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**Prevenção de lesões no futebol
feminino brasileiro: uma pesquisa
sobre percepções e práticas nos
clubes de elite**

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Prevenção de lesões no futebol feminino brasileiro: uma pesquisa sobre percepções e práticas nos clubes de elite

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RESUMO

Objetivos: Descrever as atuais percepções e práticas relacionadas à prevenção de lesões em clubes de elite de futebol feminino no Brasil.

Desenho do estudo: Estudo observacional transversal.

Ambiente de pesquisa: Pesquisa online.

Participantes: Fisioterapeutas de 32 clubes de elite de futebol feminino brasileiro.

Principais medidas de resultado: Questionário estruturado.

Resultados: Os fisioterapeutas elencaram “retorno ao esporte após lesão”, “carga de trabalho muito alta”, “lesão prévia”, “sono/repouso inadequados” e “déficit de força/potência muscular” como os cinco principais fatores de risco de lesão. “Seguir os critérios de retorno ao esporte após lesão” foi quase unanimemente classificado como uma estratégia preventiva muito importante. A percepção em relação ao nível de importância de outras estratégias preventivas foi mais divergente. Pelo menos dois terços dos clubes adotaram as seguintes avaliações para triagem de risco de lesão: “avaliação da composição corporal”, “avaliação da amplitude de movimento articular”, “testes de salto vertical”, “testes de equilíbrio dinâmico”, “testes de salto horizontal”, “testes de capacidade aeróbica” e “teste de descida do degrau ou agachamento em uma perna”. A maioria dos clubes aplicou intervenções baseadas em exercícios de múltiplos componentes para prevenção de lesões. Além disso, “seguir os critérios de retorno ao esporte após lesão”, “monitoramento da carga interna de trabalho”, “uso de modalidades de recuperação pós-exercício”, “avaliações de fatores de risco na pré-temporada” e “uso de bandagem rígida” foram estratégias de prevenção usadas por pelo menos três quartos dos clubes participantes.

Conclusão: Este estudo proporcionou insights sem precedentes sobre as percepções e práticas de prevenção de lesões implementadas nos clubes de elite do futebol feminino.

Palavras-chave: futebol, mulheres no esporte, prevenção de lesões.

ABSTRACT

Objectives: To describe the current perceptions and practices concerning injury prevention within elite women's football clubs.

Design: cross-sectional study.

Setting: Online survey.

Participants: Physiotherapists from **32 Brazilian elite women's football clubs**.

Main outcome measures: Structured questionnaire.

Results: Physiotherapists perceived '*early return to sport after injury*', '*workload too high*', '*previous injury*', '*poor sleep/rest*' and '*muscle strength/power deficit*' as the top-five injury risk factors. '*Follow return to sport criteria after injury*' was almost unanimously ranked as a very important preventive strategy. Perception regarding the importance level of other preventive strategies was more divergent. At least two-thirds of clubs adopted the following assessments for injury risk screening: '*body composition evaluation*', '*joint range of motion evaluation*', '*vertical jump tests*', '*dynamic balance tests*', '*horizontal jump tests*', '*aerobic capacity tests*', '*step-down test or single leg squat*'. Most clubs applied multi-component exercise-based interventions for injury prevention. In addition, '*follow return to sport criteria after injury*', '*internal workload monitoring*', '*use of post-exercise recovery modalities*', '*risk factor assessments at the preseason*', and '*use of rigid strapping tape*' were prevention strategies used by at least three-quarters of the participant clubs.

Conclusion: This study provided unprecedented insights into the perceptions and injury prevention practices implemented within elite women's football clubs.

Keywords: soccer, women in sport, injury prevention.

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LISTA DE ABREVIATURAS E SIGLAS

FIFA	Fédération Internationale de Football Association
CBF	Confederação Brasileira de Futebol

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1 CONTEXTUALIZAÇÃO

O futebol é o esporte mais popular do mundo (Arliani et al., 2014). Na última década é notório o crescimento do futebol feminino, a modalidade está despertando cada vez mais o interesse de torcedores, patrocinadores, emissoras, ligas e clubes historicamente masculinos (FIFA Benchmarking Report Women's Football, 2021). Em 2023, a Copa do Mundo de Futebol Feminino, que acontece na Austrália e Nova Zelândia, se tornou oficialmente a edição mais assistida na história do evento. Segundo a FIFA, as vendas de ingressos já ultrapassam a marca de 1,5 milhão estabelecida pela edição da França em 2019. O recorde foi alcançado em apenas cinco dias após o início do torneio, que já estreou com uma pré-venda de mais de 1,1 milhão de ingressos. Em todo o mundo, a Fifa espera recorde de audiência com que cerca de 2 bilhões de pessoas assistindo às transmissões dos jogos.

A ascensão do futebol feminino e o aumento da sua popularidade também auxiliam a expandir o incentivo à modalidade. As associações nacionais europeias (*Fédération Internationale de Football Association 2019 Women's Football Strategy*) ampliaram seus recursos financeiros para o futebol feminino, isso representa um aumento de 50 milhões de euros investidos em programas voltados para jogadoras de base na última década, acrescentando a pretensão de um aumento das taxas de participação de mulheres no futebol chegando à 60 milhões até 2026 (Mayhew et al., 2021). O investimento financeiro e o número de praticantes de futebol feminino alavancando, é possível observar que as exigências de jogo, competitividade e intensidade nas partidas de futebol também aumentaram significativamente (FIFA, 2019). Como resultado desses requisitos físicos mais rigorosos, somados à probabilidade de contato físico direto e indireto, as jogadoras de futebol feminino estão intrinsecamente expostas a um crescente risco de lesões (Lopez-Valenciano et al., 2021, Rodríguez et al., 2018).

No contexto do futebol profissional, as lesões representam um grande problema para os atletas e para os clubes. Em média, um jogador de elite do futebol masculino europeu permanece 37 dias da temporada afastado do esporte por esse motivo (Ekstrand et al., 2011). Esse período de ausência dos atletas causa um impacto negativo sobre o desempenho da equipe (Häggglund et al., 2013) e um considerável prejuízo financeiro ao clube (Ekstrand et al., 2013). As

lesões também têm o potencial de atrapalhar significativamente a carreira dos atletas, chegando em muitos casos a ser o principal motivador para a aposentadoria dos mesmos (Drawer & Fuller., 2001), além de deixar sequelas que reduzem a capacidade funcional e qualidade de vida dos atletas por muitos anos após a aposentadoria (Cunningham et al., 2020).

A taxa de lesões no futebol profissional masculino é de aproximadamente 3,7 lesões a cada 1.000 horas de exposição em treinamento e 36 lesões a cada 1.000 horas de exposição em jogos (López-Valenciado et al., 2020). Apesar da escassez de estudos epidemiológicos no futebol profissional feminino, uma análise recente e robusta que reportou que as jogadoras profissionais de futebol feminino sofrem 5,63 lesões a cada 1.000 horas de exposição (Horan et al., 2022). Embora as taxas de lesões no futebol masculino sejam mais altas, as atletas de futebol feminino possuem maior incidência de lesões graves. (Roos et al., 2017).

Diante desse cenário de um elevado índice de lesões graves e que acarretam uma série de consequências negativas para as atletas e clubes de futebol feminino, a prevenção de lesões específica para o futebol feminino é um dos tópicos de destaque da medicina esportiva contemporânea (Bolling et al., 2018).

Pesquisadores de diferentes partes do mundo têm desenvolvido estudos para avaliar a eficácia de diferentes estratégias comumente adotadas por clubes de futebol com o intuito de prevenir lesões nos atletas. Nesse sentido, podemos citar as avaliações na pré-temporada (Ribeiro-Alvares et al., 2020), o monitoramento da carga de trabalho (Bowen et al., 2020), o monitoramento de fatores de risco (Wollin et al., 2020), as modalidades de recuperação pós-exercício (Altarriba-Bartes et al., 2020) e as diferentes intervenções baseadas em exercícios (McCall et al., 2020), entre outras. Apesar do crescente corpo de evidências acerca da efetividade de diferentes estratégias de prevenção, a eficácia de programas de prevenção de lesões baseados em exercícios em jogadores de futebol não é consensual (Lemes et al., 2021; Obërtinca et al., 2023). No contexto específico do futebol feminino, há uma evidência limitada de que programas de prevenção baseados em exercícios contribuem para a redução das lesões em geral. (Crossley et al., 2020). Além disso, uma pergunta recorrente é o quanto o avanço científico nessa área tem sido capaz de modificar a atuação dos profissionais de saúde no “mundo real” do futebol profissional.

O estudo de McCall et al (2014) foi a primeira investigação desenvolvida com o objetivo de verificar as percepções e práticas relacionadas à prevenção de lesões adotadas por profissionais que integravam departamentos médicos de clubes profissionais de futebol masculino. Ao todo, 44 profissionais atuantes em clubes de elite da Europa, Oceania, América do Norte e América do Sul responderam ao questionário. Tendo em vista que profissionais de clubes brasileiros não participaram do estudo de McCall et al. (2014), o Grupo de Ciência no Esporte e Exercício da UFCSPA replicou este estudo no cenário da elite do futebol nacional. Neste estudo de Meurer et al. (2017), fisioterapeutas de 16 dos 20 clubes que integravam a primeira divisão do Campeonato Brasileiro de futebol proveram uma série de informações que nos permitiu conhecer as suas percepções sobre lesões na população de atletas profissionais de futebol masculino no Brasil, bem como conhecer a realidade de como são planejados e implementados os programas de prevenção de lesões nesse contexto esportivo. Assim sendo, o estudo de Meurer et al. (2017) evidenciou as semelhanças e diferenças verificadas na prevenção de lesões executada no Brasil em comparação com aquilo que é desenvolvido no exterior (McCall et al. 2014).

Apesar da ascensão do futebol feminino no Brasil e no mundo os estudos científicos voltados à essa modalidade ainda são escassos. Um artigo recente (Kirkendall, 2020) buscou a história do futebol como objeto de trabalhos acadêmicos e demonstrou que apenas 25% dos artigos incluíam participantes do sexo feminino. Além disso, diversos fatores colaboram para que o contexto vivido pelos profissionais de saúde que atuam no futebol feminino seja consideravelmente diferente do futebol masculino. Uma análise superficial das realidades dessas duas modalidades permite concluir que, em geral, clubes de futebol feminino apresentam inferioridade em termos de estrutura física e de recursos humanos em relação aos seus pares do futebol masculino. Além disso, há especificidades no perfil das atletas, nas rotinas de treinamento e no calendário de competições, entre outros fatores, que distanciam o futebol masculino do feminino. Por consequência, parece plausível que os programas de prevenção de lesões adotados no futebol feminino não sejam idênticos aos programas implementados no futebol masculino. Porém, até o presente momento, não há estudos que tenham se proposto a mostrar a realidade do que é executado em termos de prevenção em clubes profissionais de futebol feminino em parte alguma do mundo.

2 OBJETIVOS

Objetivo Geral

Descrever as percepções e práticas na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro.

Objetivos Específicos

- Conhecer o perfil dos profissionais de fisioterapia que atuam em clubes de elite do futebol feminino brasileiro;
- Conhecer a estrutura organizacional dos departamentos de saúde dos clubes de elite do futebol feminino brasileiro;
- Descrever as percepções dos fisioterapeutas acerca dos fatores de risco para lesões, importância de diferentes estratégias de prevenção de lesões, principais lesões enfocadas pelos programas preventivos e barreiras para implementação dos mesmos;
- Descrever o papel dos membros da equipe envolvida com prevenção de lesões, as avaliações realizadas na pré-temporada e durante atemporada, bem como as estratégias de prevenção executadas nos clubes.

3 ARTIGO 1

INJURY PREVENTION IN BRAZILIAN WOMEN'S FOOTBALL: A SURVEY INTO PERCEPTIONS AND PRACTICES WITHIN ELITE CLUBS

INTRODUCTION

Football (soccer) has upheld its position as the globe's most popular sport for a few decades. The women's variant of this sport has been undergoing exponential growth, now being played in over 100 countries worldwide (FIFA, 2016). The evolution of women's football has been accompanied by changes in the dynamic nature of matches played at the elite competition level. While the average total distance covered during a match has seemingly remained around 10,000 meters over the past decade, there is an undeniable rise in match intensity. To illustrate, distances covered per match by national teams in the highest speed zone saw a notable increase of 29% from the 2015 to the 2019 Women's World Cup (FIFA, 2019). As a consequence of this heightened physical requirements, coupled with the likelihood of both direct and indirect physical contact, female footballers are inherently facing a growing exposure to potential risks of injury (Lopez-Valenciano et al., 2021).

Based on a recent comprehensive analysis encompassing 10 injury surveillance studies, women's football professional players sustain 5.63 injuries per 1000 hours of overall exposure (Horan et al., 2022). It's worth mentioning that this incidence rate is lower than what has been observed among men's footballers (8.1/1000 hours) (Lopez-Valenciano et al., 2020). Conversely, there appears to be a greater occurrence of severe injuries in female players compared to their male counterparts (Roos et al., 2017). While men face an elevated risk of hamstring strains and groin-related pain, women experience higher rates of anterior cruciate ligament (ACL) ruptures, ankle syndesmosis injuries, and quadriceps strains (Larruskain et al., 2018). Apart from this distinctive injury profile based on sex, there are inherent biological traits specific to each sex (Bradley et al., 2014), along with a range of contextual factors that distinguish women's and men's football. For instance, champions from women's football top-tier leagues (such as France, Germany,

Spain, and England) played no more than 30 official matches along the 2021/2022 season, while the winners of the men's leagues in these countries competed in more than 70 matches. This further emphasizes the importance of designing preventive programs that are rooted in the specific context of woman's football (Bolling et al., 2018).

Exercise-based interventions have been the cornerstone of prevention programs in most sport contexts. However, the efficacy of exercise-based injury prevention programs in football players is not a consensus (Lemes et al., 2021; Obërtinca et al., 2023). Specifically in women's football, there is low-level evidence that exercise-based programs reduce overall and ACL injuries by 27% and 45%, respectively (Crossley et al., 2020). Considering that sports injuries occur due a complex and dynamic interaction of a web of factors a comprehensive approach encompassing an array of strategies has been advocated to mitigate the athletes' injury risk (Coles, 2018). Hence, aligned with exercise-based interventions, additional strategies construct a unified framework for football injury prevention programs. These encompass preseason screening of potential risk factors (Ribeiro-Alvares et al., 2020), in-season tracking of players' workload (Bowen et al., 2020), subjective metrics (e.g., perceived fatigue) (Delaval et al., 2022), functional status (e.g., muscle strength) (Wollin et al., 2020) and physiological markers (e.g., creatine kinase) (Tamujo et al., 2023) , as well as the incorporation of post-exercise recovery techniques (Altarriba-Bartes et al., 2021), among others.

Previous studies have already unveiled the perceptions of practitioners and practices adopted by elite men's football clubs regarding injury prevention (McCall et al., 2014; Meurer et al., 2017), as well as in competing national teams at the FIFA Men's and Women's World Cups (McCall et al., 2015; Saltzman et al., 2023). Conducting surveys of this nature that depict the "real world" of elite football holds significance, especially in light of the negative repercussion injuries can impose on team performance and finances (Eliakim et al., 2020), along with their potential to disrupt the professional trajectories of players (Drew et al., 2017). Nonetheless, injury prevention scenario in elite women's football clubs remain unexplored in the literature. Therefore, the objective of this study was to describe the current perceptions and practices concerning injury prevention within

elite women's football clubs. This survey was carried out with physiotherapists from Brazil, a country with a prominent legacy in football.

METHODS

Study design

This is a cross-sectional descriptive study. Physiotherapists from women's football clubs answered an online survey about their perceptions and the teams' current practices concerning injury prevention. This study was approved by the Ethics Committee of the Federal University of Health Sciences of Porto Alegre (Porto Alegre, Brazil). All participants provided written informed consent.

Procedures

A structured questionnaire was formulated by a sports science researcher, based in a similar study conducted in men's football (Meurer et al., 2017). The questionnaire underwent review by two scientists with expertise in women's football and two physiotherapists from women's football professional clubs. This review aimed to address potential cultural considerations and ensure the use of accessible language for participants. The definitive questionnaire version was subsequently made accessible online for participants from November 2021 to February 2022 via the Google Forms platform (google.com/forms).

The researchers established contact with all 52 clubs participating in the 2021 women's football Brazilian championship, comprising 16 clubs from the A1 series (first national division) and 36 from the A2 series (second national division). The survey targeted the physiotherapists in charge of the professional women's teams for participation. Physiotherapists who expressed interest in taking part were sent a web link to access the online questionnaire via WhatsApp Messenger. Upon clicking the provided web link, participants gained access to a comprehensive explanation regarding the survey's purpose and procedure. Following their agreement to participate in the study, participants were directed to the questionnaire, which was divided into four sections: (1) Physiotherapists' profile; (2) Workplace details; (3) Physiotherapists' perceptions towards prevention strategies; and (4) Practices towards prevention programs. The questionnaire solely comprised multiple-choice questions, with the option to include

additional answers under "other." To ensure confidentiality, participants' identities and responses were maintained in strict confidence.

Data analysis

Raw data were exported and analyzed using Microsoft Excel software. Distribution of 'yes' and 'no' answers was assessed for each prevention strategy and assessments used for injury prevention. To calculate the perception of physiotherapists towards importance of each risk factor and prevention strategies, points were awarded based on a Likert scale. Each time a risk factor or prevention strategy was rated 'very important' it was awarded a value of 3 points; 'important', 2 points; 'somewhat important', 1 point; and 'not important', zero points. Points were summed and ranked in order from highest to lowest score. The perception of physiotherapists towards the most concern injuries and the greatest barriers to implement prevention programs were ranked as follows: the most important received 5 points; the second, 4 points; the third, 3 points; the fourth, 2 points; and the fifth, 1 point. Points for each question were summed and ranked in order from highest to lowest score (McCall et al., 2014; Meurer et al., 2017).

RESULTS

Thirty-two physiotherapists from clubs engaged in the woman's football Brazilian championship participated in this study. A total of 16 physiotherapists from A1 series clubs participated, resulting in a 100% response rate. Additionally, 16 physiotherapists from A2 series clubs took part, accounting for a 44% response rate. Considering that six out of 36 clubs in the A2 series lacked a physiotherapist in their health staff, the survey encompassed 53.3% of the potential A2 series participants. The detailed profile of the participants is outlined in Table 1.

According to the physiotherapists' perception, the top-five ranked risk factors included *poor early return to sport after injury*, *workload too high*, *previous injury*, *poor sleep/rest* and *muscle strength/power deficit* (Figure 1). ACL rupture was the most concerning injury, followed by ankle sprain, hamstring and quadriceps strain, and other knee injuries (meniscus injury, ligament injury other than ACL, and patellofemoral pain) (Figure 2). *Follow return to sport criteria after injury* was almost unanimously ranked as a very important strategy (97% of the interviewees; Figure 3). The physiotherapists' perception of the importance of other strategies was more divergent, as illustrated in Figure 3. Lastly, physiotherapists considered the poor structure (facilities and/or materials) as the main barrier to implement prevention programs, followed by lack of time due to schedule and insufficient number of practitioners (Figure 4).

At least two-thirds the clubs adopted the following assessments for injury risk screening: *body composition evaluation*, *joint range of motion evaluation*, *vertical jump tests*, *dynamic balance tests*, *horizontal jump tests*, *aerobic capacity tests*, *step-down test or single leg squat* (Figure 5). Regarding the prevention strategies, most clubs applied multi-component exercise-based interventions (Figure 6). Further information on the exercise-based prevention programs is presented in Table 2. In addition, *follow return to sport criteria after injury*, *internal workload monitoring*, *use of post-exercise recovery modalities*, *risk factor assessments at the preseason*, and *use of rigid strapping tape* were prevention strategies used by at least three-quarters of the participant clubs (Figure 6).

Table 1. Profile of physiotherapists and their clubs.

Question	Mean±SD [min; max] or Count (%)
How many years have you been working as a physiotherapist?	9.22±6.29 [1; 23]
How many years have you been working as a physiotherapist in women's football?	2.95±2.52 [0.5; 11]
Did you take a SONAFE specialist title?	4 (12.5%)
Did you take a specialization course?	21 (65.6%)
Did you take a Master's degree?	4 (12.5%)
Did you take a PhD degree?	0 (0%)
In a 0-10 scale, how prepared do you consider yourself to work with injury prevention in women's football?	8.53±1.70 [1; 10]
Which practitioners are part of women's team in your club?	
<i>Coach</i>	32 (100%)
<i>S&C coach</i>	32 (100%)
<i>Goalkeepers' coach</i>	32 (100%)
<i>Physiotherapist</i>	32 (100%)
<i>Coach assistant</i>	27 (84.4%)
<i>Medical doctor</i>	16 (50%)
<i>Physiotherapy trainee*</i>	11 (34.4%)
<i>S&C coach assistant</i>	9 (28.1%)
<i>Nutritionist</i>	8 (25%)
<i>S&C trainee*</i>	8 (25%)
<i>Masseuse</i>	7 (21.9%)
<i>Psychologist</i>	6 (17.75%)
<i>Physiologist</i>	3 (9.4%)
<i>Nurse</i>	3 (9.4%)
How many physiotherapists are part of women's team in your club?	1.84±1.08 [1; 4]
How many players are part of women's team in your club?	
≤19 <i>players</i>	2 (38.25%)
20-24 <i>players</i>	6 (18.75%)
25-29 <i>players</i>	12 (37.5%)
30-34 <i>players</i>	5 (15.6%)
≥35 <i>players</i>	7 (21.9%)

max, maximum; min, minimum; SD, standard deviation; SONAFE, Brazilian National Society of Sports Physical Therapy; S&C, strength and conditioning; %, sample percentage; * undergraduate students.

Table 2. Characteristics of the exercise-based prevention programs.

Question	Count (%)
Do your club apply an exercise-based prevention program?	
Yes	31 (96.9%)
No	1 (3.1%)
Which option best describes the exercise-based prevention program applied in your club?	
<i>Collective prevention only</i> ^A	4 (12.5%)
<i>Subgroups prevention only</i> ^B	2 (6.25%)
<i>Individual prevention only</i> ^C	2 (6.25%)
<i>Collective prevention</i> ^A + <i>Subgroups prevention</i> ^B	3 (9.4%)
<i>Collective prevention</i> ^A + <i>Individual prevention</i> ^C	15 (46.9%)
<i>Subgroups prevention</i> ^B + <i>Individual prevention</i> ^C	0 (0%)
<i>Collective</i> ^A + <i>Subgroups</i> ^B + <i>Individual prevention</i> ^C	5 (15.6%)
Who supervises the execution of the exercise-based prevention program?	
<i>Physiotherapist</i>	31 (96.9%)
<i>S&C coach</i>	23 (71.9%)
<i>S&C coach assistant</i>	8 (25%)
<i>Physiotherapy trainee*</i>	3 (9.4%)
<i>S&C trainee*</i>	1 (3.1%)
<i>Players carry out on their own</i>	1 (3.1%)
<i>Coach</i>	0 (0%)
<i>Coach assistant</i>	0 (0%)
At the preseason, how many times a week is the exercise-based prevention program performed on average?	
<i>Less than once a week</i>	1 (3.1%)
<i>Once a week</i>	5 (15.6%)
<i>Twice a week</i>	6 (18.75%)
<i>3 times a week</i>	10 (31.25%)
<i>4 times a week</i>	7 (21.9%)
<i>5 times a week</i>	3 (9.4%)
<i>More than 5 times a week</i>	0 (0%)
Along the season, how many times a week is the exercise-based prevention program performed on average?	
<i>Less than once a week</i>	6 (18.75%)
<i>Once a week</i>	0 (0%)
<i>Twice a week</i>	13 (40.6%)
<i>3 times a week</i>	7 (21.9%)
<i>4 times a week</i>	5 (15.6%)
<i>5 times a week</i>	0 (0%)
<i>More than 5 times a week</i>	0 (0%)

^A all players follow the same program; ^B each subgroup of players follows a given program;

^C each player follows a program specific to their needs.

Figure 1. Perception of physiotherapists towards injury risk factors in woman's professional football.

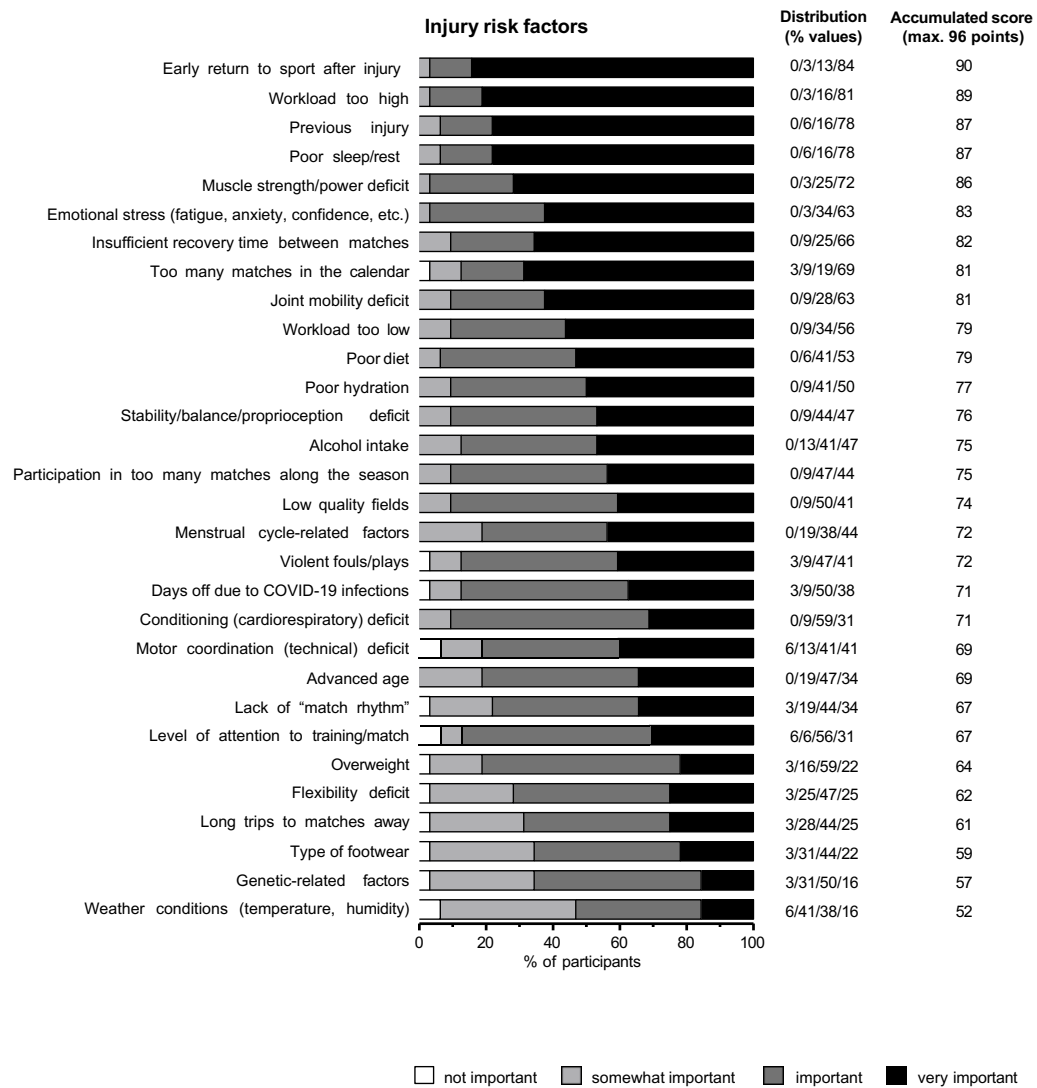


Figure 2. Perception of physiotherapists towards the most concerning injuries in woman's professional football.

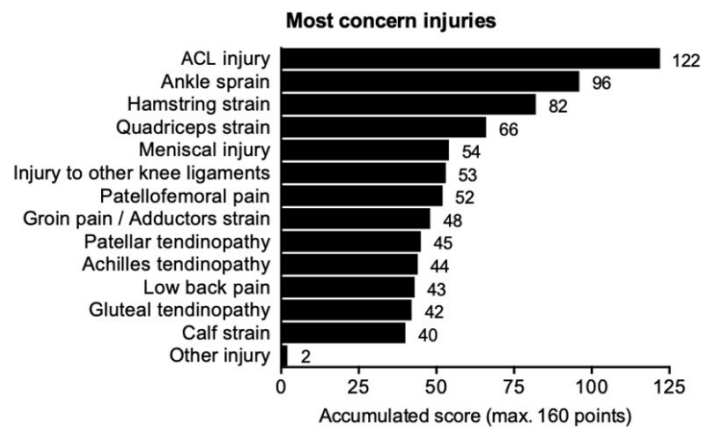


Figure 3. Perception of physiotherapists towards prevention strategies in woman's professional football.

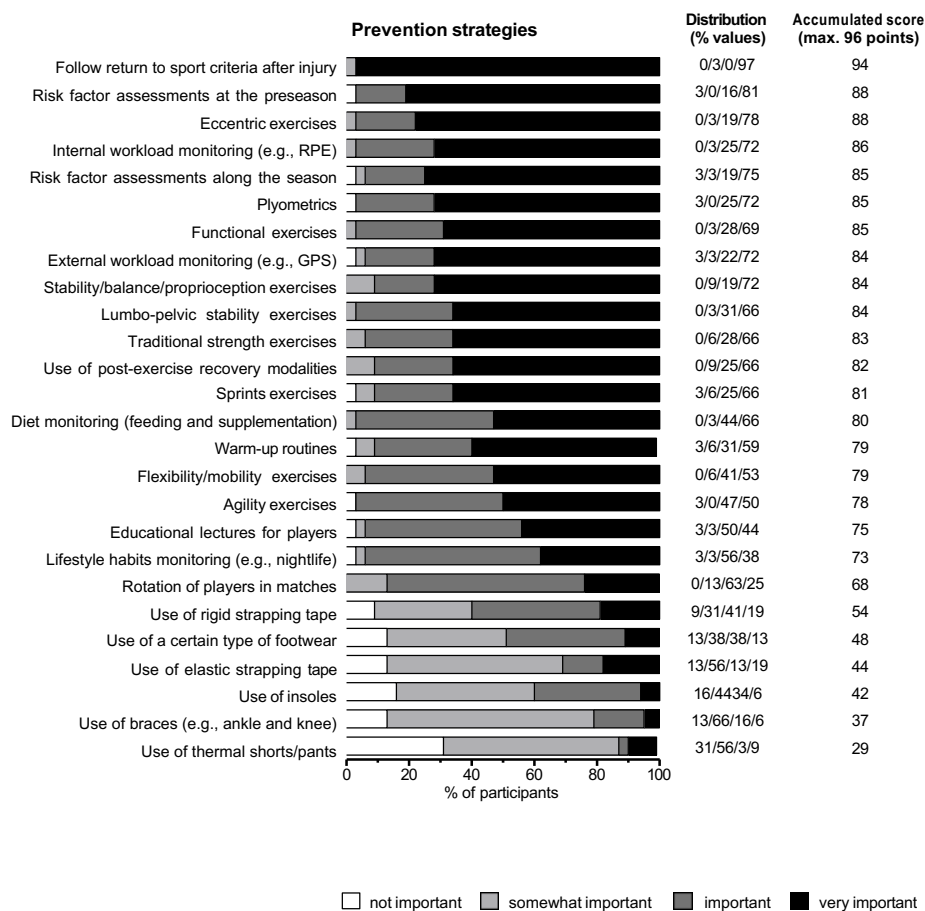


Figure 4. Perception of physiotherapists towards the greatest barriers to implement prevention programs in woman's professional football.

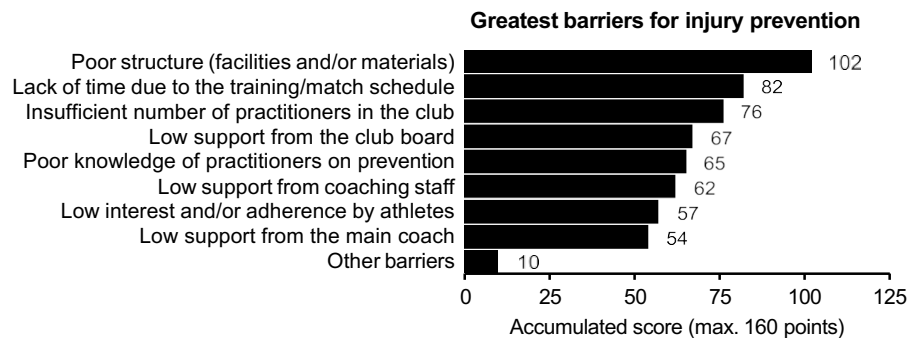


Figure 5. Percentage and absolute (value in parenthesis) distribution of assessments adopted by the 32 clubs for injury risk screening.

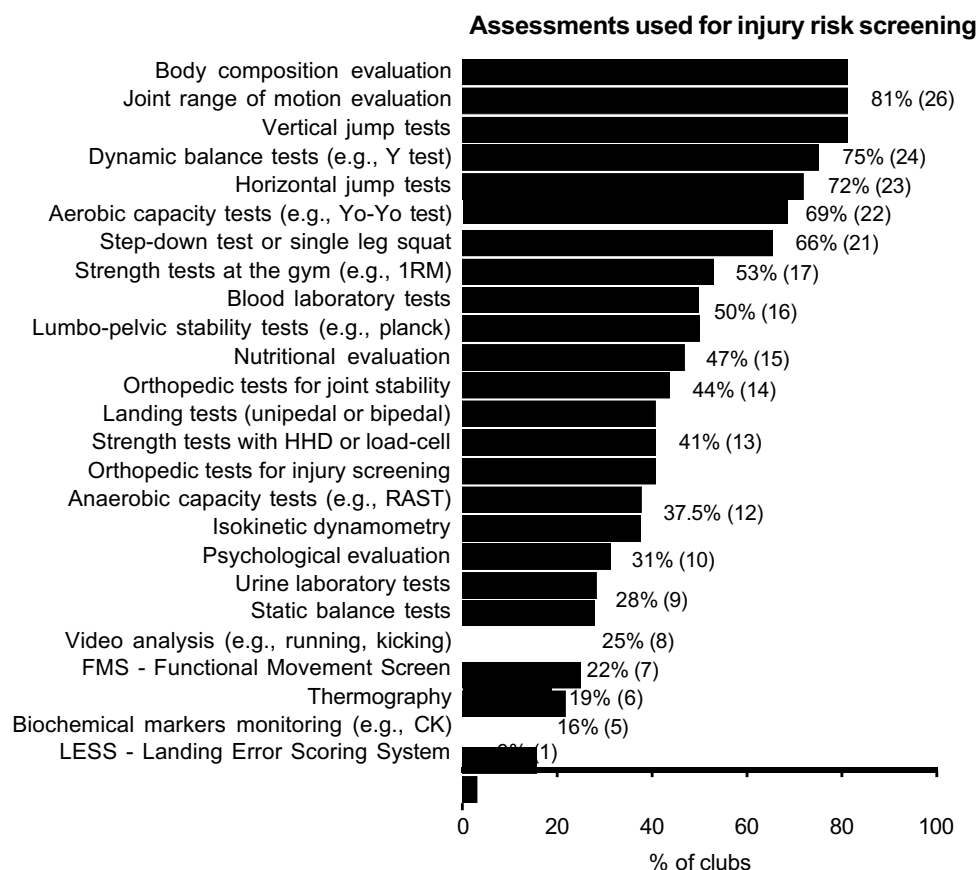
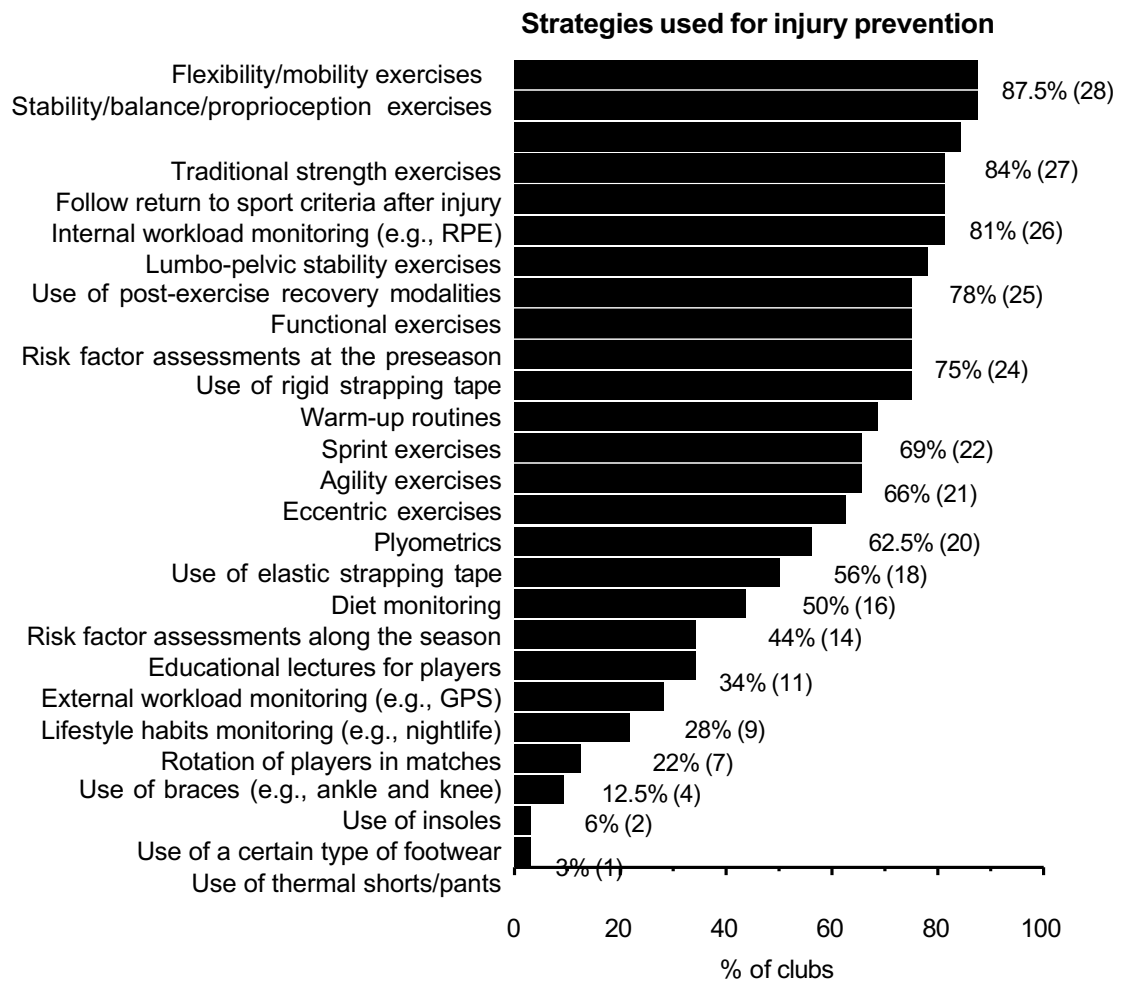


Figure 6. Percentage and absolute (value in parenthesis) distribution of strategies adopted by the 32 clubs for injury prevention.



DISCUSSION

Profile of physiotherapists and clubs

While the study participants have an average of 9 years of experience as physiotherapists, their average experience time within women's football is less than 3 years. Two-thirds of the physiotherapists did take a specialization course, but only one out of eight obtained the specialist title provided by the Brazilian National Society of Sports Physical Therapy (SONAFE). Furthermore, similar to what has been previously observed in elite men's football clubs (McCall et al., 2014; Meurer et al., 2017), physiotherapists in women's football demonstrate limited involvement in academia, particularly in pursuing PhD degrees, indicating a gap between academic and clinical practice in football. Nevertheless, it caught our attention that only one out of 32 interviewees indicated a perception of preparedness for injury prevention below seven on a scale of zero to 10.

It was remarkable that a few teams in the national second division lack a physiotherapist on their health staff. The count of physiotherapists per club varied from one to four. Caught our attention that the majority of clubs (17 out of 32 participants) had only one physiotherapist, who often had the responsibility of assisting squads of 25 or more players. For comparison, men's football clubs had already employed at least two physiotherapists over 5 years ago (Meurer et al., 2017). The limited number of physiotherapists in women's football clubs, as well as other healthcare and performance practitioners, is likely attributed to the economic disparity compared to men's football. It is noteworthy that the scarcity of staff tends to become a barrier in the implementation of preventive programs.

Perception towards injury risk factors

Previous injury and early return to sport after injury was ranked into the top-three risk factors by physiotherapists interviewed in our study. There is a consistent observation that previous injury is the risk factor most strongly associated to injury (Green et al., 2020), and this factor has also been highlighted by healthcare practitioners

in men's football (McCall et al., 2014; Meurer et al., 2017). Considering that two-thirds of women's football players with ACL reconstruction who returned to sport sustained a new knee injury within 5 to 10 years, including 42% that sustained a new ACL injury (Faltstrom et al., 2021), adoption of a high-quality therapeutic program and appropriate return to sport criteria seems imperative for female footballers. However, the inherent demands of the high-performance sports context frequently do not permit all criteria to be completely fulfilled before the athlete is once again exposed to match.

High workload and poor sleep/rest were also risk factors highlighted by our interviewees. Although the ideal metrics for workload monitoring still generate debate, there is evidence that players with a higher workload are more prone to injury (Bowen et al., 2020). Players' fatigue has also been ranked among the primary injury risk factors by the health staffs in men's football (McCall et al., 2014; Meurer et al., 2017). This perception is supported by an 11-year follow-up study conducted in the UEFA Champions League, which concluded that injury rates increased when matches were played with intervals of ≤ 4 days (Bengtsson et al., 2013). Similarly, an increase of sleep quantity following a match was significantly associated with a lower noncontact injury rate among men's football players (Delaval et al., 2022) suggesting that sleep also plays a role on injury risk.

In line with our findings, strength-related issues were ranked within the top three risk factors by healthcare men's football healthcare practitioners (McCall et al., 2014; Meurer et al., 2017). In a survey with men's professional footballers, poor strength/power was ranked as the greatest risk factor (Liporaci et al., 2022). The association between strength and injuries, especially muscle strains, yields mixed results in cohort studies (Green et al., 2020). Conversely, a systematic monitoring of target muscles along the season proven to be an efficient preventive strategy (Delaval et al., 2022; Wollin et al., 2020), as well as muscle strengthening programs have been proved to reduce muscle strain injuries in football players (Al Attar et al., 2017).

Perception towards the most concerning injuries

Knee, ankle and thigh emerge as the top three most commonly injured sites in women's football (Lopez-Valenciano et al., 2021). While some studies have identified the knee as the predominant injury site in elite-level leagues (Gaulrapp et al., 2010; Jacobson & Tegner, 2007), others have highlighted the ankle (Horan et al., 2022) or the thigh (Häggglund et al., 2009) as the most affected sites. Therefore, it was expected that the interviewed physiotherapists would show a greater concern about injuries in these sites.

In addition to having more than 4.5 times higher risk of suffering an ACL rupture (Larruskain et al., 2018), women's football players are less likely to return to play and more likely to require additional surgery up to seven years of ALC reconstruction compared to their male counterparts (Brophy et al., 2012). Furthermore, a recent prospective study (Gasparin, 2023) revealed an overall incidence rate of ACL injuries among elite Brazilian footballers (0.54/1000 h) over twice as high than previously reported in some European women's football scenes (0.09-0.24/1000h) (Gaulrapp et al., 2010; Horan et al., 2022; Larruskain et al., 2018). Considering this inflated incidence, coupled with the extended time off, the financial and performance losses for the team, and the potential risks to the athlete's career, it makes sense that physiotherapists have ranked the ACL rupture as the most feared injury.

Regarding the ankle sprain, ranked as the second most concerning injury, it is noteworthy that women have a five-fold higher incidence of ankle injuries affecting the syndesmosis, an injury type that prolongs the return-to-sport time compared to other ankle ligament injuries (Larruskain et al., 2018). This suggests that the physiotherapists' concern regarding ankle sprain in women's football players is not only related to their high incidence but also to the potential burden of this injury. Ranked as the third most concerning injury in the current study, hamstring strain has been considered a hot topic in football medicine community over the last decades, especially in men's football context. Considering the sprint as the main mechanism for the hamstring strain

(Danielsson et al., 2020), the progressive increase in the match intensity generates a greater risk of women's football players to sustaining this type of injury.

Perception towards prevention strategies

There was almost a consensus (97% of the interviewees) that the return to sport criteria constitute a very important prevention strategy, which denotes the physiotherapists' concern with re-injury. Figure 3 illustrates a discernible divergence in perceptions across all other preventive strategies. It is important to acknowledge that these perceptions are notably shaped by individuals' prior exposure to such scenarios. Consequently, a dearth of familiarity with certain prevention strategies may potentially constrain physiotherapists' ability to accurately assess their effectiveness. For instance, the higher accumulated score attributed to internal workload monitoring (e.g., rate of perceived exertion) in comparison to external workload monitoring (e.g., global positioning system) could be linked to clubs' restricted access to this technological resource due to financial constraints. Approximately only one-third of the clubs assessed in this study used global positioning systems for workload monitoring (Figure 6). Another instance pertains to the interviewees' preference for singular risk factor assessments during the preseason as opposed to continuous player evaluations throughout the season. In light of the barriers described by physiotherapists (Figure 4), including poor structure, lack of time, and an insufficient number of practitioners, implementing in-season assessments for screening risk profiles is likely to be unviable for numerous clubs.

Regarding exercise-based interventions, two-thirds or more of the interviewees ranked the following preventive strategies as very important: eccentric exercise, plyometrics, functional exercises, stability/balance/proprioception exercises, lumbo-pelvic stability exercises, traditional strength exercises, and sprint exercises. With the exception of stability/balance/proprioception exercises, the vast majority of literature available for implementing exercise-based prevention strategies comes from men's

football. The scarcity of studies involving women's football professional players makes it difficult to design such interventions for this population.

Perceptions toward barriers to implement prevention programs

Among the primary challenges to implementing prevention programs in Brazilian women's football clubs, the lack of adequate infrastructure and a scarcity of practitioners within the health and coaching staffs were prominently identified (Figure 4). These barriers are clearly related with the limited financial support allocated to the women's football department, a historical cultural issue within Brazilian football clubs. Conversely, additional barriers highlighted by physiotherapists are not contingent upon financial constraints for resolution. Considering that Brazilian teams participate in fewer than 40 matches per season (Gasparin, 2023), players seldom face congested schedules with multiple matches per week. Note that certain men's football teams manage to execute preventive programs while participating in over 70 matches annually. Therefore, the lack of time mentioned by interviewees appear to be more closely associated with poor support from the coaching staff and/or the club board. Securing additional space within the team's training regimen for prevention efforts appears to necessitate the collective recognition of its significance across the club, encompassing the head coach and all members of the coaching staff, the board members, and the athletes themselves.

Assessments used for injury risk screening

Our findings indicate that there is no unanimously agreed-upon assessment for screening the injury risk among women's football teams. It can be observed that certain assessments commonly conducted by the coaching staff are also being utilized by physiotherapists as potential indicators of players who might be more prone to injuries, such as body composition evaluation, jump tests, and aerobic capacity tests. Regarding assessments typically attributed to physiotherapists, at least two-thirds of the interviewees mentioned employing joint range of motion evaluation, dynamic balance tests, and the step-down test or the single leg squat. Hip and ankle range of motion, for

example, have been associated with the risk of lower limb injury (Fong et al., 2011; Hewett et al., 2005). Similarly, there is some evidence supporting the relationship of poor performance in the star excursion balance test (or its modified versions, as the “Y test”) with musculoskeletal injuries (Butler et al., 2013).

Considering that the interviewees ranked muscular strength deficit as one of the top-five risk factors for injury in women's football, it is noteworthy the low percentage of clubs that perform strength assessments of the players. While isokinetic dynamometry is a routine assessment component for the majority of men's football elite teams (McCall et al., 2014; Meurer et al., 2017), this type of evaluation is conducted by fewer than 40% of the women's teams participating in our study. Even low-cost strength assessments by hand-held dynamometers or load cells are used by only 41% of teams.

Interestingly, most clubs perform assessments for screening injury risk solely during the preseason (Figure 6). Baroni & Costa (Baroni & Oliveira Pena Costa, 2021) draw attention to the fact that muscle strength is an example of risk factor susceptible to modification (both positively and negatively) over a season, which underscores the importance of maintaining periodic tracking of this attribute. Not all modifiable intrinsic risk factors respond as fast as muscle strength to training interventions or detraining periods. However, the reasoning for periodic in-season assessments for injury risk screening likely applies to other modifiable intrinsic risk factors.

Strategies adopted for injury prevention

Our findings demonstrate that there is a wide array of strategies employed for preventive purposes in Brazilian elite women's football clubs (Figure 6). A systematic review with meta-analysis by Crossley et al. (Crossley et al., 2020) concluded that multicomponent exercise-based injury prevention programs reduce overall injuries by 27% and ACL injuries by 45% in women's football players. Some caution is needed in extrapolating these findings to the elite football context addressed in the current study because nine out of 12 studies included in Crossley's review involved adolescent teams. However, considering the complex and multifactorial nature of sports injuries, it seems

reasonable to anticipate better outcomes from a program comprising multiple exercise-based components rather than just a single component. The primary question may be which components are indispensable or most important for the injury prevention program in women's soccer.

According to our findings, two-thirds or more of the clubs incorporate the following exercises into their prevention programs: flexibility/mobility, stability/balance/proprioception, strength, lumbo-pelvic stability, functional exercises, sprint training, agility drills, and eccentric exercises. There is no single strategy that garners unanimous consensus among the participants. In contrast, studies conducted with elite male football clubs in Brazil (Meurer et al., 2017) and around the world (McCall et al., 2014) reported complete and quasi-complete adherence to lumbo-pelvic stability and balance/proprioceptive exercises, respectively. It is worth noting that interventions involving these types of exercise have already proven effective in preventing ankle and knee injuries in women's football players (Mandelbaum et al., 2005; Waldén et al., 2012). Consequently, despite these exercises being part of the prevention program adopted by the majority of clubs that participated in this study, it would be reasonable to assume that their adoption would be unanimous given the high concern of physiotherapists regarding ankle and knee injuries, particularly the ACL tear.

Still based on the most common injuries and those that cause the greatest concern for physiotherapists in women's soccer, it is essential for prevention programs to focus on muscle strains, especially those of the hamstrings. The prevention strategy with the strongest level of evidence for preventing hamstring strains is the eccentric exercise, particularly the Nordic curls (Al Attar et al., 2017). Although most of the literature on Nordic curls involves men's football players, this type of intervention program has already been applied and proven to be feasible within the context of elite women's football (Vianna et al., 2021). Nonetheless, one-third of participant clubs did not comprise eccentric exercises into their prevention programs. Similarly, despite exposition to sprints has been recently considered a key stimulus to mitigate the risk of

hamstring strains (Edouard et al., 2023), sprint exercises were not comprised into the prevention program of more than 30% of participant clubs.

Only one out of the 32 participant clubs did not implement an exercise-based intervention with a focus on injury prevention (Table 2). Most clubs implement a collective prevention program that is also tailored to the individual needs of certain players or subgroups. But it should be noted that 12.5% of clubs adopt a single prevention program for the entire squad, which ends up neglecting the principle of specificity. Exercise-based prevention programs typically consist of two to three sessions per week. In agreement with findings from elite men's football (McCall et al., 2014; Meurer et al., 2017), our study found that physiotherapists play a crucial role in implementing exercise-based prevention programs in women's football. This further emphasizes the potential issue caused by a reduced number of physiotherapists in clubs, given the active role of such practitioners in both prevention and rehabilitation fields.

Limitations

The current study has inherent limitations. Firstly, it is crucial to highlight that the perspectives of the interviewed physiotherapists may not necessarily reflect the viewpoints of other healthcare practitioners within the club. Secondly, it is probable that the injury prevention practices employed may be influenced by factors associated with the club's infrastructure and the composition of its human resources. Therefore, it is reasonable to postulate that differences may exist between clubs in Serie A1 and A2, or even regional disparities in a country as vast as Brazil. Nevertheless, it's essential to clarify that the current study did not intend to compare preventive practices across the two competitive divisions or seek correlations to explain the choices made by clubs. Lastly, it is prudent to exercise caution when extrapolating the findings of this study to other contexts within global women's football, given the distinct characteristics of Brazilian women's football.

CONCLUSION

This study provided unprecedented insights into the perceptions and injury prevention practices implemented within elite women's football clubs. This real-world portrait of Brazilian women's football could assist the stakeholders in designing and implementation of more comprehensive injury prevention programs.

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4 CONCLUSÃO FINAL

Realizamos um estudo pioneiro com o objetivo descrever as percepções e práticas na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro. Nosso estudo abrangeu todos os times da Série A1 e mais da metade dos times da Série A2 do campeonato brasileiro de futebol feminino. Embora seja importante analisar os dados deste estudo com cuidado ao considerar outros contextos no futebol feminino, nosso estudo não apenas oferece um perfil abrangente dos profissionais envolvidos no futebol feminino, mas também fornece informações detalhadas sobre as principais práticas e desafios associados à implementação de programas de prevenção no Brasil.

Em síntese, nossos achados sugerem que o “retorno ao esporte após lesão”, “carga de trabalho muito alta”, “lesão prévia”, “sono/repouso inadequados” e “déficit de força/potência muscular” foram os principais fatores de risco elencados pelos fisioterapeutas que responderam a pesquisa. Além disso, “Seguir os critérios de retorno ao esporte após lesão” foi quase unanimemente classificado como uma estratégia preventiva muito importante descrito pelos fisioterapeutas. Pelo menos dois terços dos clubes adotaram as seguintes avaliações para triagem de risco de lesão: “avaliação da composição corporal”, “avaliação da amplitude de movimento articular”, “testes de salto vertical”, “testes de equilíbrio dinâmico”, “testes de salto horizontal”, “testes de capacidade aeróbica” e “teste de descida do degrau ou agachamento em uma perna”.

A maioria dos clubes aplicou intervenções baseadas em exercícios de múltiplos componentes para prevenção de lesões. Além disso, “seguir os critérios de retorno ao esporte após lesão”, “monitoramento da carga interna de trabalho”, “uso de modalidades de recuperação pós-exercício”, “avaliações de fatores de risco na pré-temporada” e “uso de bandagem rígida” foram estratégias de prevenção usadas por pelo menos três quartos dos clubes de futebol feminino participantes do nosso estudo.

5 IMPACTOS DO TRABALHO

Além do impacto científico de ser o primeiro estudo a investigar as principais práticas e percepções na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro, a principal contribuição desta pesquisa é retratar o contexto do futebol feminino brasileiro no mundo real. Uma vez que esta realidade do futebol feminino seja bem descrita na literatura, é possível vislumbrar o fomento de pesquisas científicas que considerem as especificidades do futebol feminino, além de auxiliar os envolvidos na concepção e implementação de programas de prevenção de lesões mais abrangentes e assertivos voltados para o futebol feminino.

Para os profissionais de saúde que trabalham diariamente com o futebol feminino, é fundamental compreender as especificidades que diferenciam o perfil das atletas, as rotinas de treinamento, o calendário de competições e outros fatores que distinguem o futebol masculino do feminino. Com esse entendimento, torna-se crucial desenvolver estratégias de prevenção específicas voltadas para o futebol feminino, envolvendo toda a comissão técnica.

Aos clubes de futebol feminino que investem na modalidade. É importante reconhecer quais as demandas e barreiras para serem implementadas estratégias preventivas. Afinal, o investimento em um programa de prevenção de lesões eficiente reduzirá o risco de lesões ao longo da temporada e, consequentemente, irá aumentar as chances de sucesso em competições e irá impactar positivamente em aspectos econômicos do clube, consequentemente. Além disso, as autoridades de futebol feminino no Brasil, é importante reconhecer qual o caminho a ser percorrido para o avanço da modalidade e quais as barreiras encontradas pelas equipes brasileiras.

Por fim, também é importante destacar o potencial impacto sobre as atletas de futebol. Elas estão diariamente envolvidas nas rotinas de treinamento e jogos. Programas de prevenção efetivos são capazes de reduzir o risco de lesões que possuem um potencial impacto em diversos âmbitos da vida das atletas, incluindo questões biológicas, psicológicas, econômicas e sociais.

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ANEXOS

ANEXO A

Parecer de aprovação ética do projeto

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PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Percepções e práticas na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro

Pesquisador: Bruno Manfredini Baroni

Área Temática:

Versão: 2

CAAE: 51277521.7.0000.5345

Instituição Proponente: Universidade Federal de Ciências da Saúde de Porto Alegre

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 4.975.839

Apresentação do Projeto:

As informações elencadas neste campo foram retiradas do arquivo Informações Básicas da Pesquisa (PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1817433.pdf, de 30/08/2021). O futebol feminino vem crescendo exponencialmente, aumentando o número de praticantes e ganhando popularidade no Brasil e no mundo. No âmbito profissional, as lesões afetam negativamente a carreira das atletas e o desempenho de suas equipes. Estudos desenvolvidos com o futebol masculino já descreveram estratégias de prevenção de lesões comumente adotadas por clubes profissionais do Brasil e de outras partes do mundo. Porém, até o presente momento, não há estudos que tenham se proposto a mostrar a realidade do que é executado em termos de prevenção em clubes profissionais de futebol feminino em parte alguma do mundo. Sendo assim, o projeto tem por objetivo descrever as percepções e práticas na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro. Este é um estudo observacional descritivo transversal, no qual serão convidados a participar deste estudo os fisioterapeutas que atuam em clubes que disputam o Campeonato Brasileiro de Futebol Feminino (séries A1 e A2). Após a assinatura do Termo de Consentimento Livre e Esclarecido, o participante responderá a um questionário on-line desenvolvido especialmente para o presente estudo. Este questionário seguirá um roteiro composto por 22 questões, divididas em 4 sessões: a) Informações do profissional; b) Informações do local de trabalho; c) Percepções relacionadas à prevenção de lesões; d) Práticas relacionadas à prevenção de lesões. O questionário estará

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disponível entre os meses de Novembro de 2021 e Fevereiro de 2022 para acesso e preenchimento. O tempo estimado para que cada participante responda a sequência de questões é de aproximadamente 15 minutos. Serão utilizados valores de ocorrência para a análise descritiva dos dados, enquanto a análise associativa será realizada pelo teste de Qui-quadrado. Uma escala likert será utilizada para contabilizar o grau de importância atribuído pelos participantes a diferentes fatores de risco e estratégias de prevenção de lesões: muito importante = 3 pontos; importante = 2 pontos; pouco importante = 1; nada importante = 0 pontos.

Objetivo da Pesquisa:

Descrever as percepções e práticas na área de prevenção de lesões adotadas por fisioterapeutas que atuam em clubes de elite do futebol feminino brasileiro.

Avaliação dos Riscos e Benefícios:

Riscos:

A participação no presente estudo não confere riscos aparentes. Registre-se que o participante será indenizado por qualquer evento adverso comprovadamente decorrente da pesquisa. Um possível risco é a sensação de desconforto ao responder alguma questão. Caso isso ocorra, solicitamos que o participante interrompa imediatamente o preenchimento do questionário. Questionários incompletos não serão submetidos para análise dos pesquisadores, de modo que eles não terão acesso às respostas.

Benefícios:

Por ser voluntário, o participante não receberá qualquer tipo de compensação financeira para participar deste estudo. Da mesma forma, o participante não terá custo com qualquer um dos procedimentos realizados. O único benefício concedido aos participantes será o relatório fornecido ao final do estudo, no qual os pesquisadores apresentarão os achados referentes ao conjunto de clubes participantes. Reitera-se que não serão apresentados dados individuais dos participantes do estudo.

Comentários e Considerações sobre a Pesquisa:

Conforme Informações Básicas do Projeto na Plataforma Brasil, trata-se de um estudo observacional descritivo transversal e de caráter acadêmico (PPG Ciências da Reabilitação). Será realizado por meio de um questionário de preenchimento on-line, desenvolvido especialmente para o presente estudo e no ambiente Google Drive, com profissionais de Fisioterapia que atuam nos departamentos de saúde de clubes que disputam o Campeonato Brasileiro de Futebol

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Continuação do Parecer: 4.975.839

Feminino, séries A1 e A2.

Considerações sobre os Termos de apresentação obrigatória:

Termos obrigatórios apresentados de forma adequada.

Recomendações:

Iniciar coleta de dados somente após a aprovação do projeto junto ao CEP. Vide campo "Conclusões ou Pendências e Lista de Inadequações".

Conclusões ou Pendências e Lista de Inadequações:

O projeto está adequado para ser desenvolvido, tendo seu término previsto para 07/2022.

Ressalta-se que cabe ao pesquisador responsável encaminhar os relatórios parciais e final da pesquisa, por meio da Plataforma Brasil, via notificação do tipo "relatório" para que sejam devidamente apreciadas no CEP, conforme Norma Operacional CNS nº 001/12, item XI.2.d.

Considerações Finais a critério do CEP:

De acordo com o parecer do Relator.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1817433.pdf	14/09/2021 13:13:46		Aceito
Outros	Carta_reposta_R1.pdf	14/09/2021 13:13:02	Bruno Manfredini Baroni	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE_R1.pdf	14/09/2021 13:12:22	Bruno Manfredini Baroni	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_KarolineVianna_R1.pdf	14/09/2021 13:12:13	Bruno Manfredini Baroni	Aceito
Folha de Rosto	folhaDeRosto_assinada.pdf	30/08/2021 09:19:15	Bruno Manfredini Baroni	Aceito
Declaração de concordância	TCER.pdf	29/08/2021 14:20:30	Bruno Manfredini Baroni	Aceito
Declaração de Pesquisadores	TCDU.pdf	29/08/2021 14:20:07	Bruno Manfredini Baroni	Aceito

Situação do Parecer:

Aprovado

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Continuação do Parecer: 4.975.839

Necessita Apreciação da CONEP:

Não

PORTO ALEGRE, 15 de Setembro de 2021

Assinado por:

Fernanda Bordignon Nunes
(Coordenador(a))