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Junior Researchers

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EXERCISE AND HEALTH

1.1 | Influence of the Menstrual Cycle on Training and Match Performance Among Female Football Referees

Silva-Santos S.[1], Tomás R.[2], Santos-Rocha R.[1,3], Pinto A.[1], Batista A.[4], Rios M.[5], Teixeira E.[1]

[1] Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[2] Portugal Football School and Health and Performance Unit, Portuguese Football Federation, Cruz Quebrada, Portugal
[3] Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[4] Higher Institute of Educational Sciences of the Douro (ISCE Douro), 4560-708 Penafiel, Portugal
[5] Piaget Research Centre for Ecological Human Development, Jean Piaget Polytechnic Institute of the North, Vila Nova de Gaia, Portugal.

Abstract

Background: The growth and professionalization of women's football have increased the physical and competitive demands placed on female referees, highlighting the importance of understanding physiological factors that may influence performance. Among these factors, the menstrual cycle has been identified as a potential modulator of training and match performance due to its physical and psychological effects. However, evidence regarding its impact on female football referees remains limited. The objectives were to analyze the influence of the menstrual cycle on training and match performance among national-level female football referees.

Methods: A cross-sectional observational study was conducted with 78 national-level female football referees aged 20–40 years. Data were collected using a validated questionnaire that assessed premenstrual symptoms, contraceptive use, anemia diagnosis, menstrual pain intensity, and perceptions of the menstrual cycle's influence on sports performance. Binary logistic regression analysis was performed to examine the association between premenstrual symptoms during training and matches and the perceived influence of the menstrual cycle on performance, adjusted for age.

Results: Premenstrual symptoms were reported by 85.9% of participants, 62.8% reported using contraceptive methods, and 26.9% had been diagnosed with anemia. Moderate to severe menstrual pain was reported by 85.9% of the

referees. Furthermore, 67.9% perceived the menstrual cycle as having an influence on their training and/or match officiating performance. Binary logistic regression analysis revealed that the presence of premenstrual symptoms was a significant predictor of the perceived influence of the menstrual cycle on sports performance (Wald = 5.198, p = .023). Specifically, referees reporting premenstrual symptoms were approximately 4.8 times more likely to perceive their performance as being affected by the menstrual cycle than those who did not report such symptoms (OR = 4.76, 95% CI: 1.25–18.18).

Conclusion: The findings suggest that the menstrual cycle is perceived as an influential factor in sports performance by a substantial proportion of female football referees. The high prevalence of premenstrual symptoms and menstrual pain highlights the importance of individualized menstrual health monitoring and its integration into the support and management of these professionals.

Keywords: *Menstrual cycle; Female football referees; Premenstrual symptoms; sports performance*

1.2 | Features, functionality and preferences of the "Active Pregnancy" App

Alves L.[1], Mercê C.[1,2,3,4], Santos-Rocha R.[1,2,3,4]

[1] Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2] Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3] Centro de Investigação em Qualidade de Vida (CIEQV), Santarém, Portugal
[4] Centro Interdisciplinar para o Estudo da Performance Humano (CIPER), Lisboa, Portugal

Abstract

Background: The use of mobile applications by pregnant women to access information related to pregnancy and the postpartum period, as well as for self-monitoring, has been increasing and is becoming increasingly common during the prenatal and postnatal phases. *mHealth* can be a valuable support for pregnancy and postpartum because it can deliver timely guidance on lifestyle, physical activity, and self-care in a format that is accessible, affordable, and scalable. Its impact, however, depends on the quality of the information provided, usability and accessibility for different users, and the extent to which interventions reflect end-users' preferences and real-life needs, so that women are more likely to engage with and benefit from them.

This study aimed to evaluate the characteristics, functionalities, and relevance of the content of the mobile application "Active Pregnancy" for the promotion of active and healthy lifestyles (AHL), according to women's preferences.

Methods: A retrospective cross-sectional study was conducted using a questionnaire entitled "Active Pregnancy Mobile Application", consisting of 53 questions administered in digital format via the Google Forms platform. The sample included 340 pregnant or postpartum women with babies born between 2022 and 2025.

Results: The exploratory data analysis revealed high level of agreement observed in the initial evaluation of the application (91%), in the "My Pregnancy" section (95%), and in the "My Postpartum" and "My Baby" sections (both 94%) suggesting good acceptance of the structure of the future "Active Pregnancy" app, reinforcing its relevance for future development and implementation. This promising tool includes essential functionalities such as health education, self-

monitoring, feedback, personalization, and interaction with health and exercise professionals, as well as content related to AHL (nutrition, physical activity, sleep, and stress/mental health). It also incorporates key characteristics such as quality of information, perinatal appropriateness, and accessibility, highlighting the importance of proper usability assessment and the inclusion of data security and privacy policies.

Conclusion: The results suggest a high level of acceptance of the app among users and highlight the relevance of the content of the future "Active Pregnancy" app, structured based on evidence-based characteristics and functionalities, as well as on users' perceptions.

Keywords: *Pregnancy; Postpartum; Healthy lifestyle; mHealth; Technology*

1.3 | Learning to Cycle Through Balance Bikes in Children with Risk and Probable Developmental Coordination Disorder: Project Proposal

Bernardino M.[1,2,3,5], García-Ceberino J.[6], Ibáñez S.[5] Mercê C.[1,2,3,4]

[1] Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2] Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3] Centro de Investigação em Qualidade de Vida (CIEQV), Santarém, Portugal
[4] Centro Interdisciplinar para o Estudo da Performance Humano (CIPER), Lisboa, Portugal
[5] Facultad de Ciencias del Deporte, Universidad de Extremadura, Cáceres, Espanha
[6] Facultad de Educación y Psicología, Universidad de Extremadura, Badajoz, Espanha

Abstract

Background: Children with Developmental Coordination Disorder (DCD) often face difficulties in acquiring motor skills and negatively affect their long-term commitment to an active lifestyle. This is one of the most prevalent motor disorders affecting approximately 5% of children around the world. Learning to ride a bicycle represents an important milestone that promotes independent mobility, outdoor play, and social participation. However, children with probable DCD (p-DCD) or those at risk of DCD (r-DCD) often face additional challenges in acquiring this skill. This project proposal outlines an ongoing PhD project designed to investigate the effects of a structured cycling-learning program using balance bikes in children r-DCD or p-DCD.

The primary aim is to promote the acquisition of independent cycle and, secondarily, evaluate changes in motor competence (MC), perceived motor competence (PMC), balance, and physical activity (PA) levels.

Methods: The project comprises four main phases: (i) a systematic review to synthesize and identify existing cycling programs for these children; (ii) the adaptation of a cycling-learning program; (iii) program's implementation and evaluation; and (iv) a follow-up phase to examine the sustainability of its effects. A longitudinal experimental study adopting a wait-list design will be conducted.

Participants will be allocated to either an immediate intervention group or a delayed intervention group, with both groups receiving the same program at different time points. Assessments will be performed at pre-, post-intervention, and follow-up. The sample will comprise pre-school children aged 4–5 years recruited from educational institutions and identified as having r-DCD or p-DCD. Outcome measures will include cycling ability, MC assessed using the Motor Competence Assessment battery, PMC assessed through the Pictorial Scale of Perceived MC for Young Children, balance performance, and PA levels measured by accelerometry. The intervention will involve a structured progression from balance to conventional bicycles delivered.

Expected Results: It is hypothesized that participation in the program will increase the likelihood of achieving independent cycling and contribute to improvements in MC, PMC, balance, and PA levels.

Conclusion: Findings from this project may provide evidence supporting cycling-based interventions as an effective and inclusive strategy to enhance motor development and promote physically active lifestyles among children with coordination difficulties.

Keywords: *Developmental Coordination Disorder; Balance bike; Motor skills; Physical activity; Cycling*

1.4 | ACTIVE PREGNANCY: Implementation of a community-based supervised exercise program to promote healthy lifestyle, physical activity and fitness of pregnant and postpartum women in the North Region of Portugal

Pinto A.[1,2], Santos-Rocha R.[1,3], Saavedra F.[2], Silva M.-R.G.[4]

[1]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[2]Department of Sport Sciences, Exercise and Health, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal
[3]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[4]FP-I3ID, FP-BHS, and Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal

Abstract

Background: Physical activity, physical fitness, and healthy lifestyle behaviors during pregnancy and the postpartum period are key multigenerational public health protective factors that contribute to improved maternal and neonatal outcomes and long-term family health. Adequate fitness levels are associated with reduced pregnancy-related complications, enhanced functional capacity, and improved physical and mental well-being. Studies that adhered to the Criteria for Reporting the Development and Evaluation of Complex Interventions in Healthcare (CReDECI2) have demonstrated the feasibility of structured exercise programs tailored to pregnancy and the postpartum period and aligned with international recommendations. Remote, virtual exercise and education programs are particularly important for reaching pregnant and postpartum women because they can be delivered safely, flexibly, and at low cost, providing a scalable option for women who face barriers such as time constraints, childcare responsibilities, transportation difficulties, or limited access to supervised programs.

This project aims to implement two supervised, community-based virtual physical exercise programs targeting pregnant and postpartum women, respectively, and to assess their effectiveness on maternal physical activity, physical fitness, and healthy lifestyle parameters.

Methods: Two quasi-experimental trials will be conducted. Study protocols will be described according to the SPIRIT 2025 guidelines. Following medical clearance and informed consent, participants will be allocated to the respective exercise groups supervised by a qualified exercise physiologist. The intervention will last 12 or 8 weeks, with two 45-minute sessions per week, tailored to the pregnancy or postpartum stage. Maternal physical activity, physical fitness, and healthy lifestyle parameters will be assessed at baseline and post-intervention using validated questionnaires and standardized field-based fitness tests. Statistical analyses will evaluate the effectiveness of both programs and compare maternal age groups, in accordance with the CONSORT 2025 guidelines.

Expected Results: The main expected outcomes include demonstrating the positive effects of virtual programs on physical activity levels, healthy lifestyle behaviors, and both perceived and objectively measured physical fitness among pregnant and postpartum women, regardless of maternal age. This study represents ongoing work toward establishing scalable, evidence-based community exercise interventions to promote maternal health.

Keywords: *Pregnancy, postpartum, physical activity, health*

1.5 | Effects of a Combined Exercise Program on Pain and Body Composition in Women Diagnosed with Fibromyalgia

Sousa M.[1,2,3], Alves S.[1,2], Tomas-Carus P.[3], Oliveira R.[1,4,5], Mercê C.[1,2,5,6]

[1]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3]Comprehensive Health Research Centre - CHRC, Escola de Saúde e Desenvolvimento Humano, Universidade de Évora, Portugal
[4]Centro de Investigação em Qualidade de Vida (CIEQV), Santarém, Portugal
[5]Research Center in Sport Sciences, Health Sciences and Human Development (CIDESD), Instituto Politécnico de Santarém, Portugal
[6]Centro Interdisciplinar para o Estudo da Performance Humano (CIPER), Lisboa, Portugal

Abstract

Background: Fibromyalgia (FM) is a chronic condition characterized by widespread musculoskeletal pain, fatigue, and functional impairment that negatively affects physical and mental health. Excess adiposity and low muscle mass are common in this condition and may exacerbate negative symptoms. Accessible methods, such as anthropometry, allow monitoring of morphological changes during exercise interventions.

This study aimed to analyze the effects of a 10-week combined exercise program on body composition, pain intensity, and disease impact in women with FM, as well as the changes in these outcomes after a 4-week detraining period.

Methods: A quasi-experimental study was conducted with 40 women diagnosed with FM, divided into an experimental group (EG) and a control group (CG). The EG completed a 10-week combined exercise program integrating aerobic, strength, and flexibility training, followed by a 4-week detraining period. Anthropometric measures (International Society for the Advancement of Kinanthropometry), pain Visual Analogue Scale (VAS), and Fibromyalgia Impact Questionnaire (FIQ) were assessed at baseline (M1), post intervention (M2), and after detraining (M3).

Results: At baseline, groups were similar in most variables. After the intervention, the EG showed significant reductions in pain (wrist and knee) and FIQ scores ($p < 0.001$), indicating improved functional capacity and symptom control. Body composition remained stable during training but worsened after

detraining, with increased fat mass and decreased fat-free mass ($p = 0.012$). The CG showed progressive increases in pain and adiposity across all time points.

Conclusion: A 10-week combined exercise program reduced pain and disease impact in women with FM, while detraining reversed some body composition benefits. Regular, supervised exercise appears essential to maintain symptom relief and functional improvements in this population.

Keywords: *Anthropometry; Detraining; Functional Capacity; Multicomponent training; Quality of Life*

1.6 | Promoting fitness during pregnancy and postpartum by developing research-informed, socially inclusive, and digital-based educational and exercise resources for female athletes and sports professionals

Serra da Silva M.[1,2], Silva-Santos S.[1], Santos-Rocha R.[1,2]

[1]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[2]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal

Abstract

Background: Given the low prevalence of physical activity in young women in general, and the high prevalence of obesity and cardiometabolic diseases among developed countries' populations, the public health importance of increasing physical activity in women of childbearing age before, during, and after pregnancy is substantial. The promotion of moderate-to-vigorous prenatal physical activity is safe and effective for both mother and fetus contributing to promoting health and to prevent pregnancy-related disorders. Yet, most pregnant women do not receive proper guidance from public healthcare systems to be physically active, and exercising women and athletes are often discouraged from remaining active. Moreover, a lack of high-quality studies and direct evidence of physical activity volume and intensity and their effects on pregnancy outcomes on pregnant female athletes. Nevertheless, there is a growing percentage of elite female athletes, who choose to start a family during their athletic careers.

Combining pregnancy and parenthood with a sporting career can be challenging. Female athletes train and compete at the elite level during their reproductive years, yet sport policies supporting pregnancy and postpartum stages of life are lacking. Recent literature has been highlighting that within the published literature, female athletes have described how they experience numerous barriers, and are provided with minimal support and guidance, during

and following pregnancy. Moreover, elite athletes' experiences during pregnancy are vastly under-represented, and such voices are needed to support evidence-informed policies.

The objectives of this ongoing study are to identify key recommendations and actionable steps to inform the development of pregnancy guidelines to support preconception and pregnancy in national sporting organizations; to map athletes and coaches' experiences; and to build tailored resources.

Methods: A systematic review, and retrospective and qualitative studies will be conducted.

Expected results: Based on the review and qualitative study adapted from the Australian survey, data on Portuguese female athletes and coaches will inform on future educational resources and key recommendations for sporting organizations, sport coaches, exercise physiologists and female athletes during pregnancy and postpartum on: clear, transparent and multifaceted policies to support preconception and pregnancy; supportive environments which offer flexible training, social support and positive promotion of pregnant athletes; and evidence-based education and information about preconception and pregnancy to athletes, coaches, and staff.

Keywords: *Women; female athletes; pregnancy; postpartum; physical activity; exercise; educational resources*

1.7 | Characterization and Influence of Behavioral Dose on Adherence and Effectiveness of Home-Based Exercise Programs in Cancer Patients Undergoing Active Treatment: A Systematic Review Subanalysis

Paixão A.[1,2], Oliveira P.[1], Machado P.[2,3], Simões V.[1,4], Ramos L.[1,4], Félix R.[1], Branco M.[1,4,5,6]

[1]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2]Physioclem, Physical therapy clinics, Alcobaça, Portugal
[3]Center for Innovative Care and Health Technology (ciTechCare), School of Health Sciences of the Polytechnic of Leiria (ESSLei), Portugal
[4]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[5]Atividade Física e Saúde — Centro de Investigação em Qualidade de Vida (CIEQV), Santarém, Portugal
[5]Centro Interdisciplinar para o Estudo do Desempenho Humano (CIPER), Lisboa, Portugal

Abstract

Background: Exercise adherence remains one of the greatest challenges in cancer rehabilitation. In this regard, Behavior Change Techniques (BCTs) emerge as an essential tool to explain and enhance adherence. Thus, the objectives of this investigation are: (1) to identify and characterize behavior change techniques in home-based oncology intervention arms and (2) to analyze their influence on participant adherence and dropout rates throughout the exercise programs.

Methods: Secondary methodological analysis focused on the home-based exercise arms of 28 randomized controlled trials (RCTs) from a previous systematic review. Eleven essential BCTs were coded using the BCTTv1 taxonomy. Descriptive analyses, hierarchical cluster analysis (Jaccard metric) to identify technique co-occurrence profiles (clusters), and Pearson and Spearman bivariate correlations ($p < 0.05$) were performed to assess their association with adherence, dropout, and clinical outcomes.

Results: Of the 26 studies analyzed, the mean adherence was 74.8% and the dropout rate was 14.3%. An average of 6.93 BCTs per intervention was identified, with a predominance of Goal Setting and Self-monitoring (92.9% each). The

isolated count of techniques was not significantly associated with adherence or dropout (p > 0.05). However, cluster analysis revealed that only Cluster 1 (goal setting, problem-solving, action planning, commitment, and self-monitoring) demonstrated an impact on retention, exhibiting a marginal trend toward increasing adherence (rho = 0.376; p = 0.059). No significant associations were found between BCTs and clinical or symptomatic outcomes (p > 0.05).

Conclusions: The synergy between techniques is more critical than their isolated quantity. Combined patterns of self-regulation and planning (Cluster 1) are fundamental to promote autonomy and prevent dropout among cancer patients in home-based exercise programs.

Keywords: *Behavioral Adherence; Oncology Exercise; Behavior Change Techniques (BCTs); Home-Based Rehabilitation*

1.8 | ACTIVE PREGNANCY: Benefits of physical exercise on maternal physical fitness during pregnancy. Effects of virtual and in-person exercise

Castro B.[1,3], Santos-Rocha R.[2,3], Mota J[1]

[1]Faculdade de Desporto da Universidade do Porto, Porto, Portugal
[2]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[3]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal

Abstract

Background: pregnancy is a transient physiological state, from embryo implantation to the birth of the baby, during which women undergo profound hormonal, anatomical, endocrine, metabolic, psychological, and social changes. Scientific evidence shows that physical exercise provides benefits for physical fitness in pregnant women, namely cardiorespiratory fitness, muscular fitness, and balance and flexibility, as well as for health, well-being, and quality of life. Therefore, the objectives of this thesis are: (1) to analyze the effects of group-based physical exercise programs on physical fitness parameters in pregnant women; (2) to analyze the effect of a supervised physical exercise program on physical activity, physical fitness, and perceived physical fitness and health during pregnancy; (3) to compare the impact of interventions delivered in different contexts: IN (online version) versus ON (face-to-face version); (4) to evaluate the feasibility and satisfaction of participants with the physical exercise program delivered in different contexts (online versus face-to-face).

Methods: four complementary studies were developed to address the stated objectives: (1) A systematic review on the benefits of physical exercise during pregnancy on maternal physical fitness, following PRISMA 2020 guidelines; (2) A protocol for a multicenter, multicomponent, supervised physical exercise intervention delivered in virtual and face-to-face contexts over 12 weeks, with 2 to 3 weekly 45-minute sessions at moderate intensity, including the description of the program characteristics—types of exercise (aerobic training, strength training

of the major muscle groups and pelvic floor muscles, postural exercises, and stretching), frequency, intensity, and duration—according to SPIRIT 2025 guidelines; (3) An analysis of the effectiveness of the program after 12 weeks of intervention on physical activity, physical fitness, and health parameters, according to CONSORT 2025 guidelines; (4) A comparison of the effectiveness of the program delivered in different contexts (virtual and face-to-face) on physical activity, physical fitness, and health parameters, according to CONSORT 2025 guidelines; (5) A retrospective study analyzing satisfaction with the exercise program implemented during pregnancy, comparing the virtual and face-to-face contexts.

Expected Results: Expected results point to a positive effect of the intervention program delivered in both contexts on physical activity, physical fitness, and maternal health parameters. Pedagogical strategies underpinned the high adherence to the program. Supervised training programs led by qualified professionals are safe, effective, and associated with high levels of adherence and satisfaction. The results of this thesis may offer practical and accessible recommendations.

Conclusion: the existing literature, as well as the preliminary data from this thesis, reinforce the conclusion that physical exercise is safe, and yields benefits for the maternal parameters analyzed.

Keywords: *Pregnancy, Exercise, Physical Fitness*

1.9 | ACTIVE PREGNANCY: Longitudinal study on the effects of a supervised virtual exercise program during pregnancy on maternal physical fitness parameters

Freitas J.[1,2], Marinho D.[3,4], Santos-Rocha R.[1,2]

[1]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3]Department of Sport Sciences, University of Beira Interior, Portugal
[4]Research Centre in Sports Sciences, Health Sciences, and Human Development (CIDESD), Vila Real, Portugal

Abstract

Background: Physical activity during pregnancy is a major public health issue, affecting maternal health and fetal development. However, exercise must be adequately prescribed and monitored, because it may compromise the health of the participants. The demand for online interventions is growing, which may overcome barriers like time constraints or transport. Research is needed to examine not only the effectiveness of online exercise interventions, but also pedagogical and behavioral strategies, optimizing learning, engagement, and fitness adaptations. Therefore, the objectives of this study are: 1) to analyze the associations between physical activity (PPAQ) and physical fitness parameters (IFIS) in pregnant women, 2) test the application of battery fitness tests in both virtual and in person settings among pregnant and non-pregnant women, 3) develop a virtually supervised physical exercise program for pregnant women, 4) describe the study protocol and, 5) evaluate the effectiveness of program.

Methods: A total of 227 healthy women participated (167 pregnant; 60 non-pregnant), across five thesis studies, allowing analysis by maternal age (< / ≥ 35 years). The online intervention was described using CReDECI2 and CERT; the SPIRIT 2025 guidelines were applied to describe the intervention study protocol, and the results of the intervention were reported according to CONSORT 2025.

Results: Expected outcomes include demonstrating feasibility and positive effects of virtual programs on health parameters, physical activity levels, and perceived and objectively assessed physical fitness in pregnant women.

Conclusion: This study represents a work in progress toward establishing scalable, evidence-based community exercise interventions for maternal health.

Keywords: *Physical Activity; Pregnancy; Virtual Exercise Program; Physical Fitness Test Battery*

1.10 | Exercise and Nutrition in Perimenopause: Impact of a Combined Exercise and Nutrition Counselling Program on Physical Fitness, Metabolic Health, and Well-Being of Perimenopausal Women

Portela C.[1,2], Jorge R.[3,4], Santos-Rocha R.[1,2]

[1]Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal
[2]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3]School of Health Sciences, Polytechnic University of Leiria, Portugal
[4]Center for Innovative Care and Health Technology - ciTechcare, Polytechnic University of Leiria, Portugal

Abstract

Background: Perimenopause is a long transition with hormonal fluctuations that affect physical condition, metabolism, and lifestyle. How women adapt during perimenopause and post menopause shapes physical and emotional well-being and quality of life in aging. Interventions combining strength, high-intensity interval training (HIIT), stability and mobility with Mediterranean diet, glycemic control, and adequate protein show benefits. However, few evidence-based, group programs integrate exercise and nutrition for this phase and are validated by randomized trials. Therefore, this study aims to evaluate whether a 12-week structured group-based Exercise + Nutrition program improves physical fitness, metabolic health, and quality of life, compared with each component alone.

Methods: A randomized controlled trial will enroll women between 40-65 years of age, in menopause by STRAW+10. The study protocol will follow SPIRIT 2025 guidelines. After consent, participants will be randomized to three groups: IG1 will participate in three weekly sessions (online or in-person) of resistance, HIIT, and Pilates plus one weekly online nutrition counselling session (for the first 6 weeks of the intervention); IG2 will participate in the exercise program only; IG3 will participate in nutrition counselling sessions only. All participants will receive a guide to foster an active and healthy lifestyle during menopause. Assessment tools

will be applied at four time points at baseline (T0), 12 weeks (T1), 6 months (T2), and 12 months (T3) and will involve metabolic health, physical activity levels, fitness, sleep, dietary intake, symptomatology, quality of life, and adherence to the program. Statistical analyses will assess the effectiveness of each program and compare the combined program vs the separate programs per CONSORT 2025.

Expected Results: We anticipate that the combined program will better preserve lean mass, reduce fat mass (favoring peripheral distribution), improve insulin sensitivity, reduce vasomotor symptoms, improve sleep and well-being, and promote adherence to the Mediterranean diet, compared with single-component programs. Online delivery may further enhance adherence and well-being.

Discussion: The study will yield a validated clinical protocol and a Best Practices Manual for evidence-based community exercise and nutrition interventions to promote menopausal health, with applicability to public and private services and policy development.

Keywords: Perimenopause, Exercise, Nutrition, Resistance Training, Metabolic Health

1.11 | Effects of a Structured Physical Exercise Programme on Melatonin Levels and Sleep Quality in eSports Athletes

Vicente M.[1], Paixão A.[2], Rodrigues F.[1], Pimenta N.[2], Francisco R.[3]

[1]Escola Superior de Saúde Dr. Lopes Dias – Instituto Politécnico de Castelo Branco, Portugal
2 Escola Superior de Desporto de Rio Maior – Instituto Politécnico de Santarém, Portugal
[3]Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal

Abstract

Background: Sleep is a fundamental biological process involved in cognitive, metabolic, immunological, and recovery functions. Its regulation is closely linked to circadian rhythms, with melatonin playing a key role in synchronising the sleep–wake cycle. Melatonin secretion can be influenced by factors such as light exposure, lifestyle habits, and ageing. eSports athletes are frequently exposed to conditions that may disrupt sleep patterns, including prolonged screen time, late-night training sessions, irregular schedules, and sedentary behaviour. These factors may negatively affect sleep quality, recovery, health, and performance. Regular physical exercise has been identified as an effective non-pharmacological strategy to improve sleep and circadian regulation. This study aims to investigate the relationship between melatonin levels, sleep quality, body composition, and physical fitness in eSports athletes, and to evaluate the effects of a structured exercise programme on these variables.

Methods: This study will follow a pre–post intervention design. Fourteen participants will be recruited and allocated into two groups: an intervention group (n = 7) and a control group (n = 7). At baseline, all participants will collect saliva samples between 23:00 and 00:00 h to determine nocturnal melatonin concentrations. Melatonin levels will be measured using an enzyme-linked immunosorbent assay (ELISA). Sleep quality will be assessed using the Pittsburgh Sleep Quality Index (PSQI), while body composition will be evaluated through bioelectrical impedance analysis using a BIVA-PRO 101 device (Akern, Florence, Italy). Participants in the intervention group will complete a supervised moderate-intensity exercise programme consisting of 12 sessions, while the control group

will maintain their usual daily activities without participating in the programme. Perceived exertion will be recorded throughout the intervention. Forty-eight hours after the final session, all participants will repeat the assessments, including saliva collection for melatonin analysis, sleep quality evaluation, and body composition assessment.

Expected Results: Participation in the exercise programme is expected to increase nocturnal melatonin concentration and improve sleep quality. Positive changes in body composition may also be anticipated. The findings may reinforce the importance of regular physical exercise as a strategy to optimise sleep, health, and performance in eSports athletes.

Keywords: Melatonin, Sleep, eSports

SPORTS PERFORMANCE

2.1 | Effects of the Application of Different Adhesive Elastic Tapes on Muscle Strength Under Induced Fatigue Conditions

Carriço R.[1], Gonçalves R.[2], Ferreira R.[3,4,5], Bartolomeu R.[5,6,7]

[1] Coimbra Health School, Polytechnic University of Coimbra, Portugal
[2] Health & Technology Research Center (H&TRC), Coimbra Health School, Polytechnic University of Coimbra, Portugal
[3] Social Sciences, Education and Sport Department, Polytechnic Institute of Maia, Portugal
[4] Scientific-Pedagogical Unit of Physiotherapy, Coimbra Health School, Polytechnic University of Coimbra, Portugal
[5] Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[6] Polytechnic University of Guarda, Portugal
[7] Research Centre for Active Living & Wellbeing (LiveWell), Bragança, Portugal

Abstract

Background: Muscle fatigue plays a very important role in sports performance, influencing force production capacity and recovery. The aim of this crossover study was to evaluate the effect of Dynamic Tape®, Magnetic Tape®, and Kinesio Tape® application on quadriceps muscle force production capacity in apparently healthy athletes following a fatigue induction protocol.

Methods: Twelve amateur federated soccer players participated in this study, all without a history of lower-limb injuries, regularly participating in training sessions and/or matches at least twice a week over the previous two months, with a minimum of two years of regular practice in the sport and at least 90° of knee range of motion. The athletes participated in four randomized intervention sessions over four weeks: Dynamic Tape®, Magnetic Tape®, Kinesio Tape®, and control, with a 7-day washout period between sessions. In each session, participants completed a fatigue protocol consisting of 40 concentric knee extension-flexion repetitions at 120°/s, preceded by a 5-minute cycle ergometer warm-up (60 W). Knee extension of the dominant lower limb was then assessed using an isokinetic dynamometer. Torque, power, total work, fatigue index, and pain levels were recorded.

Results: No statistically significant differences were observed between interventions for peak torque, the primary outcome of the study ($p=0.060$). Similarly, total work, power, and fatigue index variables also showed no

statistically significant differences ($p>0.05$), despite the presence of moderate effect sizes. Significant differences were found in the interaction between intervention and repetition blocks ($p=0.046$), specifically between Kinesio Tape® and Dynamic Tape®, suggesting differences in the temporal progression of fatigue throughout the protocol. Statistically significant differences were also observed in the subjective scales of pain ($p=0.016$) and fatigue ($p=0.027$).

Conclusion: These results suggest that the application of elastic adhesive tapes may not significantly influence maximal strength, total work, or muscular power, although they may affect the progression of fatigue during repeated efforts. Further studies with larger sample sizes are needed to clarify these effects.

Keywords: *Muscle fatigue; Isokinetic dynamometry; Peak Torque; Elastic adhesive tapes*

2.2 | Individual Threshold Errors in Women's Football: Accounting for Relative Thresholds and Contextual Effects in Top Speed, Maximum Acceleration, and Maximum Deceleration

Silva T.[1,2], Esteves P.[2,3], Ibáñez S.[1], Krag-Andersen K.[4]

[1] GOERD, Facultad Ciencias del Deporte, Universidad de Extremadura, Cáceres, Spain
[2] Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[3] Polytechnic University of Guarda, Portugal
[4] Department of Sports Science and Clinical Biomechanics, University of Southern Denmark

Abstract

Background: Women's football has undergone rapid professionalization, increasing the physical demands of training and competition. However, fixed thresholds used to monitor external load may not adequately reflect individual physical capacities, limiting the accuracy of performance evaluation. This study investigated an individualized approach to performance monitoring in elite women's football by examining seasonal variations in top speed, acceleration, and deceleration capacities, contextual match factors, and exposure to individualized high-intensity thresholds (≥85%, ≥90%, and ≥95%) during official matches.

Methods: External load data were collected from 17 semi-professional women's football players across 22 official matches during the 2024–2025 season using GPS and accelerometry technology. Individual measurement error (IME%) was calculated as the percentage deviation from each athlete's seasonal maximum. Match- specific peak values for top speed, acceleration, and deceleration were divided by the corresponding seasonal maximum and multiplied by 100. Deviations from 100% were used to quantify individual error, while individualized thresholds ≥85%, ≥90%, and ≥95%) permitted to characterize high-intensity exposure. Linear mixed-effects models examined the influence of contextual

factors on IME%, and a three-way ANOVA was conducted to assess the interaction among players positions, threshold intervals, and metrics

Results: No significant interaction effects were observed between contextual variables and player position. Significant main effects of game location and playing position were identified for top speed IME% ($p < 0.05$). Home and away matches differed significantly in top speed IME% ($p < 0.001$; $d = 0.42$). Positional analyses revealed significant differences between central midfielders and strikers for top speed IME% ($p = 0.015$; $d = 0.87$) and maximal deceleration IME% ($p = 0.028$; $d = 0.75$). The three-way ANOVA showed significant main effects for threshold level ($p < 0.001$) and performance metric ($p = 0.006$), with no positional or interaction effects. Descriptive analyses consistently indicated greater exposure among strikers across all thresholds and metrics.

Conclusion: Individualized and position-specific approaches may enhance external load monitoring in women's football. Relative thresholds based on each player's maximal capacity, combined with IME%, may provide a more sensitive assessment of high-intensity exposure than traditional absolute thresholds. Such approaches may support improved training prescription, load management and, ultimately, players' performance.

Keywords: *Thresholds; Individualization, Women's Football; Running*

2.3 | Implementation of a Sports Performance and Health Department at an Amateur Football Club: REACT

Bernardino M.[1,2,3,5], Branco M.[1,2,3,4], Brígida N.[1,2,3], Catela D.[1,2,3] Mercê C.[1,2,3,4]

[1] *Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal*
[2] *Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal*
[3] *Centro de Investigação em Qualidade de Vida (CIEQV), Santarém, Portugal*
[4] *Centro Interdisciplinar para o Estudo do Desempenho Humano (CIPER), Lisboa, Portugal*
[5] *Facultad de Ciencias del Deporte, Universidad de Extremadura, Cáceres, Spain*

Abstract

Background: The Sports Performance and Health Department (REACT) at *Grupo Desportivo Atouguiense* was established to promote a multidisciplinary approach to athlete development, integrating performance optimization, health promotion, and injury prevention. The department currently supports athletes across both developmental and competitive football pathways, contributing to evidence-informed decision-making within the club. Therefore, the purpose of this work is to describe the implementation of REACT, present its operational framework, and summarize the main outcomes achieved during its initial phase of development.

Methods: Since its implementation, REACT has monitored 187 athletes across eight age groups, encompassing developmental categories (*Petizes*, 5–6 years; *Traquinas*, 7–8 years; and *Benjamins*, 9–10 years) and competitive categories (U-15 female, U-15 male, U-17, U-19, and senior teams). Body composition was assessed in 108 athletes using the InBody 120 bioelectrical impedance analyzer, while 25 senior players underwent a comprehensive anthropometric assessment according to International Society for the Advancement of Kinanthropometry (ISAK) standards. Motor competence and physical fitness assessments were conducted across all age groups.

Results: The implementation of REACT resulted in the creation of the club's first structured athlete monitoring system and a multidimensional database integrating anthropometric, body composition, motor competence, physical fitness, flexibility,

speed, agility, and cardiorespiratory fitness indicators. More than 40 variables were collected per athlete, supporting longitudinal monitoring and evidence-informed practice. Additionally, 61 individualized reports were produced for athletes and coaching staff from competitive age groups, facilitating personalized feedback and athlete development strategies.

Conclusion: The department has been successfully integrated into the club's organizational structure, enabling systematic monitoring across all football development stages and establishing a foundation for future research and innovation in applied sport science. These outcomes demonstrate the feasibility of implementing multidisciplinary performance and health services within an amateur football setting while supporting athlete development through objective assessment and continuous monitoring.

Keywords: *athlete monitoring; body composition; motor development; physical fitness; amateur football*

2.4 | Comparison of Ball-in-Play Running Demands Across Game Phases and The Relationship between Physical and Technical Variables: An Analysis of the 2024 Female Super Sevens Tournament

Bicudo F.[1], Figueiredo L.[2], Silva A.[3], Sarmento H.[1], Solomons J.[4], Clemente F.[5,6], Castro H.[7]

[1]Universidade de Coimbra, Portugal
[2]Universidade Federal de Minas Gerais – UFMG, Belo Horizonte, Brazil
[3]Universidade Federal de Pelotas - UFPel, Pelotas, Brazil
[4]Division of Sport Science, Stellenbosch University (SU), Stellenbosch, South Africa
[5]Sport, Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal
[6]Department of Biomechanics and Sport Engineering, Gdansk University of Physical Education and Sport, Gdansk, Poland
[7]Universidade Federal de Mato Grosso – UFMT, Cuiabá, Brazil

Abstract

Background: Rugby Sevens players require high levels of technical execution, just as well-developed aerobic and anaerobic fitness to meet the sport's intermittent high-intensity and unpredictable demands. Assessing game demands provides a clearer understanding of player requirements and helps establish physical and technical standards to work towards. For this purpose, global positioning systems (GPS) are widely employed to assess external load (EL), while video analysis is commonly used to analyze technical actions of matches, and those metrics are generally used to prescribe and evaluate training sessions. However, few studies have explored the specific demands of different game phases (attack, defense and transition) or the relationship between technical and physical variables on rugby sevens. Therefore, this study aimed to: (i) compare ball-in-play (BIP) running demands across game phases, and (ii) examine correlations between BIP duration and physical and technical variables.

Methods: Eighteen professional female rugby sevens athletes were monitored across 18 matches in the 2024 Super Sevens Cup using 10-Hz GPS units and post-match video analysis. Time of BIP, distance per minute, number of sprints per minute, sprint distance per minute (>18 km/h), number of accelerations per

minute (> 3.0 m/s2), and number of decelerations per minute (>3.0m/s2) were analyzed trough the BIP method. Post-match video analysis was conducted using Focus Software, following recommendations from previous literature to determine the number of technical actions.

Results: Significant phase differences were observed in sprint-related variables and decelerations ($p < .05$), with greater sprint output during the attacking phase, indicating that distinct locomotor outcomes emerge from different tactical contexts during matches. BIP duration was negatively associated with sprint and acceleration frequencies ($\rho = -.125$ to $-.191$, $p < .05$).

Conclusion: It is recommended that training programs periodically expose players to extended BIP efforts to enhance their ability to sustain match-level intensity. Also, BIP duration was positively associated with mostly technical variables, as tackles, passes, rucks and tries scored ($p < .05$), suggesting a technical pattern shaped by the nature of the game. These findings underscore the importance of maintaining technical performance during longer BIP periods, as the relative frequency of most technical actions remains stable.

Keywords: *Rugby; physical demands; external load; match performance; performance analysis.*

SPORTS MANAGEMENT

3.1 | Formulation of the Social Enhancement Strategy – Rio Maior Swimming Club

Rodrigues P.[1,2], Silva A.[1,2]

[1] *Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, Portugal*
[2] *Sport Physical Activity and Health Research & Innovation Center (SPRINT), Instituto Politécnico de Santarém, Portugal*

Abstract

Background: This study examines how the definition of an organization's mission, vision, and values can contribute to the development of a strategy that is both inclusive and sustainable. Its main objective is to propose a strategic model tailored to *Clube de Natação de Rio Maior (CNRM)* that may be replicated by other sports organizations. Sport in Portugal is largely rooted in the associative movement, which plays important social and educational roles and contributes to social cohesion and development. As key actors within this movement, sports clubs depend on effective management practices to ensure their sustainability. Organizational identity, reflected through mission, vision, and values, is fundamental for strategic decision-making.

Methods: A mixed-methods approach was adopted, combining documentary and statistical analysis of the contextual, transactional, and internal environments; questionnaires administered to members and stakeholders; semi-structured interviews with club directors and coaches; SWOT analysis; and strategy formulation based on the four perspectives of the Balanced Scorecard.

Results: The findings indicate that establishing a clear mission, vision, and value system is essential for developing a sustainable and inclusive strategy. The absence of a defined cultural identity has limited managerial coherence, leading the club to focus primarily on day-to-day operations. The integration of

management tools such as PEST, SWOT, McKinsey 7S, and the Balanced Scorecard provides a structured and replicable framework for aligning organisational practices with cultural identity.

Conclusion: This study resulted in the development of a strategic model for CNRM that can be applied to other non-profit sports clubs. It highlights the importance of cultural identity as a foundation for sustainability and inclusion, while demonstrating the practical relevance of sports managers and policymakers in promoting physical activity, health, and social inclusion.

Keywords: *Sports Clubs; Strategy; Strategic Management; Organizational Identity*