

Influence of walking and running on patellofemoral pain

Influência da caminhada e da corrida na dor femoropatelar

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Abstract - Due to the ease of its practice, walking / running can be performed in such a way that there is no adequate control or monitoring, resulting in the appearance of injuries, highlighting patellofemoral pain. Thus, the present study aimed to verify the levels of patellofemoral pain in walk / run practitioners. The sample consisted of 318 individuals, selected in a non-probabilistic manner, for convenience and adherence, including over 18 years old, both sexes, living in the state of Pernambuco, Brazil, who practiced walking / running. Data collection was performed using an online questionnaire on the google platform. Participants who agreed to participate answered a sociodemographic questionnaire, the International Physical Activity Questionnaire (IPAQ) and a subscale of patellofemoral pain and osteoarthritis of the KOOS questionnaire. Data were presented using descriptive statistics (mean and standard deviation), submitted to inferential statistics using Student's t test, ANOVA with Bonferroni's post hoc to show the effect of comparisons, considering a significance level of 5% ($p < 0.05$). There were no significant differences between the variables analyzed ($p = 0.599$; $ES = 0.06$), suggesting that there is no difference in patellofemoral pain in practitioners of walking / running between the sexes and different levels of physical activity; research with larger samples and monitoring of more variables, in the search for more assertive results, should be carried out.

Key words: Exercise; Patellofemoral Pain Syndrome; Running; Walking.

Resumo - Pela facilidade de sua prática, a caminhada / corrida pode ser realizada de forma que não haja controle ou monitoramento adequado, resultando no aparecimento de lesões, destacando a dor femoropatelar. Assim, o presente estudo teve como objetivo verificar os níveis de dor femoropatelar em praticantes de caminhada / corrida. A amostra foi composta por 318 indivíduos, selecionados de forma não probabilística, por conveniência e adesão, incluindo maiores de 18 anos, ambos os sexos, residentes no estado de Pernambuco, Brasil, que praticavam caminhada / corrida. A coleta de dados foi realizada por meio de questionário online na plataforma google. Os participantes que aceitaram participar responderam a um questionário sociodemográfico, o Questionário Internacional de Atividade Física (IPAQ) e subescala de dor patelofemoral e osteoartrite do questionário KOOS. Os dados foram apresentados através da estatística descritiva (média e desvio padrão), submetidos à estatística inferencial por meio do teste t de Student, ANOVA com post hoc de Bonferroni para mostrar o efeito das comparações, considerando nível de significância de 5% ($p < 0,05$). Não foi observada diferenças significantes entre as variáveis analisadas ($p = 0,599$), sugerindo que não há diferença no dor femoropatelar em praticantes de caminhada / corrida entre os sexos e diferentes níveis de atividade física; pesquisas com amostras maiores e monitoramento de mais variáveis, na busca por resultados mais assertivos, devem ser realizadas.

Palavras-chave: Exercício; Síndrome da Dor Patelofemoral; Corrida; Caminhada.

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INTRODUCTION

In general terms, health throughout the world undergoes constant changes according to the habits and customs of the population. In recent years, the search for physical exercise has increased for several reasons, among which we can mention the psychological, social, physical, in addition to personal fulfillment. From the sixties on, running started to be seen as beneficial to health and hence the surge in the number of runners and running events, with marathons receiving thousands of runners annually¹. In the ultramarathon races the number of finalists grew considerably between 1977 and 2008. In the 100-mile races in North America this growth is due to the increase in the number of runners over 40 and also women runners².

In Brazil there was a significant increase in the number of runners and also in the number of running events. The so-called São Silvestre race (the most traditional race in Latin America) had 30 thousand runners registered in 2014³. As reported by the study Sports Practices and Physical Activity in partnership with the Ministry of Sports⁴, walking and running are the second most practiced sports in Brazil, with 9.5 million practicing them, which accounts for 24.6% of the total⁴.

Due to the ease of its practice, walking / running can be performed in such a way that there is no adequate control or monitoring, variations in volume, intensity, frequency, besides biomechanical factors that can interfere in the appearance of injuries⁵. Medial tibial stress syndrome, tendinopathies, iliotibial band syndrome are some problems associated with the practice of those activities, most of which are due to overuse⁶.

Among the injuries, we prominently find patellofemoral pain, with high frequency among those who practice those sports, which is quite limiting, musculoskeletal being the most common problem that affects the joint⁷, which can evolve to degeneration of the articular cartilage, and even walkers, who have less intensity than running, can present these changes due to mechanical characteristics⁸.

Patellofemoral pain is a chronic condition, with insidious onset, characterized by peripatellar or retro patellar pain, its etiology being suggested by increased stress in the patellofemoral region in activities such as squatting, running, going up and down stairs, jumping, and sitting down for a prolonged period⁹. The intrinsic etiological factors are classified into local, distal and proximal, with local ones related to the patellofemoral joint, distal ones to the mechanics of the ankle and foot, and proximal ones to the hip and pelvis^{10,11}. The influence of pain can often be negative, leading runners to modify or cease the practice of the activity. However, lack of exercise can also be an important factor in the condition of pain¹².

Thus, walking / running can directly contribute to knee injuries⁶⁻⁸, such as patellofemoral pain, and tools that previously identify the presence of pain can help prevent injuries and, consequently, in previous interventions, optimizing physical performance. and impacting the adherence and maintenance of your practice.

This way, the present study aimed to verify the levels of patellofemoral pain in people who practice walking / running, identifying the differences between genders and levels of physical activity.

METHOD

Participants

It is a case of descriptive-type correlation survey¹³, designed to assess the levels of pain in walking / running patients. The sample consisted of 318 individuals, 52% of whom were women, who practiced walking or running. The selection of subjects was non-probabilistic, for convenience and adherence, which included individuals of over 18 years old, of both genders, who performed recreational walking or running at least 2 times a week, with a practice history of at least 6 months, living in the state of Pernambuco, Brazil. Participants who had reduced mobilization, neurological changes or any other complication that could influence the practice of walking / running were excluded from the research.

Procedures

The procedures adopted in this study met the standards of Resolution 466/12 of the National Health Council for research with human beings. The project was approved by the Committee of Ethics and Research on Human Beings (CAAE number 46978515.6.0000.5208).

Data collection was performed using an online questionnaire on Google. The survey link was sent via social networks to 100 race and gyms groups (between August and September 2020). Communication apps and social networks were used, reaching 48 cities in the state of Pernambuco, Brazil. Being adopted the selection of subjects for convenience and non-probabilistic adherence, in the perspective of reaching a larger number of participants. At first, the participants agreed to take part in the research, by accepting the terms of the Free and Informed Consent Form (ICF), with anonymity and confidentiality of the data being thus guaranteed. Then, participants answered the sociodemographic questionnaire (gender, date of birth, body mass, height, ethnicity, profession, state of birth and residence and level of physical activity), to characterize the sample. Then, they filled out the International Physical Activity Questionnaire (IPAQ)¹⁴, to identify the level of physical activity, and the Patellofemoral pain and osteoarthritis subscale of the KOOS questionnaire (KOOS-PF)¹⁴, to identify the levels of patellofemoral pain.

Instruments

The International Physical Activity Questionnaire (IPAQ) in its short version, validated for Brazil by Matsudo et al.¹⁴, was used to classify people according to the level of physical activity. It is an instrument with validity and reproducibility coefficients similar to those of other instruments, with the advantage of its short form being practical, quick and allowing surveys of large population groups¹⁴. Its short version consists of 6 questions in which patients inform how many days they performed a certain activity and the number of hours or minutes. For data interpretation we have the following: vigorous activity being practiced three or more times a week and more than 20 min per session; or moderate activity being practiced five or more times a week with more than 30 min per session; those who do not reach these parameters are considered insufficiently active.

For the functional evaluation of patellofemoral pain, the translated version of the KOOS-PF was used. This scale was validated by Crossley et al.¹⁵, and assesses whether there is influence in 3 aspects: stiffness, pain, and quality of life. These three aspects are divided into 11 items related mainly to pain during activities that overload the patellofemoral joint, including pain when squatting. A score of 100 indicates that the person does not have severe symptoms of patellofemoral pain and 0 indicates severe repercussions.

Data processing

The normality of the data performed by the Shapiro-Wilk test was not confirmed, but the data showed homogeneity, allowing to perform ANOVA. Data were presented using descriptive statistics (mean and standard deviation), submitted to inferential statistics using Student's t test. ANOVA was performed by purchasing gender and classifying the level of physical activity (vigorous, moderate, insufficiently active and physically active), with Bonferroni's post hoc to show the effect of gender and physical activity classification comparisons. Data were analyzed using SPSS software, version 20.0 (IBM, USA), considering a significance level of 5% ($p < 0.05$).

RESULTS

The sample consisted of 318 people from 48 of the 185 cities in the state of Pernambuco, with a participation of 32% of the cities in the state. Participants were, on average, 27.28 ± 9.61 years old, 52% of whom were women. The average age of women was 27.45 ± 9.44 years; average weight was 65.31 ± 16.40 kg; and average height was 162.95 ± 8.87 cm; men's average age was 27.64 ± 9.34 years old; average weight was 79.24 ± 16.25 kg; and average height was 175.26 ± 8.84 cm. Regarding the level of physical activity, it was observed that 54% of the participants practiced vigorous physical activity; 30% were insufficiently active and 16% practiced moderate physical activity. The KOOS-PF classification provided an average value of 81.39 ± 14.26 , with women having less pain 81.90 ± 17.53 compared to men 80.84 ± 17.99 . The entire sample is shown in Table 1.

Table 1. Sample characterization

Variable	Sample (n=318)	Men (n=153)	Women (n = 165)
Age (years) \pm SD	27.28 ± 9.61	27.64 ± 9.34	27.45 ± 9.44
Weight (kg) \pm SD	72.02 ± 12.04	79.24 ± 16.25	65.31 ± 16.40
Height (cm) \pm SD	168.63 ± 7.29	175.26 ± 8.84	162.95 ± 8.87
Vigorous physical activity / %	171 / 54%	98 / 64%	73 / 44%
Moderate physical activity / %	51 / 16%	19 / 12%	32 / 20%
Insufficiently active / %	96 / 30%	36 / 24%	60 / 36%
KOOS-PF classification (score) \pm SD	81.39 ± 14.26	80.84 ± 17.99	81.90 ± 17.53

Note. SD: standard deviation; KOOS-PF: patellofemoral pain and osteoarthritis subscale of the KOOS

By observing the indexes of patellofemoral pain, according to the level of physical activity, we did not observe any significant difference. Bonferroni's post hoc showed that between genders, the PA score classified as vigorous, moderate, insufficiently active and physically active are not different (Table 2).

Table 2. Differences in levels of patellofemoral pain (KOOS-PF) according to the level of physical activity (IPAQ).

Group	KOOS-PF Score Men (mean ± SD)	KOOS-PF Score Women (mean ± SD)	Δ (p)	P Bonferroni
Sample (n = 318)	80.84 ± 17.99	81.90 ± 17.53	1.06 (0.599)	1.000
Vigorous physical activity (n = 171)	80.89 ± 19.45	82.66 ± 16.14	1.77 (0.529)	1.000
Moderate physical activity (n = 51)	79.42 ± 21.76	80.97 ± 17.05	1.54 (0.755)	1.000
Insufficiently active (n = 96)	81.44 ± 16.66	81.48 ± 18.52	0.04 (0.992)	1.000

Note. SD: standard deviation; KOOS-PF: *patellofemoral pain and osteoarthritis subscale of the KOOS*.

Comparing patellofemoral pain, between the different levels of physical activity, we did not observe any significant difference, no showing any difference by Bonferroni's post hoc. Considering the group as a whole, the difference was 1.55%, only among men 1.83%, and only among women 2.09%. When we compare vigorous physical activity and insufficiently active ones, we obtain a difference of 0.22% in the whole group and 1.35% only among women favorable to vigorous physical activity. However, only among men, the insufficiently active individuals presented lesser symptoms (0.68%). The insufficiently active individuals had lesser symptoms in the entire study population, only among women and only among men when compared to moderate physical activity, the differences were, respectively, 1.33%, 2.53%, and 0.63% (Table 3).

Table 3. Comparison of patellofemoral pain (KOOS-PF) among different levels of physical activity (IPAQ).

Group	KOOS-PF (1) Score (mean ± SD)	KOOS-PF (2) Score (mean ± SD)	Δ (p)	P Bonferroni
VPA (1) – MPA (2) Comparison (Total)	81.65 ± 18.08	80.39 ± 18.46	1.25 (0.655)	1.000
VPA (1) – MPA (2) Comparison (Men)	80.89 ± 19.45	79.42 ± 21.76	1.47 (0.768)	1.000
VPA (1) – MPA (2) Comparison (Women)	82.66 ± 16.14	80.97 ± 17.05	1.69 (0.626)	1.000
VPA (1) – IA (2) Comparison (Total)	81.65 ± 18.08	81.46 ± 17.76	0.18 (0.936)	1.000
VPA (1) – IA (2) Comparison (Men)	80.89 ± 19.45	81.44 ± 16.66	0.55 (0.881)	1.000
VPA (1) – IA (2) Comparison (Women)	82.66 ± 16.14	81.48 ± 18.52	1.18 (0.695)	1.000
MPA (1) – IA (2) Comparison (Total)	80.39 ± 18.46	81.46 ± 17.76	1.07 (0.731)	1.000
MPA (1) – IA (2) Comparison (Men)	79.42 ± 21.76	81.44 ± 16.66	2.01 (0.702)	1.000
MPA (1) – IA (2) Comparison (Women)	80.97 ± 17.05	81.48 ± 18.52	0.51 (0.897)	1.000

Note. SD: standard deviation; KOOS-PF: *patellofemoral pain and osteoarthritis subscale of the KOOS*; VPA: vigorous physical activity; MPA: moderate physical activity; IA: insufficiently active.

DISCUSSION

Although the levels of patellofemoral pain were slightly lower in women, the results did not show significant differences ($p = 0.599$), suggesting that the practice of walking / running leads to similar stress in both genders. Boling et al.¹⁶ analyzed 1525 individuals (606 women and 919 men), with a prevalence of patellofemoral pain of 15.30% for women and 12.30% for men, with no significant difference between genders, i.e., similar results to the present study.

Similarly, Finnof et al.¹⁷ evaluating 98 running athletes (53 women and 45 men) showed that 60.00% of the individuals with patellofemoral pain were women, whereas 40.00% of the individuals (in other words, 2 out of 5) were male, presenting no significant differences between groups.

Showing a higher prevalence in women, Glaviano et al.¹⁸ analyzing orthopedic records, over a period of 5 years, found 2,188,753 individuals diagnosed with patellofemoral pain. Of those, the diagnosis was more common in women (55.00%).

Likewise, Tenford et al.¹⁹ assessing lifetime prevalence and risk factors for overuse injuries in long distance running athletes, with a total of 442 female and 306 male athletes, reported a prevalence of patellofemoral pain in high school runners of 21.00% in women and 16.00% in men during their lives.

There is no consensus on which gender has a higher prevalence of patellofemoral pain in runners, which has been shown to be similar in men and women^{15,16}, as the findings in the present study show. On the other hand, morpho functional (structure, imbalance of strength, daily and work activities) and hormonal (estrogen and relaxin) factors suggest a higher prevalence of patellofemoral pain in women¹⁸⁻²¹. The fact that the present study has only participants who practice recreational activities can justify the absence of a difference in patellofemoral pain between the genders.

Regarding physical condition, despite pointing out a slightly less pain in people who perform vigorous physical activity, there was no significant difference ($p = 0.655$) in the levels of patellofemoral pain at different levels of physical activity (vigorous physical activity, moderate physical activity, insufficiently active). Thijs et al.²² analyzing 84 military personnel during 6 weeks of running training, identified that only 36 individuals developed patellofemoral pain high physical efforts were not a predisposing factor to the development of patellofemoral pain. Likewise, Ramskov et al.²³ observing 629 beginner runners for 12 months in a high-structured walking and running program in which participants ran as much as they could over 1 year, identified that at the end of the period, only 24 participants developed patellofemoral pain, confirming that the practice of physical exercise had no statistical relationship with the development of patellofemoral pain, which corroborates the present study, since there was also no significant relationship between the level of patellofemoral pain among people who reported practicing physical activity.

Similarly, Witvrouw et al.²⁴ analyzing 282 students participating in competitive sport for 2 years, showed that patellofemoral pain was diagnosed in 09.00% of the students. No significant difference was found in the amount of external sports activities practiced among students who had and did not have patellofemoral pain.

Evidence of worse pain in more active people, Briani et al.²⁵, evaluating women with and without patellofemoral pain, divided into groups according to levels of physical activity practiced (vigorous and moderate), found that women with patellofemoral pain who practiced activity vigorous physical activity presented worse pain levels, when compared to those who practiced moderate physical activity. Corroborating this, in the study by Duvigneaud et al.²⁶, in a military training program for 6 weeks, with 62 healthy recruits, it was observed that 42.00% developed patellofemoral pain. On the other hand, Glaviano et al.¹² verifying 2 groups (physically active and insufficiently active) with 20 individuals each, all of whom are runners, identified higher levels of patellofemoral pain in insufficiently active people.

Accompanying the findings regarding gender, there is also no agreement regarding the different levels of physical activity in relation to the presence of patellofemoral pain in runners, where studies indicate that the level of activity can influence^{11,24,25} and others cannot²²⁻²⁴, in accordance with the results of the present study. According to the literature²⁷⁻²⁹, factors such as overload, volume and intensity of training, environmental conditions, surface and type of footwear are suggestive of higher levels of patellofemoral pain in runners.

However, such variables were not measured in the present study, which included only recreational participants. Thus, this study limitation may contribute to the absence of difference between levels, suggesting studies with more controlled variables in order to determine how much the degree of training can contribute to patellofemoral pain / discomfort.

CONCLUSION

The present study suggests that there is no difference in patellofemoral pain in people who practice walking / running between genders and different levels of physical activity, corroborating other findings. However, factors such as biomechanics, type of training, volume, intensity, environmental conditions, types of footwear and biological individuality can influence the findings. However, these factors were not controlled in this research. In this way, we suggest further studies on the theme, using larger samples and monitoring more variables, in the search for more assertive results.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee – and the protocol (CAAE number 46978515.6.0000.5208) was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: SCAS, BEC, WRS, WRS. Performed the experiments: SCAS, BEC, WRS. Analyzed the data: WRS, WRS. Contributed reagents/materials/analysis tools: SCAS, BEC, WRS. Wrote the paper: SCAS, BEC, WRS, WRS.

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