

Relationship between reliance on physical exercise, motivational factors, and the sociodemographic characteristics of Brazilian swimming, cycling, and running athletes

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Abstract:

Introduction: Exercise dependence (EXD) is defined as a compulsive engagement in physical activity. Motivation encompasses the psychological and physiological processes driving and sustaining human behavior. Objective: i) Investigate sociodemographic differences among Brazilian swimmers, cyclists, and runners. ii) Evaluate the prevalence of EXD and motivational factors within these athlete populations. iii) Explore the impact of EXD in relation to age, gender, and motivational aspects. Methods: A total of 290 Brazilian amateur and professional swimmers, cyclists, and runners completed sociodemographic questionnaires, the Exercise Dependence Scale-Revised (EDS-R) to gauge EXD, and the Sport Motivation Scale (SMS) to assess motivation. Participants were recruited through personalized online invitations sent by the researchers via the Internet. The Virtual Snowball data collection method was utilized to access electronic questionnaires through Google Forms. These questionnaires contained the research objectives, the participant's email, and the necessary consent forms. Additionally, the instrument's contents were made accessible through this platform. Results: Significant disparities were observed in athletes' characteristics, including gender, body mass index, age, marital status, weekly training volume and frequency, and daily training sessions. Brazilian athletes exhibited high levels of EXD compared to athletes in similar studies, with significant differences in the continuity and abstinence categories. Additionally, analysis of the relationship between sports motivation, age, gender, and EXD revealed significant correlations, underscoring the importance of intrinsic and extrinsic motivators, such as intrinsic regulation, experience, and introjected and external extrinsic regulation. Conclusion: This study identified complex relationships between EXD, motivation, and sociodemographic characteristics.

Keywords: Exercise addiction; Motivation; Runners; Swimmers; Cyclists

Introduction

Cyclical aerobic activities like swimming, cycling, and running have witnessed a surge in participation across various age groups (Román et al., 2016). However, excessive exercise can trigger a pathological dependency similar to addiction (Egorov & Szabo, 2013; Zandonai et al., 2020). Exercise dependence (EXD) is characterized by compulsive engagement in physical activity (Freimuth, Moniz & Kim, 2011). It is described as a physical craving for training, which can lead to an inability to reduce training volume and/or an exacerbated increase in training loads (Lichtenstein et al., 2017). Previous studies (Downs, Hausenblas & Nigg, 2004) have shown that EXD can lead to adverse effects, including tolerance, decreased engagement in other activities, interpersonal conflicts, compulsiveness, loss of control, persistence and withdrawal symptoms.

Although EDX is not currently listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) by the American Psychiatric Association (APA), several authors suggest its potential inclusion in the category of behavioral disorders due to its distinctive characteristics (Nogueira, Salgueiro & Marques, 2018; Marques et al., 2019; Weinstein & Szabo, 2023). The absence of EDX in the DSM-5 may be attributed to the intricate task of precisely defining and diagnosing it as a distinct disorder. EDX shares certain features with other disorders such as obsessive-compulsive disorder, anxiety disorder, and eating disorder, adding complexity to its categorization (Godoy-Izquierdo et al., 2023).

Moreover, some researchers indicate that EXD may be associated with various factors such as weight, body image, gender, age, and body mass index (BMI) (Román et al., 2016). Among athletes, the propensity for EXD may stem from an obsessive desire for improvement and the pursuit of increasingly ambitious goals (Ita et al., 2022). Motivation is a key factor driving exercise, while EXD involves compulsive and uncontrolled behavior in relation to exercise. Most people start exercising for different reasons, such as improving their health, achieving fitness goals, losing weight, or seeking emotional well-being (Cruz et al., 2022). This initial motivation can be considered positive and healthy, as it leads to regular and consistent engagement in exercise. However, in some cases, the initial motivation can turn into a compulsive pursuit of exercise, leading to EXD.

This happens when a person feels increasingly pressured to exercise, regardless of the negative consequences for physical and mental health (Remilly, Mauvieux, & Drigny, 2023). Furthermore, EXD is linked to specific motivational aspects of individuals, whether intrinsic or extrinsic (Tornero-Quiñones et al., 2019).

Additionally, EXD is linked with specific motivational aspects of individuals, whether intrinsic or extrinsic (Tornero-Quiñones et al., 2019). When basic psychological needs are met in the sporting environment, athletes tend to experience intrinsic motivation, derived from pleasure and internal interest in the sporting activity. On the other hand, the frustration of these needs is associated with a more extrinsic motivation, based on external rewards or avoidance of punishments (White et al., 2021).

The more autonomous regulation of motivation is characterized as intrinsic, reflecting an activity freely experienced and self-evaluated by the individual (Deci & Ryan, 2000). Intrinsically motivated behaviors are linked to psychological well-being, pleasure, joy, and persistence (Remilly et al., 2023). In contrast, extrinsic motivation involves external regulations, differing in levels of self-determination. Integrated regulation is voluntary, oriented towards personally important goals, while identified regulation occurs when the subject participates in a task considered important but not intrinsically interesting. Introjected regulation is motivated by internal pressures, such as guilt, and external regulation is controlled by external factors (Deci & Ryan, 2000). Amotivation, on the other hand, occurs when individuals behave without discernible motivational factors (Deci & Ryan, 2000). This understanding of the motivational spectrum offers crucial insights into understanding the drives behind athletes' actions.

A recent systematic review (Gonçalves Baptista et al., 2019) underscored the significance of the self-perceived importance of exercise in individuals exhibiting symptoms of sports addiction. Furthermore, motivation was associated with factors such as body image, extrinsic rewards, personal challenges, emotional regulation, health, and enjoyment. However, the study does not specify the sports in which this relationship was investigated, leading to questions about the nature of motivation in particular sports, particularly individual sports. The authors note that existing literature lacks consensus on the primary type of motivation among athletes (Lammont & Kennelly, 2012; Cruz et al., 2024).

Therefore, this study aims to i) investigate sociodemographic differences among Brazilian swimmers, cyclists, and runners; ii) evaluate the prevalence of EXD and motivational factors within these athlete populations; and iii) examine the impact of EXD in relation to age, gender, and motivational aspects.

Materials and methods

This project is a descriptive, cross-sectional study approved by the Federal University of Juiz de Fora Research Ethics Committee. Approval was granted under opinion number 5.388.573, and the study was performed in Juiz de Fora, Minas Gerais. The initial approval was obtained on April 4th, 2022.

Participants

A total of 379 athletes participated in this study, comprising 226 men (59.6%) and 152 women (40.1%). These participants were amateur and professional runners, cyclists, or swimmers. The established inclusion criteria were as follows: (a) age over 18 years old; (b) engagement in more than 8 h of training per week; and (c) consistent participation in the sport for a year or more. Exclusion criteria encompassed being injured and incomplete questionnaire responses. A total of 89 athletes were excluded owing to training less than 8 h per week, resulting in a final sample size of 290 participants.

Instruments

The sociodemographic questionnaire, tailored specifically for this study, comprises 15 questions aimed at elucidating family structure, marital status, age, sports involvement, major competitions attended, training volume and frequency, and other demographic details.

The Exercise Dependence Scale-Revised (EDS-R) instrument was utilized to assess exercise dependence (EXD), gauging physical and psychological impairments and their impact on individuals' daily functioning. This scale comprises 21 items distributed across seven factors: tolerance, abstinence, intentionality, lack of control, time, reduction of activities, and continuity. Adapted for the Brazilian context (Oliveira & Alchieri, 2010), respondents rate items on a Likert scale ranging from 1 (Never) to 5 (Always). EDS-R scores are interpreted on a continuum (ranging from 21 to 105), with higher scores indicative of more pronounced EXD symptoms. The EDS-R instrument demonstrates robust psychometric properties, including reasonable internal reliability, test-retest reliability, and concurrent validity.

The Sport Motivation Scale (SMS-Br) assesses three types of intrinsic motivation (knowledge, stimulation, and execution), three types of extrinsic motivation (identified, introjected, and external), and amotivation, guided by Self-Determination Theory. Respondents answer the question "Why do you practice sport?" across 28 items, with each dimension comprising four items rated on a Likert scale from 1 (Does not correspond at all) to 7 (Corresponds exactly). The Brazilian version, validated and translated by Bara et al. (2011) with athletes from various sports, exhibits satisfactory internal consistency, with Cronbach's alpha values ranging from 0.68 for amotivation to 0.81 for intrinsic motivation.

Procedure

Research participants were recruited through individual invitations sent by the researchers via email and social networks, including Instagram, Facebook, LinkedIn, and WhatsApp. Data collection took place between June 2023 and July 2023. Initially, the researchers contacted prominent professional athletes via social media accounts and engaged with influential pages dedicated to the three sports under study. The virtual snowball methodology was employed to target key reference chains (Costa, 2018). The Virtual Snowball data collection commenced with the distribution of a link via Google Forms, granting access to the electronic questionnaire. This questionnaire encompassed the research objectives, the Free and Informed Consent Form (ICF), the solicitation of participants' personal email addresses, and access to the instrument's content. Before responding, athletes were informed of their right to withdraw consent at any point without prejudice, and they were provided the option to participate in the study voluntarily.

Statistical analysis

Statistical data analysis was conducted using the SPSS statistical software, version 22.0 for Windows (SPSS Inc, Chicago, USA), with descriptive statistics such as mean, standard deviation, and percentages presented. The normality of data distribution was assessed using the Kolmogorov–Smirnov normality test. In this study, a p-value of 0.200 was obtained, indicating insufficient evidence to reject the null hypothesis and thus confirming that the data can be considered approximately normally distributed. The chi-squared test was employed for categorical variables to assess the homogeneity of groups concerning sociodemographic characteristics, while ANOVA (one-way) was utilized for numerical variables. Post-hoc pairwise comparisons were conducted using the Bonferroni adjustment for group comparisons. Furthermore, Pearson correlation and multiple linear regression analyses were performed to explore the relationships between the dependent variable (EXD) and the independent variables such as gender, age, and motivation categories. The significance level was set at $p \leq 0.05$.

Results

Table 1 presents the results of sociodemographic variables concerning the practiced sport. There are significant differences between genders in cycling ($p = 0.005$), with men being the most prevalent. Similarly, significant differences are found for BMI ($p = 0.027$), with runners exhibiting the lowest values. Swimmers constitute the youngest age group on average ($p = 0.008$). Performance levels diverge significantly, with a higher proportion of professionals among swimmers ($p = 0.000$) and a greater prevalence of amateurs among runners ($p = 0.000$). Regarding marital status, there is a higher percentage of married cyclists than swimmers ($p = 0.050$). Weekly training volume demonstrates variation, with cyclists training 10–12 h weekly, surpassing runners ($p = 0.001$). Swimmers engage in more frequent training than runners ($p = 0.023$), and swimmers perform more training sessions than cyclists ($p = 0.004$).

Table 1. Sociodemographic characteristics of participants in relation to sport

n (%)		Swimming n= 39	Cycling n=81	Running n=170	Total Sample	X ² /F	p-value
Gender	Males	19 (48.7%)	62 (50.7%)	101 (59.2%)	182 (62.6%)	10.788	.005*
	Females	20 (51.3%)	19 (30.3%)	69 (40.8%)	108 (37.4%)		
BMI (Mean±SD)		25.01 (3.98)	23.61 (2.84)	23.47 (3.21)	23.72 (3.25)	3.644	.027*
Age (Mean±SD)		33.71 (12.55)	39.48 (8.58)	37.99 (9.19)	37.83 (9.67)		.008*
Performance Level	Amateurs	31 (79.5%)	78 (96.3%)	168 (98.8%)	277 (95.5%)	27.860	.000*
	Professionals	8 (20.5%)	3 (3.7%)	2 (1.2%)	13 (4.5%)		
Education	Basic I	0 (0%)	0 (0%)	0 (0%)	0 (0%)	14.062	.080
	Basic II	0 (0%)	3 (3.7%)	0 (0%)	3 (1%)		
	High school	8 (20.5%)	19 (23.5%)	24 (14.1%)	51 (17.6%)		
	Higher	11 (28.2%)	22 (27.2%)	68 (40%)	101 (34.8%)		
	Postgraduate	20 (51.3%)	37 (45.7%)	78 (45.9%)	135 (46.6%)		
Civil Status	Married	11 (28.2%)	49 (60.5%)	77 (45.3%)	137 (47.2%)	15.502	.050*
	Divorced	3 (7.7%)	5 (6.2%)	12 (7.1%)	20 (6.9%)		
	Single	20 (51.3%)	19 (23.5%)	63 (37.1%)	102 (35.2%)		
	Stable union	5 (12.8%)	7 (8.6%)	18 (10.6%)	30 (10.3%)		
	Widower	0 (0%)	1 (1.2%)	0 (0%)	1 (0.3%)		
Hours per week worked	More than 40h	10 (25.6%)	30 (37%)	78 (66.1%)	118 (40.7%)	18.442	.108
	Between 20-40h	16 (41%)	41 (50.6%)	55 (32.4%)	112 (38.6%)		
	Between 10-20h	7 (17.9%)	6 (7.4%)	15 (8.8%)	28 (9.7%)		

	Less than 10hh	0 (0%)	1 (1.2%)	6 (3.5%)	7 (2.4%)		
	Does not work	6 (15.4%)	3 (3.7%)	16 (9.4%)	25 (8.6%)		
Years of training	1-3	7 (17.9%)	16 (19.8%)	28 (16.5%)	51 (17.6%)	7.190	.304
	4-7	5 (12.8%)	24 (29.6%)	52 (30.6%)	81 (27.9%)		
	8 -10	6 (15.4%)	11 (16.6%)	29 (17.1%)	46 (15.9%)		
	+ 10	21 (53.8%)	30 (37%)	61 (35.9%)	112 (38.6%)		
Weekly volume (hours)	Between 8-10h	17 (43.6%)	32 (39.5%)	100 (58.8%)	149 (51.4%)	25.193	.001*
	Between 10-12h	4 (10.3%)	27 (33.3%)	25 (14.7%)	56 (19.3%)		
	Between 12-15h	9 (23.1%)	15 (18.5%)	26 (15.3%)	50 (17.2%)		
	Between 15-20h	6 (15.4%)	6 (7.4%)	9 (5.3%)	21 (7.2%)		
	More than 20h	3 (7.7%)	1 (1.2%)	10 (5.9%)	14 (4.8%)		
Weekly training frequency	2x Week	0 (0%)	2 (2.5%)	1 (0.6%)	3 (1%)	20.718	.023*
	3x week	0 (0%)	9 (11.1%)	13 (7.6%)	22 (7.6%)		
	4x week	1 (2.6%)	13 (16%)	33 (19.4%)	47 (16.2%)		
	5x week	11 (28.2%)	16 (19.8%)	22 (12.9%)	49 (16.9%)		
	6x week	16 (41%)	24 (29.6%)	70 (41.2%)	110 (37.9%)		
	7x week	11 (28.2%)	17 (21%)	31 (18.2%)	59 (20.3%)		
Training sessions per day	1 session	13 (33.3%)	57 (70.4%)	96 (56.5%)	166 (57.2%)	18.984	.004*
	2 sessions	24 (61.5%)	22 (27.2%)	67 (39.4%)	113 (39%)		
	3 sessions	2 (5.1%)	0 (0%)	5 (2.9%)	7 (2.4%)		
	4 sessions	0 (0%)	2 (2.5%)	2 (1.3%)	4 (1.4%)		

*p < 0.05; SD= standard deviation.

Table 2 presents the findings from the EDS-R and SMS questionnaires across the three evaluated endurance sports. While no significant differences are observed in the total EDS-R scores between sports, swimmers exhibit notably higher averages in the "Continuity" category than cyclists. In contrast, runners demonstrate higher averages in the "Abstinence" category than cyclists. Though no significant differences are observed among motivation categories in the SMS ($p \geq .05$), a significant effect is discerned in the "Identified extrinsic" category, with swimmers and runners presenting higher averages compared to cyclists, which could be a relevant result from practical or clinical standpoints.

Table 2. Descriptive statistics of EXD and motivation between sports

		Swimming Mean (SD) n= 39	Cycling Mean (SD) n=81	Running Mean (SD) n=170	p-value	F	Post-hoc
EXD	Intentionality	9.00 (3.56)	8.80 (3.29)	8.35 (3.42)	0.431	0.844	
	Continuance	7.54 (3.76)	6.06 (2.78)	6.41 (3.05)	0.048	3.073	S>Cy*
	Tolerance	11.44 (2.83)	10.78 (3.23)	10.49 (3.29)	0.251	1.388	
	Reduction of activities	7.92 (3.22)	7.67 (2.80)	7.21 (2.82)	0.265	1.336	
	Lack of control	11.62 (2.25)	10.60 (2.75)	10.86 (2.72)	0.151	1.902	
	Abstinence	10.46 (2.97)	9.54 (3.13)	10.72 (3.45)	0.031	3.517	Ru>Cy*
	Time	9.44 (3.11)	8.47 (2.93)	9.71 (3.23)	0.283	1.266	
Motivation	EDS-R total	67.41 (12.29)	61.93 (13.45)	62.76 (13.87)	0.100	2.326	
	Intrinsic – namely	22.95 (4.27)	22.21 (5.55)	22.74 (5.13)	0.682	0.383	
	Intrinsic – to perform	24.46 (3.13)	23.06 (5.03)	23.95 (4.64)	0.218	1.533	
	Intrinsic – experience	25.13 (3.13)	24.30 (4.28)	25.32 (3.39)	0.111	2.218	
	Identified - extrinsic	21.05 (5.75)	19.83 (5.57)	21.51 (5.20)	0.070	2.687	
	Introjected - extrinsic	20.64 (4.62)	21.22 (5.06)	21.43 (5.40)	0.694	0.366	
	External -extrinsic	14.85 (5.18)	12.73 (5.96)	13.14 (6.29)	0.189	1.677	
	Amotivation	8.26 (5.18)	7.75 (4.29)	7.19 (4.73)	0.372	0.992	

*p < 0.05; SD (standard deviation). S: Swimming. Cy: Cycling. Ru: Running.

Table 3 shows correlations between gender, age, EXD, weekly training volume, and motivation to practice across the respective modalities. The EDS-R and SMS exhibit a significant correlation in multiple categories, including intrinsic motivation ($r = 0.455$; $p < 0.05$), intrinsic motivation to perform ($r = 0.423$; $p <$

0.05), intrinsic motivation to experience ($r = 0.469$; $p < 0.05$), identified extrinsic motivation ($r = 0.311$; $p < 0.05$), introjected extrinsic motivation ($r = 0.417$; $p < 0.05$), and external extrinsic motivation ($r = 0.369$; $p < 0.05$). Additionally, EXD (as measured by EDS-R) shows a significant association with gender ($r = 0.410$; $p < 0.05$) and age ($r = -0.279$; $p < 0.05$).

Table 3 – Pearson correlation between sex, age, weekly training volume, EXD and motivation

Gender (A)	1	-.036	.082*	.410*	.445*	.447*	.461*	.151*	.296*	.107*	-.173*
Age (B)		1	-.074*	-.279*	-.007	-.022	.070*	.197*	.020	-.104*	.017
Weekly training volume (C)			1	.117*	.156*	.052*	.071*	.239*	.016	.294*	.256
EXD (D)				1	.455*	.423*	.469*	.311*	.417*	.369*	.037
Intrinsic – namely (E)					1	.853*	.817*	.495*	.531*	.338*	-.031
Intrinsic – to perform (F)						1	.927*	.443*	.574*	.283*	-.054*
Intrinsic – experience (G)							1	.504*	.523*	.180*	-.138*
Identified -extrinsic (H)								1	.554*	.506*	.173*
Introjected -extrinsic (I)									1	.246*	.089*
External -extrinsic (J)										1	.277*
Amotivation (K)											1

* $p < 0.05$; Gender: Male = 0; Female = 1.

Table 4 presents the outcomes of linear regression, with EXD as the dependent variable and gender, age, and motivation as independent variables. Variables demonstrating moderate to strong correlations (between 0.2 and 0.6) (Cohen, 2013) were included in the regression analysis, with age, intrinsic regulation experience, and introjected and external extrinsic regulation emerging as common predictors.

Table 4 - Linear regression of EXD predictive factors

	EXD			Confidence interval of 95%	
	B	T	p-value	Inferior limit	Upper limit
Constant	41.136	5.964	.000*	27.556	54.715
Gender	-1.604	1.055	.292	-4.598	1.389
Age	-.440	-5.926	.000*	-.587	-.294
Intrinsic – namely	-.218	-1.046	.297	-.629	.193
Intrinsic – to perform	.160	.556	.579	-.407	.727
Intrinsic – experience	.903	3.079	.002*	.326	1.481
Identified -extrinsic	-.268	-1.565	.119	-.605	.069
Introjected -extrinsic	.704	4.239	.000*	.377	1.031
External -extrinsic	.322	2.326	.021*	.050	.595
Amotivation	.097	.618	.537	-.212	.406

* $p < 0.05$; Gender: Male = 0; Female = 1.

Discussion

Concerning gender, age, BMI, and training volume, conflicting findings have emerged in the literature. Santos et al. (2014) found no significant gender differences in running addiction among half marathoners and marathon runners. Conversely, Guskowska and Rudnicki (2012) reported that men displayed higher sports addiction levels than women. On the contrary, studies by Román et al. (2016) and Tornero-Quñones et al. (2019) suggested that female triathlon athletes exhibited elevated rates of EXD. In our study, although gender correlated with EXD, it did not emerge as a significant predictive factor. Regarding BMI, consistent with previous research (Román et al., 2016; Tornero-Quñones et al., 2019), we observed significant differences among endurance athletes, with runners displaying the lowest rates, aligning with recent literature findings.

Regarding age, a previous investigation (Tornero-Quñones et al., 2019) suggested that young adults exhibited a higher prevalence of EXD compared to older adults, a trend observed in our study. Regarding training volume, Román et al. (2016) observed significant differences in the duration and frequency of training sessions across athletes, with triathletes demonstrating the highest volume. Similarly, Tornero-Quñones et al. (2019) found that swimmers and triathletes completed more training sessions, while cyclists devoted more time per session. In our study, swimmers displayed a higher weekly training frequency, whereas cyclists spent more time per session.

The second objective was to assess the prevalence of EXD and motivational factors across athlete populations. Our investigation revealed no significant differences in total scores between sports. However, swimmers showed significantly higher averages in the "Continuity" category than cyclists. This suggests that swimmers are more likely to continue exercising despite knowing they have a persistent disorder, which may be caused or worsened by exercise (e.g., continuing to swim despite an injury) (Lichtenstein et al., 2017). On the other hand, runners displayed significantly higher averages in the "Abstinence" category than cyclists. This

could indicate that runners are more likely to experience withdrawal symptoms such as anxiety, fatigue, or depression when they stop exercising or are unable to exercise, which may suggest physiological exercise dependence. This greater difficulty in stopping or reducing exercise among runners could be due to the unique neuroadaptations associated with running and the relative ease of maintaining the activity compared to swimming or cycling (Zandonai et al., 2020).

The third objective was to explore the impact of motivation on sports practice concerning age, gender, and motivational aspects. Our findings suggest associations between certain motivations—such as intrinsic regulation, introjected extrinsic regulation, and external extrinsic regulation—and EXD. Previous studies (Edmunds, Ntoumanis & Duda, 2006; Fortier, 2009) have also highlighted introjected extrinsic regulation as a significant predictor of EXD. Additionally, González-Cutre and Sicilia (2012) linked EXD not only to non-self-determined motivations like external and introjected regulation but also to self-determined motivations such as integrated regulation. Román et al. (2016) identified integrated, identified, and introjected regulations as predictors of EXD. Furthermore, several studies have indicated an inverse correlation between age and sports addiction prevalence (Ruiz-Juan, Sancho & Ibarzábal, 2013; Román et al., 2016; Tornero-Quñones et al., 2019).

Conclusions

The results underscore significant differences in athletes' characteristics regarding gender, BMI, age, marital status, weekly training volume and frequency, and daily training sessions. Notably, Brazilian athletes exhibited higher levels of EXD than their counterparts in similar studies, with notable differences observed in the "Continuity" and "Abstinence" categories. Moreover, the analysis revealed substantial associations between sports motivation, age, gender, and EXD, underscoring the pivotal role of intrinsic and extrinsic factors in shaping athlete behavior. Noteworthy motivation categories include intrinsic regulation, experience, introjected and external extrinsic regulation

This study is a promising exploration of the associations between EXD and motivation among athletes in Brazil. However, some limitations should be mentioned. First, the cross-sectional design of this investigation constrains causal interpretations. Additionally, the sociodemographic analysis lacked a specific question regarding the presence or absence of children, an important factor identified in previous studies. Based on the findings, several recommendations for future research can be considered. i) Diversify samples to include athletes from different geographic regions, cultures, and sporting performance levels. ii) Implement longitudinal studies to track changes in the variables of interest over time. iii) Expand the analysis to encompass other individual sports modalities beyond running, cycling, and swimming, aiming to elucidate specific patterns of EXD and motivation within different sporting contexts. This study's insights into the associations between Exercise Dependence (EXD), motivation, and diverse athlete characteristics offer actionable recommendations for sports practitioners to tailor training interventions, emphasizing the importance of considering cultural nuances and individual motivations in optimizing athletes' well-being and performance.

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