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RELATIONSHIP BETWEEN SOCIAL MEDIA INDUCED MENTAL FATIGUE AND SPRINT PERFORMANCE IN YOUNG FUTSAL ATHLETES

RELAÇÃO ENTRE A FADIGA MENTAL INDUZIDA PELAS REDES SOCIAIS E O DESEMPENHO DE SPRINT EM JOVENS ATLETAS DE FUTSAL

RELACIÓN ENTRE LA FATIGA MENTAL INDUCIDA POR LAS REDES SOCIALES Y EL RENDIMIENTO EN SPRINT EN JÓVENES ATLETAS DE FÚTBOL SALA

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ABSTRACT

The literature indicates that mental fatigue has negative impacts on athletic performance, affecting cognitive, technical, and physical abilities. Although its effects on endurance exercises are widely recognized, the influence of this phenomenon on high-intensity anaerobic activities remains poorly investigated, especially among young futsal athletes. This gap is relevant due to the possibility that everyday factors, such as excessive use of social media, may trigger or exacerbate mental fatigue. The aim of this study was to determine whether social media-induced mental fatigue is related to sprint performance in young futsal athletes. To this end, a quasi-experimental study was conducted with 16 male athletes aged between 13 and 16 years. Participants were assessed for anthropometry and biological maturation. To measure cognitive fatigue, a 100-millimeter visual analog scale was used before and after mental stress. Mental fatigue was induced by having participants sit in a chair and use social media on their smartphones for 40 minutes without interruption. To measure physical performance, the Repeated Sprint Test (RAST) protocol was used, and subjective perception of effort was assessed using the Borg scale (6-20). The results showed that individuals reached a state of mental fatigue after using social media (effect size: -0.701; power: 0.770) compared to the period before using smartphones. Regarding the correlation between anaerobic performance and mental fatigue, it was found that, in all variables analyzed, there was no significant association between the repeated sprint test and mental fatigue, despite the subjective perception of high effort (effect size = 0.60; power = 0.99). The study concludes that young futsal athletes who are mentally fatigued by 40 minutes on social media are not affected in their anaerobic performance of

repeated sprints in variables such as best sprint, worst sprint, average sprints, maximum power, average power, minimum power, and fatigue index.

KEYWORDS

Mental fatigue; Smartphones; Young athletes; Anaerobic performance.

RESUMO

A literatura aponta que a fadiga mental tem impactos negativos no desempenho atlético, afetando as habilidades cognitivas, técnicas e físicas. Embora seus efeitos em exercícios de resistência sejam amplamente reconhecidos, a influência desse fenômeno em atividades anaeróbicas de alta intensidade permanece pouco investigada, especialmente entre jovens atletas de futsal. Essa lacuna é relevante devido à possibilidade de fatores cotidianos, como o uso excessivo de mídias sociais, desencadear ou exacerbarem o cansaço mental. O objetivo deste estudo foi determinar se a fadiga mental induzida pela mídia social está relacionada ao desempenho de sprint em jovens atletas de futsal. Para isso, foi realizado um estudo quase experimental com 16 atletas do sexo masculino, com idades entre 13 e 16 anos. Os participantes foram avaliados quanto à antropometria e à maturação biológica. Para medir a fadiga cognitiva, utilizou-se uma escala visual analógica de 100 milímetros antes e depois do estresse mental. A indução da fadiga mental ocorreu com os participantes sentados em uma cadeira, utilizando mídias sociais em seus smartphones por 40 minutos ininterruptos. Para medir o desempenho físico, foi empregado o protocolo de Teste de Sprint Repetido (RAST), e a percepção subjetiva de esforço foi avaliada usando a escala de Borg (6-20). Os resultados mostraram que os indivíduos atingiram um estado de fadiga mental após o uso da mídia social (tamanho do efeito: -0,701; potência: 0,770) em comparação com o período anterior ao uso dos smartphones. No que tange à correlação entre o desempenho anaeróbico e a fadiga mental, verificou-se que, em todas as variáveis analisadas, não houve associação significativa entre o teste de sprint repetido e a fadiga mental, apesar da percepção subjetiva de esforço elevada (Tamanho do efeito = 0,60; Potência = 0,99). O estudo conclui que jovens atletas de futsal que estão mentalmente fatigados por 40 minutos nas mídias sociais não são afetados em seu desempenho anaeróbico de sprints repetidos em variáveis como melhor sprint, pior sprint, sprints médios, potência máxima, potência média, potência mínima e índice de fadiga.

PALAVRAS-CHAVE

Fadiga Mental; Smartphones; Jovens atletas; Desempenho anaeróbico.

RESUMEN

La literatura señala que la fatiga mental tiene impactos negativos en el rendimiento deportivo, afectando las habilidades cognitivas, técnicas y físicas. Aunque sus efectos en los ejercicios de resistencia son ampliamente reconocidos, la influencia de este fenómeno en las actividades anaeróbicas de alta intensidad sigue siendo poco investigada, especialmente entre los jóvenes atletas de fútbol sala. Esta laguna es relevante debido a la posibilidad de que factores cotidianos, como el uso excesivo de las redes sociales, desencadenen o exacerben el cansancio mental. El objetivo de este estudio fue determinar si la fatiga mental inducida por las redes sociales está relacionada con el rendimiento en sprints de jóvenes atletas de fútbol sala. Para ello, se realizó un estudio cuasi-experimental con 16 atletas varones, con edades comprendidas entre los 13 y los 16 años. Se evaluó la antropometría y la maduración biológica de los participantes. Para medir la fatiga cognitiva, se utilizó una escala visual analógica de 100 milímetros antes y después del estrés mental. La inducción de la fatiga mental se produjo con los participantes sentados en una silla, utilizando las redes sociales en sus teléfonos inteligentes durante 40 minutos ininterrumpidos. Para medir el rendimiento físico, se empleó el protocolo de la Prueba de Sprint Repetido (RAST), y la percepción subjetiva del esfuerzo se evaluó utilizando la escala de Borg (6-20). Los resultados mostraron que los individuos alcanzaron un estado de fatiga mental tras el uso de las redes sociales (tamaño del efecto: -0,701; potencia: 0,770) en comparación con el periodo anterior al uso de los teléfonos inteligentes. En cuanto a la correlación entre el rendimiento anaeróbico y la fatiga mental, se observó que, en todas las variables analizadas, no hubo una asociación significativa entre la prueba de sprints repetidos y la fatiga mental, a pesar de la elevada percepción subjetiva del esfuerzo (tamaño del efecto = 0,60; potencia = 0,99). El estudio concluye que los jóvenes atletas de fútbol sala que están mentalmente fatigados por 40 minutos en las redes sociales no se ven afectados en su rendimiento anaeróbico de sprints repetidos en variables como mejor sprint, peor sprint, sprints medios, potencia máxima, potencia media, potencia mínima e índice de fatiga.

PALABRAS CLAVE

Fatiga mental; Teléfonos inteligentes; Atletas jóvenes; Rendimiento anaeróbico.

1 INTRODUCTION

Mental fatigue (MF) is a psychobiological state characterized by feelings of tiredness and reduced cognitive performance, usually resulting from prolonged exposure to tasks that require continuous mental effort (BOKSEM; TOPS, 2008; MARCORA *et al.*, 2009). In the context of sports, science has

deepened its investigations into the effects of this condition on athletic performance, since several factors present in athletes' routines can contribute significantly to its manifestation.

Among the factors that contribute to mental fatigue in athletes' daily lives, both the demands inherent to the competitive sports environment and stimuli outside of it stand out. In the first case, the constant need to make decisions under pressure, the execution of complex tactical strategies, and the high level of concentration required during training and competitions constitute intense cognitive demands capable of triggering or aggravating this psychobiological state (RUSSELL *et al.*, 2019; RUSSELL *et al.*, 2022). In the second case, factors such as excessive use of social media and video games (FORTES *et al.*, 2019; FORTES *et al.*, 2020; FARO *et al.*, 2023; FORTES *et al.*, 2023; FREITAS-JUNIOR *et al.*, 2025), overload of academic or professional activities (RUSSELL *et al.*, 2019; MAHDAVI *et al.*, 2024), prolonged reading of complex content (MOHAMMADI *et al.*, 2022), sleep deprivation (DURMER; DINGES, 2005; VIRK *et al.*, 2022), chronic stress (MEI *et al.*, 2024) and driving vehicles, which imposes multiple simultaneous cognitive demands (ADACHI *et al.*, 2024), also contribute significantly to the development of mental fatigue.

Studies have shown that mental fatigue affects athletes' performance in a variety of ways, including cognitive, technical, and physical aspects. In terms of cognition, there are impairments in inhibitory control, working memory, decision-making, speed of action, and reaction time (COUTINHO *et al.*, 2017; SLIMANI *et al.*, 2018; VOGT *et al.*, 2018; FORTES *et al.*, 2021). In the technical-motor sphere, there is a reduction in coordination, precision, and dexterity of movements (DUNCAN *et al.*, 2015; ROZAND *et al.*, 2015; BADIN *et al.*, 2016). In physical performance, the main impacts occur on aerobic endurance, with evidence that mental fatigue significantly compromises performance in endurance activities (SMITH *et al.*, 2015; SCHIPHOF-GODART *et al.*, 2018; BROWN *et al.*, 2020; FILIPAS *et al.*, 2021; SOYLU *et al.*, 2022).

However, uncertainties and gaps remain in the scientific literature regarding the relationship between mental fatigue and short-duration, high-intensity activities, predominantly of anaerobic metabolism, such as sprints, jumps, and other explosive efforts. Most studies suggest that there is no significant relationship between mental fatigue and performance in such actions (SMITH *et al.*, 2015; WEERAKKODY *et al.*, 2021; QUEIROS *et al.*, 2021; FORTES *et al.*, 2024), although this field still lacks more targeted research on specific intermittent modalities involving repeated, high-intensity efforts directly associated with this physical capacity.

In exercise physiology, sprinting is understood as a motor action of running performed at maximum or near-maximum intensity for a short period of time. Its execution depends predominantly on anaerobic metabolism for the rapid resynthesis of adenosine triphosphate (ATP) and is therefore a reflection of the neuromuscular system's ability to produce force at high speed (GAITANOS *et al.*, 1993; SPENCER *et al.*, 2005). Performance in short sprints, in turn, is widely recognized as one of the main indicators of anaerobic power in intermittent sports (ZAGATTO *et al.*, 2009; DARDOURI *et al.*, 2014), such as futsal, in which intense, short-duration movements occur repeatedly and at high speed (SPYROU *et al.*, 2020). Even so, there are few studies that address the possible effects of mental fatigue on this variable in young school-age athletes, especially when it comes to futsal, whose physiological demands require high anaerobic response capacity. This scenario highlights an important gap in the

literature and justifies further research that considers the particularities of this population, the daily stimuli to which they are exposed (such as frequent use of social media), and the specificities of the sports context in which they are involved.

Research into the relationship between mental fatigue and anaerobic performance is therefore justified by its potential practical and scientific implications. From a practical standpoint, this study aims to generate knowledge that can guide the routines of athletes, parents, and coaches regarding the management of digital technology use—a ubiquitous behavior among young people—and its interface with physical performance. Academically, the research aims to fill or at least reduce a theoretical gap on the cognition-performance interaction in high-intensity physical efforts, as well as to test the ecological validity of a fatigue induction protocol that reflects an everyday stimulus.

Thus, the present study aims to verify whether mental fatigue induced by the use of social networks has any relationship with sprint performance in young school athletes playing futsal. Given the above, the study hypothesis is that anaerobic performance, analyzed through repeated sprints, will not be significantly altered, even if the subjects are in a state of mental fatigue.

2 METHODS

2.1 DESIGN AND PARTICIPANTS

This is a quasi-experimental study with an intra-subject pre- and post-test design. The quasi-experimental approach was chosen because it allows for the investigation of the effect of an intervention (mental fatigue induction protocol) in a field environment without the randomization of a control group, which is appropriate for the context of an already formed sports team. The intra-subject pre- and post-test design was considered the most appropriate for this study, as each athlete acts as their own control. In this model, the variables of interest are measured before (pre-test) and immediately after (post-test) the intervention, allowing the acute effect of induced mental fatigue to be analyzed, minimizing the influence of interindividual variability (differences in physical capacity, maturation, etc.) on the results. The sample was composed of 16 male athletes (aged between 13 and 16 years) from a regional futsal team. Participants were included according to the following criteria: 1) being a futsal athlete, with at least two training sessions per week during the last six months; 2) being between 13 and 16 years of age; 3) participating in a school futsal team with 80% attendance at training sessions and competitions. Volunteers who had physical or cognitive limitations that prevented them from performing the study tests or who did not participate in any of the collection stages were excluded from the sample.

2.2 ETHICS

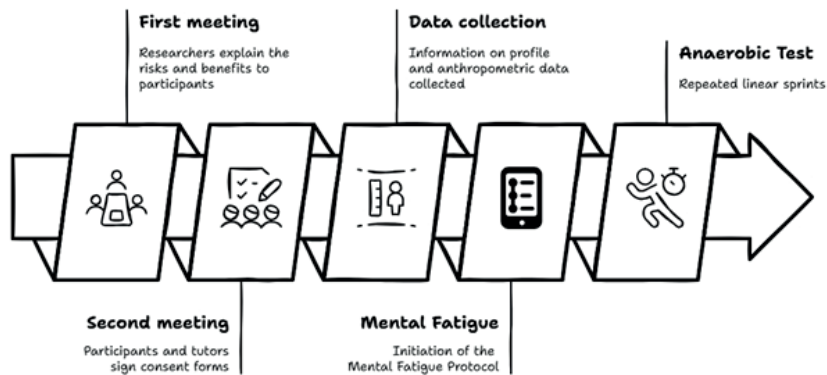
All research procedures were previously approved by the Research Ethics Committee of the Federal University of Rio Grande do Norte - Brazil (CAEE: 76464423.5.0000.5537/2024; Opinion: 6.608.025), in

accordance with Resolution 466/12 of the National Health Council, on 12/12/2012, strictly respecting the ethical principles of the Declaration of Helsinki. The study design was previously made available on the REBEC Platform (#RBR-55gksmb). All those responsible and participants were duly informed about the research procedures and reviewed the terms of consent and assent on their own accord. At the end of all stages of the research, the main results were reported back to the participants, their guardians, and coaches in accessible language. This procedure reinforces the study's ethical commitment to valuing volunteers and returning the knowledge generated to the community involved.

2.3 PROCEDURES

At the first meeting, the researchers visited the school and explained the risks and benefits of the research to teachers, guardians, and volunteers. After being informed, the participants and their respective guardians signed the informed consent forms, and then the researchers collected profile information and performed anthropometric analyses of the athletes to characterize them. After 24 hours, anthropometric and profile data were collected from all participants, followed by the mental fatigue protocol and the anaerobic repeated linear sprint test (Figure 1).

Figure 1 - Search protocol sequence.



Source: Prepared by the authors

2.4 ANTHROPOMETRIC AND BIOLOGICAL MATURATION ASSESSMENTS

The anthropometric parameters of chronological age, body mass, and height (standing and sitting) were verified by a single evaluator, strictly following the standardization of the International Society for Advancement in Kinanthropometry - ISAK (SILVA; VIEIRA, 2020). Body mass was recorded using a Balmak BK300F digital scale with a capacity of 150 kg and divisions of 1/10 kg, and height was recorded using a Sanny® ES2060 stadiometer (Personal Caprice). Body mass index (BMI) was calculated using the following equation ($BMI = \text{Weight (kg)} / \text{Height m}^2$). The maturity offset prediction was defined by peak height velocity, as described by Moore *et al.* (2015): Maturity offset in boys = $-7.999994 + [0.0036124$

$\times (\text{Age (years)} \times \text{Height (cm)})]$. The stage of biological maturation was determined from the results obtained with the Maturity offset. Based on the scores generated, the biological maturation of individuals was classified into stages: late (<-1), medium (between -1 and 1), and early (>1). All assessments were conducted individually and in a private setting, without the presence of other participants, in order to ensure the privacy of volunteers and the reliability of the data collected.

2.5 MENTAL FATIGUE PROTOCOL

For the mental fatigue protocol, participants sat in a chair and used cell phones with full attention to social media (Instagram or TikTok) for 40 minutes. Participants were supervised to ensure that there were no interruptions or shutdowns of cell phone screens. They were instructed to use only the selected social media during the protocol. This protocol was chosen to destabilize executive functions through the information overload characteristic of digital content (DURAND-BUSH; DESCLOUDS, 2018; FORTES *et al.*, 2020; FORTES *et al.*, 2021).

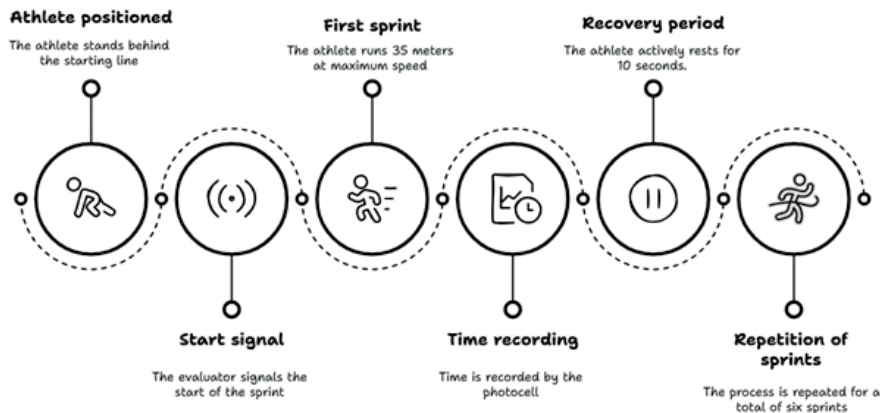
2.6 ASSESSMENT OF MENTAL FATIGUE

Mental fatigue was assessed using a 100 mm visual analog scale (VAS) (FARO *et al.*, 2023; FREITAS-JUNIOR *et al.*, 2025). Participants indicated their level of stress and perceived mental fatigue using the VAS, which ranged from low mental fatigue on the left end to greater mental exhaustion on the right end (PAGEAUX; LEPERS, 2018; SMITH *et al.*, 2019; FILIPAS *et al.*, 2021). The tests were administered before (baseline) and after the mental fatigue protocol.

2.7 PHYSICAL PERFORMANCE ANALYSIS – RUNNING-BASED ANAEROBIC SPRINT TEST (RAST).

The RAST was used to assess the participants' anaerobic performance, consisting of six supramaximal 35-meter sprints, with 10 seconds of passive recovery between them. The times were recorded with centesimal precision by photocells (Speed Test Fit – Cefise Biotecnologia Esportiva). Based on these times, maximum power (Pmax), average power (PM), minimum power (Pmin), and fatigue index (FI) were calculated (DRAPER; WHYTE, 1997; KALVA-FILHO *et al.*, 2013). The protocol involved positioning the athlete behind the starting line, starting the timing when crossing the first photocell. The sprint was performed at maximum speed to the finish line, where the second photocell recorded the final time. Then, the athlete returned to the finish line, rested for 10 seconds, and repeated the process until completing the six sprints (Figure 2).

Figure 2 - Demonstration of the Physical Protocol (RAST Test)



Source: Prepared by the authors

2.8 SUBJECTIVE PERCEPTION OF EFFORT

To assess the intensity of the RAST and the possible relationship between mental fatigue and physical performance, the Borg Scale (BORG, 1982) was used to measure subjective perception of exertion (SPE). Participants were familiarized with the scale and the concept of SPE 24 hours before the tests. The measurement was performed immediately after the sixth sprint, using a monochromatic visual scale numbered from 6 (absolute rest) to 20 (maximum effort). Due to possible exhaustion, athletes were instructed to point to the number corresponding to their perception if they were unable to verbalize it.

2.9 STATISTICS

The sample size was calculated a priori according to Fortes *et al.* (2021), considering the results on the response time and counter movement jump variables proven by the computerized Stroop test and electronic jump mat with the aid of G*Power software (Version 3.1, Düsseldorf, Germany). A minimum size of 14 individuals was reached for the present study (sample power = 0.80). The normality of the data was tested and denied by the Shapiro-Wilk, asymmetry, and kurtosis (-1.96 to 1.96) tests and by QQ-Line plotting. The effect size was verified by Spearman's Bisserial Correlation coefficient "R" and interpreted by magnitude (COHEN, 1992): low (≤ 0.05), medium (0.06-0.25), high (0.26-0.50), and very high (> 0.50). All analyses were performed using the open source software Jamovi® (version: 2.3.18. Sydney, Australia). For all analyses, a significance level of $p < 0.05$ was adopted.

In addition, post-hoc sample power was calculated from the effect size results using G*Power software (Version 3.1, Düsseldorf, Germany), interpreting the sample power appropriate for the intervention (power = 0.96).

2.10 STRATEGIES FOR BIAS CONTROL

To minimize potential researcher bias and ensure data objectivity, rigorous strategies were adopted at all stages of the study. First, all participants received standardized and neutral instructions for each procedure, avoiding any type of response induction. For physical performance variables, objective and automated equipment (photocells) and a single trained evaluator for anthropometric measurements (ISAK protocol) were used, eliminating researcher subjectivity in these collections. Crucially, for the subjective variable (mental fatigue via VAS), the assessment was always conducted individually and in a private setting. Researchers were instructed to maintain a neutral stance, limiting themselves to providing standardized instructions for completing the scale, without commenting or expressing reactions to the athletes' markings. In addition, supervision during the fatigue induction protocol was carried out discreetly, ensuring adherence to the task without creating observational pressure that could, in itself, interfere with the volunteers' mental state.

3 RESULTS

Table 1 shows the sample characteristics. We highlight that the subjects had a high subjective perception of effort (SPE) ($p=0.08$, Effect size=0.60. power:0.99).

Table 1 - Sample characterization

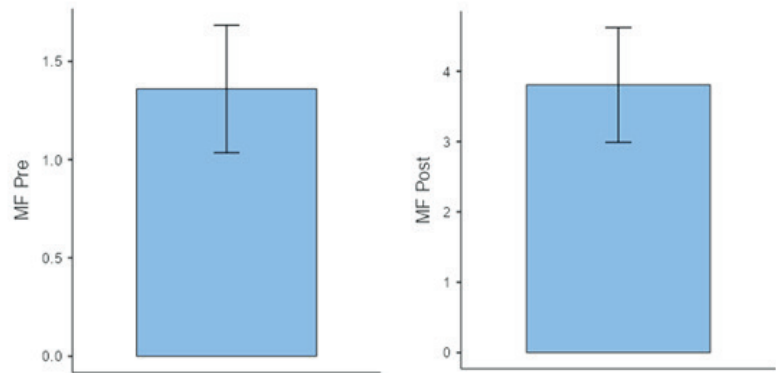
Variable	Median	Interquartile range
Age (years)	14.1	1.6
PVC	0.321	1.432
Height (centimeters)	1.650	0.127
Weight (Kg)	57.150	15.675
Body Mass Index	20.595	3.910
Sports experience (years)	3.0	2.2
Subjective Perception off Effort (SPE)	17.000	3.000

PHV: Peak height velocity; Cm: centimeters; Kg: kilograms.

Source: Research Data

In the Mental Fatigue variable, it was noted that the indices were higher after the use of social networks, suggesting that the induction occurred in a positive manner ($p= 0.013$; Effect size: -0.701; Power: 0.770) (Figure 3).

Figure 3 - Mental fatigue compared before and after using social media.



Source: Research Data

Table 2 shows the results of the relationship between mental fatigue and anaerobic performance. It can be observed that, in all anaerobic performance variables analyzed through Sprint (best sprint, worst sprint, average sprints, maximum power, minimum power, average power, and fatigue index), there was no significant association between mental fatigue and physical performance. These data indicate an absence of correlation between the state of mental fatigue and the anaerobic capacity of the participants.

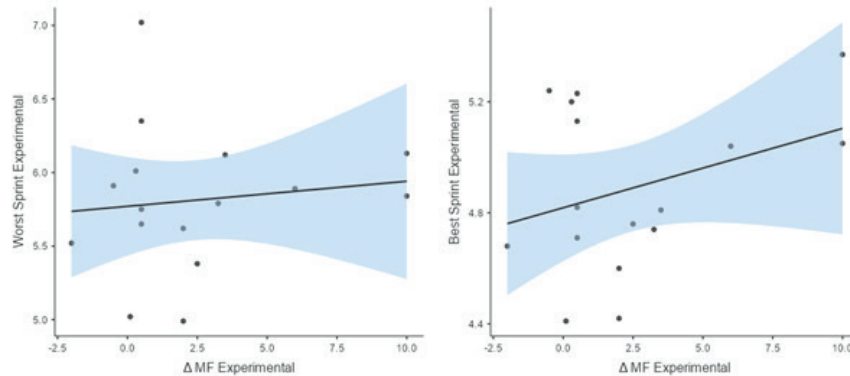
Table 2 - Correlation between mental fatigue and anaerobic capacity (Spearman’s test, R coefficient).

Variables	Correlation Data		
	R	p	Power
Mental Fatigue – Best Sprint	0.154	0.568	0.089
Mental Fatigue – Worst Sprint	0.182	0.499	0.106
Mental Fatigue – Average Sprints	0.144	0.595	0.084
Mental Fatigue – Maximum Power	-0.423	0.130	0.412
Mental Fatigue – Minimum Power	-0.460	0.073	0.487
Mental Fatigue – Average Power	-0.405	0.120	0.378
Mental Fatigue – Fatigue Index	-0.202	0.454	0.120

Source: Research Data

Figure 4 clearly illustrates the absence of correlation between mental fatigue and performance in the best sprint and worst sprint. Thus, the data demonstrate that changes in psychobiological state did not impact the participants’ anaerobic neuromuscular performance.

Figure 4 - Correlation between mental fatigue and worst and best sprint variables



Source: Research Data

In summary, the results demonstrate that the 40-minute social media protocol was effective in inducing a state of mental fatigue in young athletes. However, this change in psychobiological state did not show a significant correlation with any of the anaerobic performance variables assessed by the RAST. These findings, which corroborate the initial hypothesis of the study, provide the basis for the subsequent discussion.

4 DISCUSSION

The aim of this study was to investigate whether there is a relationship between mental fatigue and anaerobic power performance in school athletes playing futsal, using the repeated sprint test (RAST). Based on the results obtained, it was found that using social media on smartphones for 40 minutes was effective in inducing mental fatigue in participants. However, in accordance with the initial hypothesis and previous findings in the literature, no relationship was observed between mental fatigue and sprint performance, considering all the variables analyzed: best sprint, worst sprint, average sprints, maximum power, minimum power, average power, and fatigue index.

The most plausible explanation for this lack of correlation lies in the fact that mental fatigue does not directly affect physiological variables associated with muscle performance decline, such as blood lactate accumulation or significant changes in heart rate and neuromuscular function (MARCORA *et al.*, 2009; PAGEAUX *et al.*, 2015; SUN *et al.*, 2021). This is because the main mechanism involved in mental fatigue is psychobiological and subjective in nature, characterized by an increased perception of effort (VAN CUTSEM *et al.*, 2017; PAGEAUX; LEPERS, 2018; FORTES *et al.*, 2024). This mechanism is related to an increase in the neuromodulator adenosine in the prefrontal cortex and anterior cingulate cortex regions and a decrease in the release of the neurotransmitter dopamine in the body,

which is associated with pleasure, motivation, and mood (MARTIN *et al.*, 2018; ROELANDS *et al.*, 2021; FORTES *et al.*, 2024). As anaerobic efforts are high intensity and short duration (usually ending in seconds), these cognitive processes do not have a significant influence on immediate muscle performance (STAIANO *et al.*, 2024; CLAUSEN, 2003).

Previous studies also corroborate this lack of impact of mental fatigue on performance in short-duration, high-intensity exercises. Smith *et al.* (2015), for example, investigated team sports players with internal logic similar to futsal, such as soccer, and found results consistent with those of the present study. The authors observed that mental fatigue did not affect performance in high-intensity zones, where athletes maintained their peak speeds, but compromised performance in lower-intensity aerobic zones. The proposed explanation is that, in anaerobic efforts, the brevity of the action reduces the influence of psychobiological factors and the athlete's momentary mental state, with muscle performance based on contractile actions and energy metabolism prevailing.

Following this perspective, Staiano *et al.* (2024) conducted a study with amateur athletes from invasion sports (soccer, basketball, and handball), subjecting them to a battery of repeated sprints (a protocol similar to the one adopted in this research). The results indicated that mental fatigue negatively interfered only in the phase of sprints with changes in direction, resulting in a 9% drop in average running time and an increase in the fatigue index. However, during high-intensity linear sprints, no changes were observed in the variables of peak time, average time, and fatigue index. The explanation provided by the authors is that, in sprints with changes in direction, the cognitive demand to process visual stimuli and make decisions in a short period of time is greater, and therefore more susceptible to the interference of mental fatigue that affects perception, attention, and decision-making abilities. Linear sprints, on the other hand, because they depend predominantly on muscle contractile capacity and energy metabolism (exclusively physiological factors), do not require significant cognitive involvement, which makes them less vulnerable to the effects of mental fatigue.

Fortes *et al.* (2024), with 16 highly trained university athletes in athletics (a sport that makes extensive use of both anaerobic and aerobic capacities), tested whether mental fatigue induced by 60 minutes of social media use affected the neuromuscular performance of these subjects in 100- and 200-meter sprints. As a result, it was noted that after cognitive manipulations, there was no effect of mental fatigue on performance in any of the short-distance running events (100 and 200 meters). Some of the reasons given for the study's findings are that, according to functional magnetic resonance imaging (fMRI), the areas activated by short-term high-intensity efforts are different from the areas affected by mental fatigue, as mental fatigue affects the prefrontal cortex and dorsolateral cortex (WASCHER *et al.*, 2014; PIRES *et al.*, 2018), while high-intensity efforts activate the posterior cingulate cortex (FONTES *et al.*, 2015; GUIMARÃES *et al.*, 2015). In addition, there is a possibility that neuromuscular performance is regulated by peripheral mechanisms, where during high-intensity exercise there is an increase in the epinephrine (adrenaline) release, which stimulates the activity of the sodium-potassium pump (Na^+/K^+), contributing to the maintenance of membrane potential and greater contractile efficiency of muscle fibers (CLAUSEN, 2003).

Contrary to the results of the present study and the literature, Gonzalez *et al.* (2024), in a different anaerobic task (single vertical jump) with 14 highly trained university volleyball athletes, found that

mental fatigue impacted the maximum power performance of these athletes compared to the control condition. The results showed that jump performance (force applied to the ground, flight time, height reached, impact absorption on landing) was lower when subjects were induced to mental fatigue, however, there was no change in the kinematics of the movement when compared to the control condition. The authors point out that this difference in results can be explained by several factors, including the sample size being slightly smaller than in other studies with university athletes (MARTIN *et al.*, 2015; WEERAKKODY *et al.*, 2021) which may generate a lack of statistical power and results found by chance; another possibility is that the sample of their study was predominantly female (which differs from previous studies, most of which were with male athletes), which may point to a possible difference in mental fatigue between the sexes (TENG *et al.*, 2021).

The study enables us to contribute to coaches of futsal athletes in the school age group. First, we understand that using social media for 40 minutes immediately before training causes mental fatigue, which can lead to both a decrease in the subjects' motivation to practice and a greater subjective feeling of tiredness, declining their performance in both training and competitions, which is a cause for concern. Second, if the coach wants to relax the use of social media before training, the study suggests that they periodize their training to allow its use only in purely physical training focused on short-duration exercises (which use anaerobic power), since the use of smartphones does not affect this physical capacity. In addition, due to the academic demands of these athletes, the coach can use more physical training during school exam periods, which require a lot of cognitive effort, so as not to compromise their training.

Although this study presents results that can be beneficially applied to the practice of youth athlete coaches, it has some limitations: (I) we analyzed only male participants, so the results cannot be generalized; (II) although the Visual Analog Scale (VAS) is validated and widely used in experimental studies, objective behavioral and physiological measures, such as the Stroop test and electroencephalography, were not adopted to confirm the athletes' mental fatigue status with greater precision.

5 CONCLUSION

We therefore conclude with this study that 40 minutes of social media use will cause mental fatigue in young futsal athletes, but this cognitive overload has no significant relationship with anaerobic performance in sprints, considering all the variables tested in the repeated sprint protocol. These results suggest that, although cognitive fatigue is present, it does not compromise high-intensity, short-duration exercises. Despite the results presented, it is recommended that coaches limit the use of social media before activities that require complex cognitive processing (such as tactical training and games), but may be more flexible in sessions focused only on specific physical training.

Finally, this study raises new questions and opens up several avenues for future research. It would be pertinent for future studies to include female athletes in their samples in order to investigate whether the relationship between mental fatigue and anaerobic performance behaves similarly between

the sexes. Future studies could also incorporate objective measures, such as electroencephalography (EEG), to provide more robust neurophysiological confirmation of fatigue status. Furthermore, for a more holistic understanding, future research should assess the impact of mental fatigue on a broader spectrum of anaerobic performance tests. This includes other measures of lower limb power, such as the Counter Movement Jump (CMJ), and tests that assess acceleration capacity over short distances (e.g., 10m sprints). Equally important would be to evaluate performance in tasks that combine physical and cognitive components, such as agility protocols with direction changes (e.g., T-Test or Sprint with direction change), which more reliably simulate the complex demands of futsal.

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