ORIGINAL ARTICLE

Nonspecific chronic low back pain and incapacity level: influence of walking performance

Dor lombar crônica inespecífica e nível de incapacidade: influência no desempenho da caminhada

Alberito Rodrigo de Carvalho[1,2], Welds Rodrigo Ribeiro Bertor[2], Ricardo Massao Abico[2], Lana Brandl[2], Thiago Fernando Mattjie[2], Alexandro Andrade[3], Leonardo Alexandre Peyré-Tartaruga[1]

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ABSTRACT

BACKGROUND AND OBJECTIVES: Chronic low back pain syndrome promotes several functional losses which impact quality of life of patients, and walking is one of the most impaired functions. Being chronic low back pain a syndrome with multiple etiologies, efforts to understand the relation between functional losses and etiologic factors are justified. This study aimed at correlating walking speed with pain perception, incapacity level (I) and condition of having or not chronic low back pain (group).
METHODS: Sample was made up of volunteers with nonspecific low back pain (LG/n=8) and healthy subjects (CG/n=8). Incapacity level was obtained by Oswestry Incapacity Index during evaluation. Tests battery was divided in three sessions according to walking intensity, as follows: preferred self-selected speed (VP) and faster and slower speeds as compared to VP. In each session, volunteers walked for five minutes and at every minute pain was quantified by the analog scale. Kendal Tau test was used with p=0.05.
RESULTS: Walking speed was not correlated with pain intensity, with incapacity level or with the group. However, group versus incapacity level, group versus pain, incapacity level versus pain were correlated with one another.
CONCLUSION: Walking performance was not influenced by nonspecific chronic low back pain and by incapacity level.

Keywords: Chronic pain, Gait, Human locomotion, Psychosocial impact.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A síndrome de dor lombar crônica promove diversos prejuízos funcionais que impactam a qualidade de vida dos pacientes, e a caminhada é uma das funções mais comprometidas. Sendo a dor lombar crônica uma síndrome multietiológica, os esforços para se entender a relação os entre prejuízos funcionais e os fatores etiológicos se justificam. O objetivo deste estudo foi correlacionar a velocidade de caminhada com a percepção dolorosa, o nível de incapacidade (I) e a condição de ter ou não dor lombar crônica (grupo).
MÉTODOS: A amostra foi composta por voluntários com dor lombar crônica inespecífica (GL/n=8) e sujeitos saudáveis (GC/n=8). O nível de incapacidade foi obtido pelo Índice de Incapacidade de Oswestry durante a avaliação. A bateria de testes foi dividida em três sessões de acordo com a intensidade da caminhada como segue: velocidade autosselecionada preferida (VP), e velocidades mais rápidas e mais lentas que a VP. Em cada sessão os voluntários caminharam por cinco minutos e a cada minuto a intensidade dolorosa foi quantificada pela escala analógica. Foi usado o teste Tau de Kendall com p=0,05.
RESULTADOS: A velocidade de caminhada não se correlacionou com a intensidade dolorosa, com o nível de incapacidade e nem com o grupo. Entretanto, grupo *versus* nível de incapacidade, grupo versus dor, nível de incapacidade versus dor foram correlacionados uns com os outros.
CONCLUSÃO: O despenho da caminhada não foi influenciado pela dor lombar crônica não específica e pelo nível de incapacidade.

Descritores: Dor crônica, Impacto psicossocial, Marcha, Locomoção humana.

INTRODUCTION

Low back pain is a syndrome-based condition with high prevalence in the global population. The identification of the etiology of low back pain has remained a challenge since there is little correlation between pathological findings and clinical presentation. One of the main characteristics of chronic low back pain is functional impairment, walking speed being one of the factors most affected, with a possible impairment in the metabolic cost of walking[1-3].
The contribution of psychosocial and neuropsychological etiological factors on the performance of motor tasks, for instance, walking, is still poorly understood and confusing in the context of chronic low back pain, even though these factors give an im-

1. Universidade Federal do Rio Grande do Sul, Laboratório de Pesquisa do Exercício, PPG-Ciências do Movimento Humano, Porto Alegre, RS, Brasil.
2. Universidade Estadual do Oeste do Paraná, Colegiado de Fisioterapia, Cascavel, PR, Brasil.
3. Universidade do Estado de Santa Catarina, Centro de Ciências da Saúde e do Esporte, Laboratório de Psicologia do Esporte e Exercício, Florianópolis, SC, Brasil.

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Correspondence to:
Exercise Research Laboratory, Federal University of Rio Grande do Sul (UFRGS)
Rua Felizardo, 750,
90690-200 Porto Alegre RS, Brasil.
E-mail: leonardo.tartaruga@ufrgs.br

portant contribution for both, the assessment of chronic low back pain and rehabilitation programs[4].

Clinically, healthcare professionals may recognize the nature of chronic low back pain using several models proposed in the scientific literature (pathological, neurophysiological, signs and symptoms, biopsychosocial, motor control, among others). These models often lead clinicians to adopt unidimensional therapeutic interventions rather than multidimensional ones[5] increasing the chances of obtaining less-than-ideal results. Thus, efforts at contributing to the understanding of the relationship between the various etiological dimensions of chronic low back pain are justified.

Al-Obaidi et al.[6] concluded, by multiple linear regression, that the level of physical activity and anticipation of pain, the latter being a factor of psychosocial nature, were strong predictors of deficits in walking speeds between subjects with low back pain compared to the control group. Other authors have also shown that in chronic low back pain patients, as compared to asymptomatic individuals, walking speed on self-determined preferred gait intensity is significantly lower[7,8].

Studies regarding low back pain present conflicting findings with respect to the relationship between functional performance, physical activity level, painful intensity, level of disability and walking speed: a weak but significant correlation between pain, disability and quality of life[9]; lack of evidence that walking plays a positive role in reducing pain and in improving functionality in chronic low back pain[10]; poor evidence for the association between chronic low back pain and the impairment in performance of activities of daily living[11]; positive correlation between high rates of disability and low levels of physical activity[12].

Considering the difference in the contributions of various studies, the aim of this study was to correlate walking speed (WS) with pain perception, level of disability (LD) and condition of having or not chronic nonspecific low back pain (group). The hypothesis of this study proposes that patients with chronic nonspecific low back pain are less able to adapt their spatial-temporal parameters and thus, the walking speed variation performed at different intensities (preferred self-selected speed, slower and faster than the preferred self-selected speed) is positively correlated with perceived painful intensity and level of disability.

METHODS

Volunteers with chronic nonspecific low back pain, being treated in an Institutional Physical Rehabilitation Center (IPRC), were recruited intentionally, not probabilistically, to compose the chronic low back pain group (LG). They were of both genders, aged between 25 and 60 years, without osteomuscular injuries in other joints and/or systemic illnesses. We opted for a convenience sampling because a considerable part of patients from IPRC lives at neighboring towns covered by this Rehabilitation Center. The control group (CG) consisted of subjects without systemic or musculoskeletal disorders, either chronic or acute, in lower limbs and/or spine, and were matched per age, weight, and height about the LG.

Volunteers, from both groups, were excluded if they systematically and routinely engaged in physical exercise, two or more times per week for at least 30 minutes; showed obvious differences in length of lower limbs, postural misalignments and body mass indexes greater than 30.0 $kg.m^2$.

Inclusion criteria for the LG followed the recommendations of original or review articles that focused on the diagnosis and treatment of low back pain, according to signs and symptoms indicated in the anamnesis and physical examination[13-15]. Volunteers should report low back pain persisting for more than three months, without radiation to lower limbs but with physical and clinical characteristics compatible with category 1 pain (nonspecific low back pain) according to the guidelines for evaluation and treatment proposed by the American College of Physicians and the American Pain Society[14]. According to those guidelines, the main guideline was the search for signs and symptoms present in the anamnesis and physical examination that could suggest specific cause for low back pain (called red flags) and that, when found, have not characterized chronic nonspecific low back pain.

The experimental design of this study involved the following steps: 1) screening; 2) preferred self-selected speed determination; 3) walking test.

After receiving explanations of the procedures and objectives of the research, volunteers underwent clinical screening for the collection of history and anthropometric data.

To all volunteers, the level of self-reported disability was determined by the Brazilian version of the Oswestry Disability Index (ODI) adapted from the original - version 2.0 whose reliability was recognized (αCronbach = 0.87, ICC = 0.99)[16,17]. It is a questionnaire composed of 10 questions with six possible answers each, which reflects the repercussion of low back pain on individual's daily and social activities. The scores are presented in percentage values.

The subject underwent a familiarization period, for five minutes, on the treadmill (Embrex 563-R3, Brusque, Brazil) and then the preferred self-selected speed (PS) was determined.

Walking intensity in PS was determined as follows: a) the volunteer was asked to choose the most comfortable speed, similar to the one used daily, that could be maintained over a long path; b) the treadmill speed was increased progressively up to a standard of 7 $km.h^{-1}$ (or until before the volunteer feels insecure walking) and then reduced in the same pattern so that the volunteer could choose his PS in each set; c) the PS of each patient was determined by calculating the mean of PSs from two sets of recording[18].

The test battery was divided into three sections according to walking intensity as follows: preferred self-selected speed (PS), and slower and faster than the PS. Only three intensities were proposed to avoid overloading the LG. Before starting, subjects received instructions about the use of the pain visual analog scale (VAS) to quantify the intensity of pain during the test. The intensity of pain was graphically represented as a 10 cm line so that the number zero, representing the absence of pain, was on the left and the number 10, representing the worst possible pain, was on the right[19].

During the time they walked on the treadmill, in the three sections, minute by minute, the volunteer was asked to score the pain experienced at that exact moment through the VAS making a total of six samples: from moment zero immediately before the beginning of walking until the moment five at the end of the last walking minute. The valid painful intensity of each section for statistical analysis was the arithmetic average of all measures of that section.

In the first section, subjects walked at their PS. The order of the next two sections was randomly selected so that in one case, the volunteers walked 0.5 km.h^{-1} slower than that in the PS and in the other, the volunteers walked 0.5 km.h^{-1} faster than that in the PS. In each section, the subjects walked for five minutes.

This study followed the principles embodied in the Declaration of Helsinki and was approved by the Institutional Ethics Committee on Human Research and classified as observational, ex-post facto, exploratory-descriptive, transversal study. All the volunteers in this study signed a free informed consent form (FICT) before participation.

Statistical analyses

For statistical analysis, we used the SPSS 15 software. Data normality was tested by the Shapiro-Wilk test. The inter-group comparisons for sample data characterization and walking speed were done by applying unpaired *t*-test. The correlations were determined by Kendall´s Tau test. The correlation strength was interpreted by the following score: very low (r value<0.2), low (r value between 0.2 and 0.39), moderate (r value between 0.4 and 0.69), high (r value between 0.7 and 0.89), very high (r value between 0.9 and 1). For all statistical tests, we adopted α=0.05.

RESULTS

The sample consisted of 21 volunteers (CG/n=10; LG/n=11) and statistical differences were not found in age and in anthropometric characteristics between groups: age (year) CG 37.7±6.4/ LG 43.6±10.6/T(19)= -1.525; p=0.144; height (cm) CG 177.3±8.0/LG 165.5±10.1/T(19)=1.757; p=0.095; body mass (kg) CG 73.3±10.0/LG 72.1±15.8/T(19)=0.189; p=0.852; lower limbs (in meters) CG 0.90±0.05/LG 0.84±0.08/T(19)=1.863; p=0.078. Median length of LG chronicity pain was 10 years, with the lowest value of one year and the highest 30 years.

Descriptive statistics for painful intensity, walking speed and level of disability variables are shown in Figure 1. Statistical differences were not found in walking speed, in each walking speed intensity, between groups, but the level of disability and painful intensity were statistically different.

Painful intensity in LG in the last two months previous to the collection was 6.8 ± 1.1. Average values of pain observed in LG, in all walking speed intensities, were lower than average intensity reported in the last two months before the sampling.

Correlations can be seen in table 1. Significant correlations were observed between group versus the level of disability, group versus pain intensity, and between the level of disability versus pain intensity. However, statistical correlations were not found between walking speed and other variables.

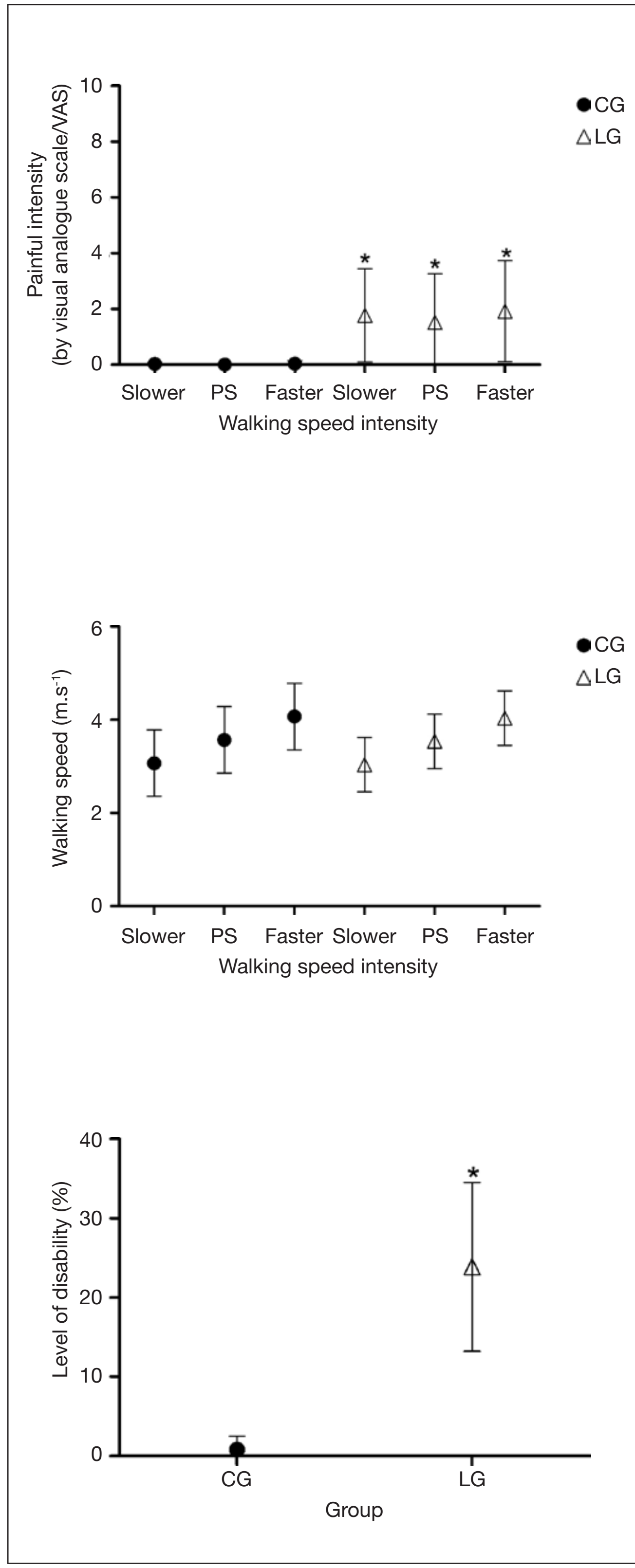

Figure 1. Descriptive statistics (median, minimum and maximum values) for variables painful intensity, walking speed and level of disability. Walking speed 0.5 km.h^{-1} slower than preferred self-selected speed (SLOWER), preferred self-selected speed (PS), speed 0.5 km.h^{-1} faster than preferred self-selected speed (FASTER), visual analog scale (VAS), control group (CG), lumbar group (LG). *The show statistical difference with regard to CG at same walking speed intensity.

Table 1. Correlation among group, painful intensity, level of disability and walking speed

Pairs of Correlation			Correlation (R)	Significance (P-value)	Strength
Group	X	Painful intensity in SLOWER	0.638	0.001*	Moderate
		Painful intensity in PS	0.548	0.008*	Moderate
		Painful intensity in FASTER	0.638	0.001*	Moderate
Level of disability	X	Painful intensity in SLOWER	0.498	0.004*	Moderate
		Painful intensity in PS	0.421	0.020*	Moderate
		Painful intensity in FASTER	0.486	0.005*	Moderate
Level of disability	X	Group	0.780	<0.001*	High
Group	X	Walking speed in SLOWER	-0.400	0.832	-
		Walking speed in PS	-0.400	0.832	-
		Walking speed in FASTER	-0.400	0.832	-
Level of disability	X	Walking speed in SLOWER	-0.095	0.573	-
		Walking speed in PS	-0.095	0.573	-
		Walking speed in FASTER	-0.095	0.573	-

Note: Walking speed 0.5 $km.h^{-1}$ slower than preferred self-selected speed (SLOWER), preferred self-selected speed (PS), speed 0.5 $km.h^{-1}$ faster than preferred self--selected speed (FASTER). *Statistical significance.

DISCUSSION

The aim of his study was to correlate walking speed with pain perception, the level of disability and the condition of having or not chronic nonspecific low back pain (group). However, the hypothesis of the study was not confirmed. Pain perception, level of disability and even low back pain did not modify the walking ability. Painful intensity indicated by the volunteers of the LG during the tasks of walking on a treadmill was low when it was compared to pain intensity in the last two months. It should be informed that the use of medications which, by whatever means, may relieve or even eliminate pain was not controlled in this study, and we considered it as a study limitation.

In fact, two LG volunteers reported, informally, having used analgesics/anti-inflammatories several days before the collection period and both showed no pain during the walking tasks at different effort intensities, though disability scores had been 8% for one and 32% for the other, the latter being the highest score of disability of LG. We decided not to exclude volunteers who had reported using medication for it being a common behaviour among these patients and that decision was reinforced by the finding of a study that estimated the size of the effect of several therapeutic approaches in nonspecific low back pain compared to the condition without treatment, in which the use of nonsteroidal anti-inflammatory drugs showed only a moderate effect on the condition of chronic low back pain[20].

Another important contribution that may help explaining why LG volunteers presented lower pain levels during the experimental tasks is the effect of attention demands on pain aspects. Behavioral theories and neurobiology suggest that the attention demand favours the information process related to pain, however, compared to multiple stimuli, the purpose of achieving an objective often hinders the achievement of another simultaneous objective. Thus, cognitive tasks that generate distraction are associated with lower pain levels and reduction in brain activity related to pain[21]. Also, moderate intensity exercise could significantly attenuate the attention demand in relation to rest and high-intensity exercise[22].

From the findings of the two afore mentioned studies[21,22] it may be suggested that walking could compete with painful information. Walking was considered, in this study, as moderate-intensity activity, in the sense that it was intended to simulate the intensity performed by volunteers in their daily activities. As such, walking on a treadmill and the task of quantifying pain while walking may have contributed to decreasing pain perception and may explain the difference between the average pain intensity corresponding to the two months prior to the study and pain intensities recorded during the collection.

A high correlation was also observed between the group effect and the level of disability, with the lumbar group showing higher levels of disability. Such observation is consistent with findings from other studies[9]. Regarding those, although there was a moderate correlation of low back pain with disability and with catastrophizing, the correlation between disability and catastrophizing was strong and the latter accounted for 28% of disability while the severity of pain accounted for only 3%[23]. This reinforces the suggestion that psychosocial aspects significantly contribute to the clinical condition and that there is a possible link between these psychosocial factors and physiological changes that lead to recurrence of the painful condition.

A systematic review study, which used only longitudinal delineation research, evaluated the clinical course of pain and disability among patients with acute nonspecific low back pain (less than 12 weeks) and persistent (more than 12 weeks but less than 12 months). Authors concluded that the evolution of pain and disability was similar and without significant differences among those with acute low back pain. However, in those with persistent pain, the clinical manifestation of pain was more apparent than the disability[24], though it is likely, for this group of patients, to have moderate levels of pain and disability in a period of one year.

The level of disability being correlated with both the group effect (patients with low back pain with higher disability levels) as well as painful intensity (volunteers with higher disability levels reported greater pain perception), it was expected that such relationships could influence the speed in which volunteers walked on the treadmill. However, contrary to what would have been expected, the speed performed did not correlate with any of the variables measured in this study, traditionally considered relevant in cases of chronic low back pain[15]. Perhaps the absence of correlation is because patient perceives and quantifies the impact of chronic low back pain in a different and independent way of motor and kinematic changes that the syndrome causes on physical dimension.

The level of disability in this study was measured by self-reported instrument type. Some authors[25] argued that self-reported disability and functional capacity measurements are moderately related. In their research, these authors used self-reported disability evaluations in addition to ones based on performance tests, which involved a walking test. They concluded that both disability assessment methods are influenced by different patient characteristics. Self-reported measurements are more influenced by psychological conditions than those based on the performance. Corroborating this idea, other researchers have observed in a sample of chronic low back pain features of significantly worsened mood in relation to those without low back pain, but no difference in the Six-Minutes Walk test[26].

Though the tests used to measure the impact of low back pain on people's performance and quality of life may help orient health professionals, such tests don't always reflect the multiplicity of influencing factors that affect pain conditions. In fact, personal goals of the evaluated person and the discrepancy between what is important for the patient and what is being evaluated can have implications on results[24]. Similarly, specific performance tests, such as the walking test, may not reflect the limitations in other activities. Thus, it is recommended that more sensitive tests to the distinct needs of patients are more appropriate[24,27].

According to a study[28], whose sample was composed of patients with lumbar spinal stenosis, and considering conceptual differences between capacity (individual's ability to perform a given task or action in a controlled setting) and performance (activities performed by an individual on a day to day basis in the context of their own life), as proposed by the International Classification of Functioning, Disability and Health, we can observe that an improvement in walking capacity is not necessarily accompanied by gains in walking performance. Clinical evaluation by questionnaires seem mostly associated with capacity but not with performance.

Moreover, in another study, authors observed that patients with specific and nonspecific low back pain, despite lower strength levels for dorsal and lower limb muscles, did not show any worse functional performance than healthy subjects[29].

The main contribution of this study is the idea of how chronic low back syndrome can reflect in distinct manners on different etiological aspects and therefore the need to identify the effects caused by this syndrome specifically in each of its etiological dimensions to have a broader view of the patient and that the treatment, from this analysis, meets these specific needs. Therefore, the challenge remains as to how to recognize and assimilate therapeutic approaches and the diversity of changes that chronic low back pain triggers in the individual.

Despite a large amount of research performed to better understand what causes and/or maintains low back pain, the contradictions in the notes of these studies still predominate. Per a review[30], most the 60 articles that were registered in the Clinical Trial Registry of the World Health Organization from October 2009 retook approaches that failed to contribute to previous clinical trials. Perhaps this shows the need for continuous investigation on the topic, for it is a highly prevalent syndrome that remains largely unexplained.

CONCLUSION

We conclude that the walking speed performed was not influenced by chronic nonspecific low back pain and level of disability.

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