

RELATIONSHIP OF FEMALE BREASTS TO PHYSICAL ACTIVITY, EXERCISE AND SPORT - PART 1

RELAÇÃO DAS MAMAS FEMININAS COM A ATIVIDADE FÍSICA, EXERCÍCIO E ESPORTE - PARTE 1

RELACIÓN DE LAS MAMAS FEMININAS CON LA ACTIVIDAD FÍSICA, EL EJERCICIO Y EL DEPORTE - PARTE 1

REVIEW ARTICLE
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ABSTRACT

Introduction: The women are increasingly seeking to be physically active or even choose sports as their professional activity as in the years, the number of Summer Olympic athletes has equaled that of men. Due to this growing female participation in sports, the study of female and male differences has become increasingly relevant in the involvement of the academic world. **Objective:** A review on this subject, stimulating more research, and making knowledge reach more women is a major objective of this literature review. We understand that more studies are needed to understand pathophysiology, prevention, and treatment. **Methods:** The study design was a retrospective narrative review of the relationship between breasts and physical activity, exercise, and sports. **Results:** Several anthropometric and physiological differences have been established; however, the volume and shape of the female breast is peculiar but still little studied. The specificity of female breasts are conditions that can exert sports performance and contribute to distancing women from physical activity practice. **Conclusion:** Possible conditions of female breasts in sports are exercise-induced mastalgia, breast injury, nipple injury, pregnancy, and many others. We understand that more studies are needed to understand pathophysiology, prevention, and treatment. **Level of Evidence II; Retrospective Narrative Review.**

Keywords: Breast; Physical Activity; Exercise; Sports; Sports Performance.

RESUMO

Introdução: As mulheres estão cada vez mais buscando ser fisicamente ativas e até escolhendo o esporte como sua atividade profissional, pois, nos últimos anos, o número de atletas olímpicas de verão equiparou-se ao dos homens. Devido a essa crescente participação feminina nos esportes, o estudo sobre as diferenças entre homens e mulheres tem se tornado cada vez mais relevante no âmbito acadêmico. **Objetivo:** Uma revisão sobre esse assunto, estimulando mais pesquisas e fazendo com que o conhecimento chegue a mais mulheres constitui o principal objetivo desta revisão da literatura. **Métodos:** O desenho do estudo foi uma revisão narrativa retrospectiva da relação entre mamas e atividade física, exercícios e esportes. **Resultados:** Várias diferenças antropométricas e fisiológicas foram estabelecidas; entretanto, o volume e a forma da mama feminina são peculiares, mas ainda pouco estudados. A especificidade das mamas femininas é um fator que pode prejudicar o desempenho esportivo e contribuir para afastar as mulheres da prática de atividade física. **Conclusão:** As possíveis condições das mamas femininas no esporte são mastalgia induzida pelo exercício, lesão mamária, lesão do mamilo, gravidez e muitas outras. Entendemos que são necessários mais estudos para compreender a fisiopatologia, a prevenção e o tratamento. **Nível de Evidência II; Revisão Narrativa Retrospectiva.**

Descritores: Mama; Exercício Físico; Exercício; Esportes; Desempenho Esportivo.

RESUMEN

Introducción: Cada vez son más las mujeres que buscan ser físicamente activas e incluso eligen el deporte como actividad profesional, ya que en los últimos años el número de atletas olímpicas de verano ha igualado al de los hombres. Debido a esta creciente participación femenina en el deporte, el estudio de las diferencias entre hombres y mujeres se ha vuelto cada vez más relevante en el ámbito académico. **Objetivo:** Realizar una revisión sobre este tema, estimular nuevas investigaciones y hacer que el conocimiento llegue a más mujeres constituye el principal objetivo de esta revisión bibliográfica. **Métodos:** El diseño del estudio fue una revisión narrativa retrospectiva de la relación entre mamas y actividad física, ejercicio y deporte. **Resultados:** Se han establecido varias diferencias antropométricas y fisiológicas; sin embargo, el volumen y la forma de la mama femenina son peculiares, pero aún poco estudiados. La especificidad de las mamas femininas es un factor que puede perjudicar el rendimiento deportivo y contribuir a alejar a las mujeres de la actividad física. **Conclusión:** Las posibles afecciones de las mamas femininas en el deporte son la mastalgia inducida por el ejercicio, las lesiones mamarias, las lesiones del pezón, el embarazo y muchas otras. Entendemos que se necesitan más estudios para comprender la fisiopatología, la prevención y el tratamiento. **Nivel de Evidencia II; Revisión Narrativa Retrospectiva.**

Descriptorios: Mama; Ejercicio Físico; Ejercicio; Deportes; Rendimiento Deportivo.



INTRODUCTION

The practice of physical activity, physical exercise, or sport should be part of the routine of the human being for health promotion, prevention, and disease control. The World Health Organization has launched a target to reduce physical inactivity rates worldwide by 10% by 2025, and there is evidence that women are less physically active than men.^{1,2}

Given the circumstances, it is expected that the number of women practicing will grow, a fact that has already been observed, for example, in Brazil and other countries, also reinforced by other data such as the number of female athletes increasingly close to 50% participating in the Summer Olympics, the largest high-performance sporting event in the world.²⁻⁴

For these numbers to increase and for women who are already practicing to remain physically active, inherent and specific factors of the female sex related to the practice of physical activity, physical exercise, or sport must be addressed, as there are factors that can negatively impact both the decision to start practicing and lead to its abandonment, and thus possibly contribute to physical inactivity and a discrepancy between females and males in this relationship.⁵

Among the factors influencing this relationship, the different physical characteristics between the sexes play an important role. A very individual physical characteristic of the female sex is the breasts. Despite receiving increasing attention from the medical and scientific community, there is still a need to understand and detail the relationship between the female breast and human movement, especially in physical activity, exercise, and sport.^{5,6}

In this context, a brief review showing what is available in the medical and scientific literature so far will add important value to discussing and understanding the relationship of female breasts with the practice of physical activity, physical exercise, and sports, the influence of each topic involved with this theme, to direct the resolution of unresolved problems and optimization of issues with potential for improvement, dissemination of information on the subject to the general population and health professionals so that they can address the subject, and thus women are increasingly inserted in the physically active population and maintaining long-term practice.

PRESENTATION AND DISCUSSION

The 20th century saw great growth in society's acceptance of female athlete. Given the need for public strategies to encourage better levels of physically active women, breast-related problems, therefore, deserve attention.

Exercise-induced mastalgia

Mastalgia affects day-to-day activities, including physical activity, exercise, and sports. Mastalgia is a problem for many physically active women, and this discomfort in the breasts during exercise can come from childhood and adolescence, justifying the need and importance of establishing the relationship between mastalgia and physical effort since mastalgia related to effort can be a barrier to the practice of physical exercise, with breast records being considered a barrier to practice with published data ranging from 17% to 46%.⁷⁻¹⁴

The breasts contain limited anatomical support,⁷ with projections of the superficial mammary fascia crossing the retro-mammary space to fuse with the fascia of the pectoralis major muscle, forming the posterior suspensory ligaments of the breasts, which connect the mammary glands to the overlying skin.¹⁵ Although there are no true ligaments, they maintain the position of the breasts, and as the breasts have no muscle tissue to provide support, these weak structures provide the breasts with only primary support.¹⁴

This lack of effective intrinsic support leads to excessive breast movement during physical activity¹⁰ concerning the trunk,¹⁶ causing pain and being described by some authors as exercise-induced mastalgia. As the magnitude and frequency of breast sway increases with movement, mastalgia occurs.^{10,16} The hypothesis for the etiology of this pain is that the increased tension of the structures and fascia leads to stretching.^{7,10,13,17}

Although not associated with pain, breast sway alone during exercise can be a problem, as shown by a study of 2089 school-aged women with a prevalence of 38%.¹⁸ Recently, a publication described that poor study designs and inadequate assessment methods limit available research on exercise-related breast biomechanics.¹⁹

Although the hypothesis makes sense and is the most widely accepted, it is necessary to attest causality so that it is effectively proven that this biomechanical movement of breast swing is what causes exercise-induced mastalgia, and if it is, if it is the only pathophysiological factor because, with the integral understanding, it will be more effective to approach exercise-induced mastalgia.

The prevalence of mastalgia in physically active women varies in the literature. In ascending order, 19% prevalence was described in 319 participants of 10-kilometer and marathon races.²⁰ In Another publication with 2089 school-aged girls, 30% had sports-related breast pain,¹⁸ similar prevalence to a study with 1285 marathon runners of 32% during the 2012 London marathon.⁷ Two other studies with similar prevalence were 1265 women who rode horses with a prevalence of 40%¹¹ with a study of 239 women from the general population of 41%.¹⁰ The sample with 540 athletes from 49 different sports, the prevalence was 63%.¹⁶

One of the authors further proposed that data from elite athletes may not represent the breast movement and pain experienced by the general population, as breast movement and mastalgia differ between different sports,¹⁶ which may explain the difference in mastalgia prevalence. Studies should increasingly target the prevalence of each exercise and sport at the most varied levels of practice to make a possible association between modality and association with mastalgia and level of practice and association with mastalgia.

Exercise itself was described as the most prevalent factor in mastalgia,¹⁰ accounting for 14% in one sample⁷ and being a cause of mastalgia exacerbation in 33%¹⁶ and worsening in 32% by physical activity/sport in other samples.²¹ One fifth during exercise⁷ and almost half during training and competition¹⁶ effectively show that there is an association of exercise with mastalgia. Some explanations may justify these data.

The sporting gestures described that triggered mastalgia were jumping (82%), running (77%), and landing (66%).¹⁶ One study describing a sporting gesture specific to the sport of horse riding that caused mastalgia was the sitting trot,¹¹ one of many gestures in the sport. It is complex to develop strategies to act out specific sports gestures or even alter them, as they can not only interfere with performance but also mischaracterize the sport and exercise, so more studies are needed to understand how an effective approach can be established to at least decrease breast pain during exertion can be achieved.

Another possible explanation may be the association of cyclical mastalgia, another etiology of mastalgia, with exercise. In an investigation of 6812 adult women in the reproductive phase and not taking contraception, recruited by an exercise app, mastalgia, and breast tenderness was the third most common symptom related to the menstrual cycle, with 83.1% of the sample.²²

In physically active women from the general population, 63% experienced breast pain associated with the menstrual cycle.¹⁶ Although the hypothesis that breast movement causing exercise-induced mastalgia could have a compounding effect with cyclic mastalgia was refuted by one study,¹⁷ it would be prudent to replicate further studies to understand

the relationship of exercise-induced mastalgia with cyclic mastalgia, even if there is in fact no compounding effect. Severity certainly needs to be related to whether exercise leads to or exacerbates mastalgia.

Data show 74% of a sample reporting some level of suffering from mastalgia, with 52% reporting the severity as uncomfortable and 8% as excruciating,⁷ similar to 56% and 8% respectively from another publication.¹¹ 44%⁷ and 20%²¹ of women, have not taken any measures to relieve the pain or report not having found a solution.

It is possible that even if exercise-induced mastalgia occurs, certain severities are tolerated, and training/competition is undertaken or that exercise-induced mastalgia, even at lower intensities, is a reason for not participating in sport. Probably, this threshold needs to be detected individually if it really exists.

It is also important to identify other variables in addition to those already identified, always in the context ranging from ordinary physically active women to high-performance athletes, so that mastalgia does not occur during physical exercise/sport during training/competitions or that it does not exacerbate/worsen the condition. Even physical activity, in general cannot be neglected either.

Considering sexual physical activity, 41% of a sample presented mastalgia during the act²¹ and police officers who perform strenuous physical activity specific to the profession also reported breast pain,²³ so daily and work-related physical activities deserve attention and research direction as much as physical exercise and sport, which are more researched.

Exercise-induced mastalgia, like other aetiologies of mastalgia, does not have pharmacological management as a first line of treatment and is therefore also a gap to be filled in the literature. Articles cite Danazol and Tamoxifen^{7,9,24} as an alternative, but these are medications that are listed by the World Anti-Doping Agency (www.wada-ama.org)²⁵ and are contraindicated in women subject to anti-doping testing, and these medications are often described as having only temporary relief and possible adverse effects.

It is necessary to establish whether there is effectiveness of these and any other pharmacological treatments for mastalgia. Targeting strategies and effective treatment will enable practice and decrease mastalgia. Strategies such as educational measures should be implemented, as knowledge about breast health increases levels of physical activity and reduce barriers to sports practice.

In one publication, 87% of the sample reported that they would like more education regarding breasts.¹⁸ Disseminating the topic of exercise-induced mastalgia to all physically active women will bring about a broad discussion and wealth of information so that this visibly common issue does not go unrecognized, and when it does occur, physically active women can count on adequate assistance.

In order to simplify the name and strengthen the topic so that more studies are published, and it reaches more women, we suggest that the term 'exercise-induced mastalgia' be replaced by 'athletic mastalgia', referring to non-cyclical breast pain caused by physical activity, exercise or sport.

Performance, intensity, and duration

Discomfort and pain in the breasts can be a hindrance to performance.¹⁴ Reports of mastalgia hindering performance are 17%,⁷ 20%¹⁶, and 21%.¹¹ All athlete-related professionals should be alert to the negative potential of mastalgia on sports performance.¹⁶

There is clearly a huge gap to be filled in assessing the negative impact that mastalgia has on performance. Although exercise-induced mastalgia should be treated as a public health problem, performance deserves attention. Investigations in high-performance sport and elite athletes are known to receive attention from scientific research when a factor that interferes with performance is identified, it may be an

opportunity for scientific research field to take advantage of and seek more information and answers on how and how much mastalgia negatively impacts performance.

Breast pain may increase with more vigorous intensities.¹⁰ Vigorous exercise was more related to mastalgia compared to moderate exercise, with 54% and 64%⁷ and 49% and 78% respectively.¹⁰ A quarter of participants who experienced mastalgia decreased their exercise intensity, and a fifth stopped training due to mastalgia. 15% decreased the duration, in addition to other measures such as performing other activities or rescheduling training being cited.⁷

Another publication showed that 24% of participants also reported reducing physical activity (stopping, relaxing, resting, lying down) to reduce breast pain.¹⁰

Interestingly, one study related low intensities, classified by them as between 1 and 10 miles of running per week, with a higher incidence of breast pain, and as there was an association with breast size, it was hypothesized that possibly women with larger breasts do not become long-distance runners due to the greater movement that can lead to pain,²⁰ which is in line with women with large breasts and hypertrophic breasts participating less in vigorous physical activities compared to those with smaller breasts, as well as those with smaller breasts spent significantly more time practicing physical activity compared to those with hypertrophic breasts.⁸

Training load variables such as duration and intensity, and possibly even frequency of practice, with indirect evidence of association with mastalgia, should receive studies determining each of these variables in isolation, because, in addition to understanding the magnitude and influence of each one individually in relation to mastalgia, they can direct training load control as an approach strategy.

Breast size

Breast size is related to mastalgia⁷ and should be interpreted as a potential barrier for women to participate in physical activity^{8,13} and be considered a cause of exercise intolerance.²⁶

Larger breasts are more likely to have breast pain than smaller breasts,²⁷ with a 13% higher prevalence of mastalgia in women with larger breasts compared to women with smaller breasts.¹⁷ Some studies cite increased bra size as a link to mastalgia,^{7,11} which indirectly associates breast size.

Women with large breasts experience greater breast movement. In one sample, 15% of girls reported that their breasts were too large to exercise and were a determining factor for non-participation in sports in 63% of school-aged girls aged 11-18 years with larger breasts, compared to 45% with smaller breasts.¹⁸ Another publication of 355 women was divided into 4 groups in relation to breast size quantified by 3D Scan, being small (less than 350ml), medium (350-700ml), large (701-1200ml), and hypertrophic (above 1200ml), and the groups were compared.⁸

Those with hypertrophic breasts participate less in total physical activity per week, with 58% reporting that either currently or in the past, their breast size affected their level and participation in physical activity and running was the activity that was most affected by breast size, 21% of the sample, but activities with jumping and leaping such as dancing, team sports were also identified as a problem for women with larger breast sizes.⁸

Obesity is a factor that increases breast volume.^{9,28} In a study of asymptomatic (no mastalgia) and symptomatic women with breast pain, body mass index was significantly lower in asymptomatic women,⁷ and another sample of marathon runners compared to women in the general population, marathon runners were significantly lighter and had a lower prevalence of mastalgia.¹⁷

Therefore, it is necessary to associate whether body mass is really directly associated with mastalgia.¹¹ In the study that classified breasts, 76% of patients with hypertrophic breasts were obese by body mass index classification, and this population tends to participate less in physical activities compared to non-obese patients.⁸

With direct quantitative measurement, control group, and intervention studies could be designed to establish this relationship. Even if there is still no evidence, effective measures are needed in women with large breasts so that they are included in the context of physical exercise and sports to enjoy the health benefits.

Sports bra

Invented in 1977, "the sports bra revolutionized support for the defining anatomical features of the mammalian class and paradoxically brought freedom to women athletes of all sizes and shapes to participate in the sports unexpected a few years earlier".²⁹

Breast discomfort in female athletes can be reduced or prevented by using a proper bra shape that supports the breast tissue and minimizes exercise-induced breast movements.¹³

Lower prevalences of mastalgia have been related to greater sports bra use,¹⁷ so the simple advice of using the right sports bra benefits women to reduce exercise-induced mastalgia.^{10,11,21} Publications show it is the most commonly used method to relieve mastalgia.^{7,10,21} This intervention showed 85% relief in mastalgia when using the right sports bra and correctly in one study,³⁰ in addition to not compressing, it generates better breast comfort over a conventional sports bra.³¹

It is possible, however, that the sports bras available still do not meet the specific demands among the different modalities in which women who participate due to the variety of sport-specific movements and their long hours of training and competition do not sufficiently reduce excessive breast movement, in some they need to be specific to the movement that the athlete will perform.^{11,16}

In one sample, 10% reported that inadequate bra fit and no optimal support increased mastalgia during marathon running,⁷ going in line with another in which 23% reported poor bra fit and inadequate support also worsening mastalgia in 21%.¹⁰

At least one bra-related issue was reported by 59% of the sample, the most common being friction, chafing, and bra sinking into shoulders¹¹ and may bring an extra problem beyond the mastalgia issue. "I can't find the right sports bra" was the most cited problem in one of the publications.¹⁰

It is also possible to wonder whether the sports bra is unknown as a method to relieve or treat mastalgia.⁷ The sports bra was the most frequent device used by women during horseback riding, but only 14% of women with small breasts and 19% of women with large breasts used sports bras exclusively for riding.¹¹ In police officers, who perform physical activity for their profession, the sports bra was the second most used type of bra during the shift, 17% of the sample.²³

In a population of children and adolescents, these figures are even lower; only 10% of girls in the age range 11 to 18 years always wore a sports bra during exercise and sport, and over 50% never wore a sports bra.¹⁸

The topic of sports bras needs to be discussed among the most varied types of physical activity, physical exercise, and sport disciplines practiced in order to reach all women. This is confirmed because, in high-performance athletes in a sample, 90% of the participants reported always using a sports bra^{32,33} and in a race, 91% of marathon runners reported always using it.⁷ When compared to women in the general population, marathon runners wear significantly more sports bras during practice than the general population, which was 32.1%.¹⁷

Only 5.1% of the marathon runners reported never having worn a sports bra.¹⁷ The use of sports bras during practice was related to being

able to perform more vigorous and moderate intensities compared to those who did not wear them,¹⁰ so it is possible that not wearing a sports bra may represent one of the difficulties of not practicing sports in certain modalities in the general population because of not being able to meet the demands of the training performed.

Initiating educational measures to direct women to choose the appropriate sports bra, fitting the breasts in a supportive manner is accurate,^{7,8} increasing knowledge about breast health and consequently increasing levels of sports bra use.¹⁰

In elite athletes, the sports bra appears to cater for movement specifically of their sport to reduce the occurrence of mastalgia impact in this population¹⁶ and any negative impact on performance that can be addressed by wearing the appropriate sports bra should be encouraged.

One group that deserves special attention with educational measures regarding the appropriate sports bra are women with larger breasts, with sports bras better developed for sufficient support,⁸ the need for this adequate support in these women being already well established.¹¹

Finally, the low use of sports bras in school-aged girls shows the opportunity for education on the subject in school-aged girls¹⁸ and perhaps even more important than in adults if long-term health strategies are to be considered to reduce breast issues associated with physical activity, exercise, and sport.

These two points of dissemination of information on the sports bra as a method of action against mastalgia seem critical, with sports bras suitable according to what the woman exercises or practices. There is scope for discussion in the literature to assess whether sports bras currently meet the demand for each specific breast, and a need to test for causality with control and intervention study designs.

The scope of our article chose to discuss the general clinical aspects in relation to breasts and physically active women. The recommendation for change cited is the sports bra is every 6 months.^{13,28}

Physical exercise as a treatment for mastalgia

There is a classification of mastalgia divided into 3 categories, cyclic mastalgia, non-cyclic mastalgia (in which exercise-induced mastalgia is included), and extra-mammary mastalgia.^{9,24} Treatment studies of mastalgia in the literature propose lifestyle change, which physical activity, exercise, and sport are part of.^{9,17,24}

In a study with an intervention group containing 20 women training 3 times a week for 6 weeks, there was a significant improvement in relation to the visual sensory analog scale in relation to mastalgia compared to the control group.⁹ In 1659 women from the general population, with a 52% prevalence of mastalgia, higher physical fitness and physical activity levels were associated with lower prevalence of breast pain,²¹ in agreement with another study that compared 234 marathon runners with 234 women from the general population matched by age revealing a significantly lower prevalence of breast pain in the marathon runners cohort, being 32.1% compared to 43.6% respectively, and the lower prevalence may be related to the amount of increased physical activity.¹⁷

There is a publication showing that 80% of women with breast pain did not exercise regularly, showing that low levels of physical activity were a significant factor in the clinical history.³⁴ Exercise can be implemented as an effective strategy and treatment of breast pain and recommended safely by clinicians^{9,21} and should be in the prescription of women with this symptomatology due to its potential therapeutic mechanism.

There, therefore, appears to be a need to correctly establish the diagnosis of the etiology of mastalgia. On the one hand, it appears that mastalgias other than those induced by exercise benefit from physical exercise as a non-drug therapeutic tool. This field of research certainly deserves further exploration and investigation by the medical community.

On the other hand, there is exercise-induced mastalgia, which unacceptably causes women to stop exercising/sports.

No woman should stop being physically active because of exercise-induced mastalgia. For this to happen, more information, comprehensive understanding, adequate attention and support, and the search for effective interventions, so that if this problem is not totally solved, it is at least mitigated to the maximum to the point that women can enjoy the benefits of physical exercise brings health.

CONCLUSION

It is clear that exercise-induced mastalgia is a reality at all levels of practice and training modalities other than physically active women.

Considering the negative impact on sports performance and the possible barrier to keeping the population of women physically active, simple interventions such as disseminating information on the subject, adjusting

adequate training load and the appropriate sports bra according to the breasts, in addition to explaining that physical exercise itself can be implemented as a therapeutic tool, can contribute to minimizing these complications.

We emphasize the suggestion of a simple denomination, in which we suggest athletic mastalgia, so that we can delve deeper into the topic, making more and more women aware to seek help. Ceasing to be physically active or any negative impact on training due to breast-related problems should become unacceptable.

We identified the existence of other topics on the relationship of breasts with physical activity, exercise, and sport in addition to mastalgia, and these topics will be addressed in future publications as we will continue with this review to bring more data and provide information about these important issues that were not discussed here.

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