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ORIGINAL RESEARCH

Prevalence of low back pain among CrossFit participants: a cross-sectional study

Prevalência de dor lombar entre praticantes de crossfit: um estudo transversal

Prevalencia de dolor lumbar entre practicantes de CrossFit: un estudio transversal

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ABSTRACT | CrossFit is a physical conditioning modality characterized by various movement patterns, activities, and energy systems. This study aimed to investigate the prevalence of occasional low back pain in the 12 months prior the study and during the lifetime of Brazilian practitioners of CrossFit. This is a cross-sectional study designed to reach the largest possible number of participants. To achieve this, an electronic questionnaire was created using an online platform (Google Forms). The invitation to participate in the research was distributed to Brazilian practitioners via Facebook and Instagram platforms. Data were collected on prevalence of low back pain at three time points: current (occasional prevalence), in the past year, and at any moment in life (lifetime prevalence). Of the 309 participants included, 90.3% (n=279) reported low back pain at some point in their lives, whereas, 75.1% (n=232) reported at least one episode of low back pain in the last 12 months, and 15.5% (n=48) reported having low back pain while answering the questionnaire. Although low back pain was frequent among CrossFit practitioners it was generally occasional episodes, of moderate intensity and not severe enough to limit the participants' usual activities or routine.

Keywords | Low Back Pain; Epidemiology; Exercise.

RESUMO | O crossfit compreende uma modalidade de condicionamento físico caracterizada por uma variedade de padrões de movimento, atividades e sistemas de energia usados. Este estudo teve como objetivo investigar a prevalência de dor lombar pontual de praticantes brasileiros de crossfit nos últimos 12 meses e em algum momento da vida. Trata-se de um estudo transversal elaborado para atingir o maior número possível de participantes e, para isso, foi criado um questionário eletrônico utilizando uma plataforma online (*Google Forms*). O convite para participar da pesquisa foi distribuído a praticantes brasileiros por meio do *Facebook* e do *Instagram*. Foram coletadas informações sobre a dor lombar pontual, no último ano e em algum momento da vida. Dos 309 participantes incluídos, 90,3% (n=279) relataram já ter sentido dor lombar em algum momento da vida, enquanto 75,1% (n=232) relataram pelo menos um episódio de dor lombar nos últimos 12 meses e 15,5% (n=48) relataram estar com dor lombar enquanto respondiam ao questionário. A dor lombar foi uma queixa frequente entre praticantes de crossfit e, apesar de frequente, a dor lombar pontual tendeu a ter intensidade moderada e não era forte o suficiente para

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limitar as atividades habituais ou alterar a rotina diária dos participantes.
Descritores | Dor Lombar; Epidemiologia; Exercício Físico.

RESUMEN | El CrossFit es una modalidad de acondicionamiento físico que se caracteriza por una variedad de patrones de movimiento, actividades y sistemas de energía utilizados. Este estudio tuvo el objetivo de investigar la prevalencia de dolor lumbar puntual en practicantes brasileños de CrossFit en los últimos 12 meses y en algún momento de sus vidas. Se trata de un estudio transversal creado para llegar al mayor número posible de participantes y, para ello, se utilizó un cuestionario electrónico a través de una plataforma en línea (*Google Forms*). La invitación a participar en la investigación fue distribuida a los practicantes brasileños a través de *Facebook* e *Instagram*. Se recopilaron las informaciones sobre el dolor lumbar puntual, en el último año y en algún momento de sus vidas. De los 309 participantes, el 90,3% (n=279) relató ya haber experimentado dolor lumbar en algún momento de su vida, mientras que el 75,1% (n=232) relató haber experimentado dolor lumbar al menos una vez en los últimos 12 meses y el 15,5% (n=48) relató tener dolor lumbar al contestar el cuestionario. El dolor lumbar ha sido una queja frecuente entre los practicantes de CrossFit y, a pesar de frecuente, el dolor lumbar puntual tendió a ser de intensidad moderada y no era lo suficientemente fuerte como para limitar las actividades habituales o afectar la rutina diaria de los participantes.
Palabras clave | Dolor de la Región Lumbar; Epidemiología; Ejercicio Físico.

INTRODUCTION

CrossFit, also known as high-intensity functional training, is a form of physical conditioning characterized by a variety of movement patterns and activities, such as weightlifting, resistance training, gymnastics, and metabolic and aerobic conditioning. CrossFit also involves the use of different energy systems, such as ATP-CP/phosphagen, glycolytic, and oxidative pathways[1]. Although numerous health benefits have been documented[2], some concerns have been raised regarding the seemingly random nature of exercises, the potential lack of individualized programming, and safety risks associated with the high intensity and competitive nature of the activity[3]. Moreover, a systematic review of CrossFit-related injuries identifies the lumbar spine as one of the most frequently affected body areas[4].

Low back pain is the leading cause of years lived with disability in both developed and developing countries, and it ranks sixth in terms of global disease burden, highlighting an urgent need for further research to better understand low back pain in different contexts[5]. The study of low back pain prevalence is particularly relevant due to the persistence of symptoms and the high costs associated with medical treatment[6]. While low back pain is self-limiting in most cases, many athletes experience long-term symptoms that can affect their ability to engage in physical exercise[7].

Guidelines for studies on low back pain prevalence recommend investigating three time periods: occasional/acute prevalence, prevalence in the past 12 months, and lifetime prevalence[8]. Even though the prevalence of low back pain is well researched in the general population, variations in definitions and study methodologies lead to considerable differences in reported rates. A systematic review using pooled data reports an average occasional prevalence of 18% for low back pain in the general population, with lifetime prevalence reaching 39%[9], and as high as 93.3% in some cases[10]. Most studies on the topic address low back pain in sports that impose significant strain on the spine, such as rowing[11,12], gymnastics[13,14], wrestling[15], weightlifting[15], and cross-country skiing[16,17]. In these practices, the reported averages for occasional pain prevalence, 12-month prevalence, and lifetime prevalence of low back pain are 24%, 55%, and 61%, respectively[18]. To date, no studies have exclusively investigated the prevalence of low back pain among CrossFit practitioners. Therefore, this study aimed to determine occasional prevalence, 12-month prevalence, and lifetime prevalence of low back pain, as well as to examine the characteristics of occasional low back pain prevalence in CrossFit practitioners residing in Brazil.

METHODOLOGY

Study type, location, and sample

This is a cross-sectional, quantitative study. Participants included CrossFit practitioners of any experience level, aged 18 or older, and residing in Brazil.

The exclusion criterion was any form of adapted CrossFit practice, such as using a wheelchair or assistive devices. To determine the appropriate sample size, a sample size calculator was used (http://sampsize.sourceforge.net/iface/index.html), with a 5% margin of error, an estimated 24% occasional prevalence of low back pain based on previous literature[18], an estimated population of 200,000 CrossFit practitioners in Brazil, and a 95% confidence interval. This calculation yielded a minimum sample size of 280 participants.

Data collection instrument and procedures

To ensure a nationwide data collection, an electronic questionnaire was developed using the Google Forms platform. The questionnaire, which was self-administered, gathered demographic information (such as age, sex, education level, and region of residence in Brazil) along with details about the participants' CrossFit experience and average weekly training time. Additionally, participants provided information about the occurrence of low back pain, including occasional prevalence (pain at the time of completing the questionnaire), 12-month prevalence, and lifetime prevalence.

In sports-related studies, there is no consensus on the precise definition of low back pain, with variations in its description regarding location, intensity, frequency, and duration[18]. The most commonly accepted definition is "pain or discomfort in the lower back with or without radiation to one or both legs"[11,12,16,19]. This definition was presented to participants in this study. To assist in accurately identifying the lumbar region, a visual illustration of the human body was included in the questionnaire.

Participants were asked three key questions to assess prevalence: (1) "Have you ever experienced low back pain in your life?"; (2) "In the past 12 months, have you experienced low back pain at any time?"; and (3) "Are you currently experiencing low back pain?" Based on their responses, participants were classified as either having low back pain or not. They were instructed to exclude pain associated with fever or menstruation. If occasional low back pain was reported, participants were directed to additional questions concerning the characteristics of their pain, including its intensity, any related disability, radiation to the legs, and possible causes. Pain intensity was measured using the Pain Numerical Rating Scale (Pain NRS), where participants rated their pain on a scale from 0 (no pain) to 10 (the worst imaginable pain).

The questionnaire was distributed using snowball sampling via social media platforms, with participants encouraged to respond and share the survey with others. Invitations to participate in the study, along with the survey link, were shared in partnerships with CrossFit-related pages on social media, including Facebook and Instagram. The research team contacted the administrators of these pages via Facebook inbox and Instagram direct messages. If administrators agreed to collaborate, they were provided with the survey link for further distribution. The research team also promoted the study through their own social media accounts.

Data analysis and processing

The collected data were organized and compiled in the Excel (Microsoft) program, while statistical analysis was conducted using SigmaPlot version 12.0. The normality of the data was assessed with the Shapiro-Wilk test. Categorical variables were described using absolute (n) and relative (%) frequencies, while numerical variables were expressed as measures of central tendency (median) and variability (interquartile range 25–75%), as the data did not follow a normal distribution according to the Shapiro-Wilk test results. Associations between the occurrence of low back pain across different periods and the variables of sex and age group were analyzed using the Chi-squared test. Comparisons between individuals who reported low back pain and those who did not, across different time periods, were performed using the Mann-Whitney test. These comparisons considered variables such as age, weekly practice time, and CrossFit experience. Statistical significance was set at 5% for all analyses.

RESULTS

A total of 310 individuals completed the survey, with 309 meeting the eligibility criteria for participation in the study. Table 1 summarizes the results regarding age, age group, sex, education level, region of residence, weekly training frequency, and time practicing CrossFit. The median age of the participants was 29 years (interquartile range 25–34), with most participants aged from 18 to 29 years (51.5%; n=159). Most participants were

female (55.7%; n=172), had completed higher education (71.2%; n=220), and resided in the Northeast (27.1%; n=84) and Southeast (25.3%; n=78) regions. Smaller proportions lived in other regions of Brazil, all of which were included in this study. The median reported weekly practice time for the modality was 6 (5–7) hours, and the median duration of CrossFit experience was 32 (14–48) months.

Table 1 – Results regarding sex, age, age group, education level, region of residence, weekly training time, and time practicing CrossFit. Brazil, 2022 (n=309)

Parameter	Median [25-75%] or % (n)
Age, years	29 [25–34]
18 to 29 years	51.5 (159)
30 to 39 years	38.8 (120)
40 years or older	9.7 (30)
Sex	
Female	55.7 (172)
Male	44.3 (137)
Schooling level	
Complete primary education	1 (3)
Incomplete secondary education	1.3 (4)
Complete secondary or supplementary education	4.5 (14)
Incomplete higher education	21 (65)
Technical course	1 (3)
Complete higher education	71.2 (220)
Brazilian region of residence	
North	4.4 (14)
Northeast	27.1 (84)
Center-West	23.9 (74)
Southeast	25.3 (78)
South	19.2 (59)
Weekly CrossFit practice time, hours	6 [5-7]
Time practicing CrossFit, months	32 [14–48]

Of the 309 participants included, 90.3% (n=279) reported having experienced low back pain at some point in their lives, while 75.1% (n=232) reported at least one episode of low back pain in the past 12 months. Additionally, 15.5% (n=48) stated they were experiencing low back pain at the time of completing the survey. There was no association between the occurrence of low back pain in the three different periods and sex or the investigated age groups (p>0.05) as shown in Table 2.

Table 3 presents the median ages of participants according to the occurrence of low back pain in each period. A statistically significant association was found between the occurrence of low back pain in the past 12 months and age (p=0.036). However, no such association was identified for occasional or lifetime low back pain (p>0.05).

Table 2 – Results regarding the prevalence of lifetime, 12-month, and occasional low back pain according to age group. Brazil, 2022 (n=309)

Parameter	% (n)	p-value
Reported low back pain at some point	90.3 (279)	
Sex		
Female	55.2 (154)	0.757
Male	44.8 (125)	
Age group		
18 to 29 years	91.8 (146)	
30 to 39 years	90.8 (109)	0.129
40 years or older	80 (24)	
Reported low back pain in the past 12 months	75.1 (232)	
Sex		
Female	56.9 (132)	0.532
Male	43.1 (100)	
Age group		
18 to 29 years	76.7 (122)	
30 to 39 years	76.7 (92)	0.133
40 years or older	60 (18)	
Reported occasional low back pain	15.5 (48)	
Sex		
Female	56.3 (27)	0.945
Male	43.8 (21)	
Age group		
18 to 29 years	15.7 (25)	
30 to 39 years	14.2 (17)	0.729
40 years or older	20 (6)	

Table 3 – Results regarding the comparison between participants who reported or did not report low back pain in the different analyzed periods in relation to age.

Variable	Median [25-75%]	p-value
Reported low back pain at some point		
Yes	29 [25–34]	0.097
No	32 [27–37]	
Reported low back pain in the past 12 months		
Yes	29 [25–33]	0.036
No	30 [27–37]	
Reported occasional low back pain		
Yes	29 [25–35]	0.519
No	29 [25–34]	

Table 4 presents the results of the comparison of participants who reported low back pain with those who did not, across different periods concerning weekly CrossFit practice and time practicing the modality. Individuals who reported having experienced low back pain at some point in their lives had a median weekly practice lower than those without a history of low back pain (p=0.016). For the other periods analyzed, no association was identified. Regarding CrossFit experience, no association was found with the occurrence of low back pain in any of the periods examined (p>0.05).

Table 4 – Results regarding the comparison between participants who reported or did not report low back pain in the different analyzed periods in relation to weekly practice time and CrossFit experience.

	Weekly practice time, hours Median [25–75%]	p-value	CrossFit experience (months) Median [25–75%]	p-value
Reported low back pain at some point				
Yes	6 [5-7]	0.016	30 [14-48]	0.277
No	7 [5-10]		48 [12-72]	
Reported low back pain in the past 12 months				
Yes	6 [5-7]	0.137	26.5 [14-48]	0.054
No	6 [5-8]		36 [13-62.5]	
Reported occasional low back pain				
Yes	5.3 [5-7]	0.643	36 [14-48]	0.652
No	6 [5-7]		30 [14-48]	

Table 5 presents the characteristics of occasional low back pain, as reported by the participants. Overall, 29.2% (n=14) responded that the pain was strong enough to limit their usual activities, while 20.8% (n=10) reported that the pain spread to the leg. Additionally, only 16.7% (n=8) identified a specific cause of the pain, with herniated or protruded discs (75%, n=6), errors in exercise execution during training (12.5%, n=1), and pelvic retroversion (12.5%, n=1) being the only causes reported. Regarding pain intensity, the median reported score was 5 points [4–7], and Figure 1 depicts the distribution of participants according to pain intensity.

Table 5 – Results regarding the characteristics of occasional low back pain. Brazil, 2022 (n=48).

Parameter	% (n)
Reported severe pain, enough to impair usual activities or alter daily routine for more than a day	
No	70.8 (34)
Yes	29.2 (14)
Reported pain spreading to the leg	
No	79.2 (38)
Yes	20.8 (10)
Reported a specific known cause for low back pain	
No	83.3 (40)
Yes	16.7 (8)
Herniated or protruding disc	75 (6)
Other	25 (2)

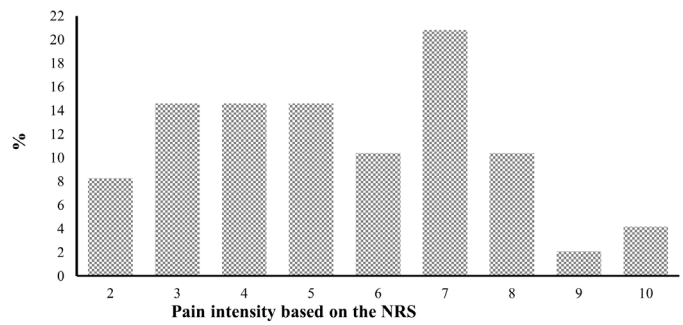

Figure 1: Bar graph illustrating the pain intensity based on the Numerical Rating Scale (NRS) as reported by participants experiencing occasional low back pain (n=48).

DISCUSSION

This study aimed to identify the prevalence of low back pain across different periods among CrossFit practitioners residing in Brazil and to characterize occasional low back pain in this population. Our results indicated occasional prevalence, 12-month prevalence, and lifetime prevalence rates of approximately 16%, 75%, and 90%, respectively. Among those with occasional low back pain, although we identified a median pain intensity corresponding to moderate intensity, less than 30% reported pain severe enough to cause functional limitations.

While other studies on injuries among CrossFit practitioners have been published, our study specifically focused on the prevalence of low back pain, marking it as a novel contribution. Furthermore, it included a representative sample with participants from all regions of Brazil, enabling a diverse demographic and contributing to robust findings. However, some limitations must be considered. The cross-sectional design of the study does not account for individuals who may have stopped practicing CrossFit due to severe low back pain complaints, potentially underestimating the true prevalence and intensity of occasional low back pain. Additionally, the retrospective nature of the data may introduce recall bias, particularly regarding the recollection of low back pain occurrences in the past 12 months. Conversely, individuals with a history of low back pain might have been more inclined to participate, which could potentially overestimate the prevalence data.

The occurrence of lumbar spine injuries has been extensively investigated in epidemiological studies on CrossFit-related injuries[20]. In these studies, the lumbar region is consistently among the most affected areas[21-23]. Our results suggest that the prevalence of low back pain among CrossFit practitioners is higher than that in the general population[5,10,24] and among elite athletes in sports that place considerable overload on the lumbar region[18], particularly regarding 12-month and lifetime prevalence rates. A study conducted with a large urban population cohort in Brazil reported occasional, 12-month, and lifetime prevalence rates of 9.8%, 48.1%, and 62.6%, respectively[24]. In a systematic review by Hoy et al.[9] on low back pain prevalence, which aggregated data from studies conducted in various countries, average occasional prevalence was found to be 18.3%, 12-month prevalence was 38.0%, and lifetime prevalence was 38.9%. Despite the observed differences, the cross-sectional design of this study does not allow for causal inferences between CrossFit practice and these findings, requiring caution in interpreting the results.

The frequent complaints of low back pain among CrossFit practitioners have been attributed to the high levels of stress placed on the musculoskeletal system. This stress may arise from performing complex movements with high repetition counts and an emphasis on speed, which could lead to unproper technique and subsequent injuries[25]. However, further studies are needed to investigate the role of technical quality and training intensity in the occurrence of frequent complaints, such as low back pain. Moreover, due to the variety of movement patterns and activities inherent to the modality, it is possible that practitioners are more aware of and attentive to potential discomfort during training, which could explain the high prevalence rates observed in this study.

Hopkins et al.[26] analyzed medical records of CrossFit practitioners hospitalized for low back pain complaints and found that, although most cases were managed conservatively, the average duration of symptoms exceeded six months. This underscores the importance of investigating low back pain complaints and the potential risk factors for its onset. In our study, we identified an association between age and the occurrence of low back pain in the past 12 months. Those who reported a history of pain had a lower median age compared to those who did not, suggesting that younger CrossFit practitioners need to be more mindful of potential discomfort in the lumbar and may benefit from preventive strategies. In the general population, the frequency of low back pain increases with age[9,24,27,28]. However, when athlete cohorts are analyzed, this association appears to differ across sports modalities[16,29-33].

In addition to age, lower weekly practice time was associated with the occurrence of lifetime low back pain. It is possible that individuals with higher weekly practice time develop better conditioning and are less likely to experience pain complaints. However, since weekly practice time was not associated with other prevalence periods, further studies are needed to clarify the true role of practice time in the onset of low back pain among CrossFit practitioners.

Finally, this study results revealed considerable prevalence rates of low back pain among CrossFit practitioners, emphasizing the importance of properly preparing coaches and sports medicine professionals to manage low back pain and implement preventive measures. As such, there is a continued need for longitudinal studies to gain a more comprehensive and reliable understanding

of the impact of low back pain in this population and its risk factors, guiding the development of precise preventive measures.

FINAL CONSIDERATIONS

We observed that the occurrence of low back pain was a frequent complaint among CrossFit practitioners, with occasional prevalence, 12-month prevalence, and lifetime prevalence rates of 15.5%, 75.1%, and 90.3%, respectively. Despite being common, occasional low back pain tended to exhibit moderate intensity and was not severe enough to limit participants' usual activities or alter their routines. Moreover, our results suggest that the prevalence of low back pain is higher compared to other forms of physical exercise, underscoring the need for specific attention to preventive strategies and management of the condition to maintain practitioners' well-being.

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