HLC type changed from external to internal; while in the passive group, 22 (76 %) had the HLC type maintained, 4 (14 %) had the HLC type changed from internal to external, and 3 (10 %) had the HLC type changed from external to internal. In total, 45 (78 %) participants had no change in the HLC type, while 13 (22 %) had the HLC type changed. Through the Chi-square test, it was verified that

Table 3
Comparison of means at baseline and the endpoint of observation of the primary outcomes.

Outcomes	Time frame	Mean (SD)	*t*-test (p-value; Cohen's d)	
PSFS	Baseline	4.46 (2.17)	<0.001*	−1.09
	Endpoint	7.15 (1.94)		
PNRS	Baseline	6.69 (1.96)	<0.001*	1.28
	Endpoint	3.24 (2.35)		

Paired *t*-test; *: statistically significant.
PNRS, pain numerical rating scale; PSFS, patient-specific functional scale; SD, standard deviation.

Table 4
Relationship between groups and type of locus in secondary outcome.

Outcome	Treatment group		*t*-test (p-value)	Locus of control		*t*-test (p-value)
	Active group	Passive group		Internal	External	
GPE	3.93 (1.30)	3.79 (1.42)	0.70	3.81 (1.44)	3.92 (1.26)	0.75

Independent samples *t*-test; GPE, global perceived effect.
Data are mean and (standard deviation).

there was no significant change ($p = 0.75$) (Table 5).

Discussion

This study investigated the type of HLC in individuals with CNLBP. At baseline, most of the sample presented an internal type of HLC, a condition in which the individuals perceive that their health is a product or consequence of their behavior or actions. The results suggest that the type of HLC was not a predictor of pain intensity, degree of functional ability, or GPE. There was no significant difference in the type of HLC in the two treatment groups, ruling out the relationship between the type of HLC and the type of treatment, and there was no significant difference in the change in the type of HLC between baseline and the endpoint of observation.

It was found that the type of HLC, the treatment group, and the interaction between the type of HLC and the treatment group are not predictors of pain intensity and degree of functional ability. Although there was a significant difference in the results between baseline and the endpoint of observation, demonstrating a clinically important improvement, there was no relationship with the type of HLC or the type of intervention. This improvement at the endpoint of observation is justified by the fact that all participants received approaches considered effective according to the most current evidence for the treatment of CNLBP.[11] Previous studies have found a significant positive relationship between the type of internal HLC and reduction in pain intensity, pain during activity, improvement in the degree of functional ability, and quality of life.[7,15–17] Furthermore, other studies concluded that individuals with a low perception of control over their health are much more likely to report depressive symptoms, and that individuals with an internal HLC type were less depressed than others, thus considering the type of HLC as a predictor for psychiatric comorbidities.[8,18,19] However, none of these studies evaluated the type of HLC at different times, only outlining the individual's profile at baseline, which does not allow conclusions to be drawn and compared with the results of this study.

Table 5
Change of locus types between baseline and the endpoint of observation.

Locus of Control	Change at the endpoint, Yes/No	Active group, n (%)	Passive group, n (%)	Active and Passive groups, n (%)	p-value
Internal - External	No	26 (90 %)	25 (86 %)	51 (88 %)	0.68
	Yes	3 (10 %)	4 (14 %)	7 (24 %)	
External - Internal	No	26 (90 %)	26 (90 %)	52 (90 %)	1.00
	Yes	3 (10 %)	3 (10 %)	6 (10 %)	
Change	No	23 (79 %)	22 (76 %)	45 (78 %)	0.75
	Yes	6 (21 %)	7 (24 %)	13 (22 %)	

Relative chi-square test.

When evaluating the secondary outcome, the type of HLC did not influence the GPE. No studies were found in the literature that relate the type of HLC to the variable GPE. However, both treatment groups reported a better perception of overall improvement. This result may be attributed to the specific characteristics of exercises and manual therapy as therapeutic approaches, which emphasize joint manipulation and physical exercises, respectively, to restore adequate musculoskeletal function, resulting in improvements in joint mobility and pain relief.[20,21] Evidence suggests that both exercises and manual therapy care are effective in treating low back pain.[22,23]

According to the information collected at baseline, the hypothesis that the internal HLC type would be predominant in the active group was refuted, because, in the context of this study, exercise was considered an active approach, based mainly on the use of therapeutic exercises. The external/chance HLC would be predominant in the passive group, which was considered a passive technique, centered on spinal manipulation. This result agrees with the report of the predominance of the external HLC type in individuals undergoing physical therapy treatment, about the group of individuals who were waiting to start treatment.[24] However, it differs from studies that demonstrate a consensus where patients with CNLBP undergoing physical therapy treatment present a predominance of internal belief.[7,25,26]

When comparing the type of HLC at baseline and the endpoint of observation in the treatment groups, it was observed that there was no significant change, where the majority of volunteers who sought exercises therapy (active intervention) did not obtain at the endpoint of observation a change to the type of internal HLC, just as the majority of volunteers who sought manual therapy (passive intervention) did not obtain a change to the type of external HLC, therefore, the type of intervention was not associated with the change in the type of HLC. The literature recommends that education on anatomy, pain, physical and mental coping strategies, work, lifestyle, exercise, and cognitive-behavioral treatment should be used for patients with CNLBP[10] who have an external HLC type to increase the internal beliefs of these individuals, favoring self-management and resulting in a better prognosis.[16] No evidence was found comparing the type of HLC during observation of different treatments. However, studies show that patients with CNLBP have higher levels of disability and worse quality of life when they have an external HLC type, and better levels of disability when they have an internal HLC type. Furthermore, better results at the end of treatment are associated with decreased external HLC levels.[5,7,18,26] In this study, the approaches were not controlled but were merely observed. Therefore, the treatment groups did not necessarily conduct interventions that aimed to modify the patient's type of belief (such as pain education, for example), which may justify maintaining the type of HLC in the sample evaluated.

An interesting result was observed in the present study, where a small portion of the participants had their HLC type changed. Comparing the HLC type at baseline and the endpoint of observation, it was evident that there may be a change in the HLC type; however, there is a greater probability of it remaining stable.

Limitations of the study

Given the proposal of a longitudinal observational before-and-after design, the present study has some limitations: volunteers were not randomized between treatments; it was not possible to blind the evaluator and the participants seeking care for CNLBP; and there was no control of the intervention administered. Therefore, further investigations should include the control of these factors.

Although we examined HLC type change quantitatively, a future qualitative study could explore the perceptions and practice beliefs of physical therapists who approach these interventions, as well as a detailed exploration of the interpretations and experiences of the population who have had their HLC type changed.

The results of this study may stimulate the development of future studies in this field of knowledge. Although it was shown that the type of HLC was not a predictor for the variables studied, it is recommended that controlled interventions be considered in future studies to verify whether the results remain consistent. In addition, the absence of psychosocial interventions, such as education in pain neuroscience, may also be a limiting factor in the conclusions. These issues may serve as a basis for future investigations, providing new subsidies for advancement in this area of study.

Conclusion

The type of health locus of control did not predict pain, function, or global perceived effect in individuals with chronic nonspecific low back pain, and remained changeless regardless of treatment type. These findings suggest that changes in beliefs about health control may not occur spontaneously during usual exercises or manual therapy care. Incorporating educational or cognitive-behavioral strategies might be important to influence such beliefs and potentially enhance treatment outcomes.

Declaration of competing interest

The authors declare that there is no competing interest related to this study.

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