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An Integrated Analysis of Environmental, Team, and Parental Relations on Psychosocial Skills Development and Their Association With the Mental Health of Adolescent Athletes

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ABSTRACT

The development of psychosocial skills in youth athletes is related to multiple sports' subsystems, including parental, team, and environmental factors. These subsystems shape athletes' ability to acquire life skills, cope with stress, and build resilience which influence mental health. Understanding these interactions is essential for designing effective interventions that promote well-being and protect against mental illness. This study examined how subsystems within the youth sport system relate to psychosocial skills and their relation to athletes' mental health. A quantitative, cross-sectional design was employed, and Structural Equation Modeling analyzed pathways. Validated instruments assessed parenting behavior (EMBU-P), coach–athlete relationship (CART-Q), life skills (LSSS), coping (ACSI-28), resilience (SRS), sport well-being (S-MHC), and psychosocial difficulties (SDQ). The sample comprised 312 athletes (13.9 ± 1.9 years) from two Brazilian regions, one from a nationally renowned club and another from a microregion. Athletes from the microregion reported lower levels of life skills, but higher levels of psychological resilience and greater psychosocial difficulties. The coach–athlete relationship played an essential role in fostering life skills and sport well-being. Parenting behavior was positively associated with life skills and coping skills and negatively related to psychosocial difficulties. Life skills, coping skills and psychological resilience were positively associated with sport well-being, reinforcing their role in psychosocial adaptation. Psychological resilience was the only skill linked to reducing psychosocial difficulties. The findings highlight the distinct, positive roles of the coach–athlete relationship and parenting behavior in fostering psychosocial skills, while underscoring the complex (something opposing) influence of the region and type of sport on specific skills.

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Mental health is best understood as a state that combines different levels of emotional, psychological, and social well-being with the assessment of mental illness. This view conceptualizes well-being and mental illness into two distinct but related continuums, allowing for a more nuanced assessment of mental health beyond the traditional illness-based perspective (Keyes, 2014). In sport contexts, this approach can be adapted to assess athletes' mental health through sport-specific indicators of well-being (Foster & Chow, 2020; Tozetto et al., 2024). For example, an athlete may not have any diagnosed mental illness but still feel emotionally drained, disconnected from teammates, and lacking motivation—indicating low well-being despite the absence of clinical symptoms (Keyes, 2014). This framework, called the dual-continuum model of mental health (Keyes, 2014), enables a deeper understanding of how youth sport system can both support and hinder athletes' mental health (Rato Barrio et al., 2021).

This holistic perspective, which views well-being and personal development as central goals within the athletes' development (Hauser et al., 2024), underscores the necessity of systemic conceptual models. To conceptualize this system, the heuristic model for integrated understanding of the youth sport system (HMYSS) exemplifies the dynamics of sports and

presents three subsystems that relate to the athlete: environmental, team, and family subsystem (Dorsch et al., 2020). Each subsystem consists of different levels of relation exerted by sports agents, such as directors, nutritionists, psychologists, consultants, physiotherapists, coaches, parents, siblings, and teammates, all of whom contribute to the athletes' development. Understanding the quality of these relations—whether they provide functional support or exert dysfunctional pressure—is important, as these features directly shape the sport development environment and influence long-term well-being and psychosocial outcomes (Hauser et al., 2024).

The sports environmental subsystem provides experiences through local social and cultural structures, which are reflected in different designs for young athletes' participation (Dorsch et al., 2020; Evans et al., 2017). As a result, various sports and formats exhibit unique characteristics shaped by their specific contexts (Moeijes et al., 2018; Rossing et al., 2018; Vaughan et al., 2022). In the southern and southeastern regions of Brazil, athletes from capitals and large cities can explore multiple sports during their development, whether team-based or individual, supported by private or public initiatives and the concentration of financial resources (PNUD, 2017; Tozetto et al., 2017). Additionally, elite sports clubs with fully

professional structures are predominantly found in large cities and capitals. In contrast, smaller cities and rural areas generally offer only team sports (e.g., soccer, volleyball, basketball), typically funded by cities with scarce resources and prejudiced by a limited number of coaches (PNUD, 2017; Tozetto et al., 2017). Coaches, as primary agents directly engaged with athletes, play a fundamental role in shaping their behaviors, attitudes, experiences, and outcomes within the team subsystem (Dorsch et al., 2020; MacDonald et al., 2020; Simons & Bird, 2023). Furthermore, as agents of the family subsystem, parents are essential contributors to the development of young athletes' character and conduct (Dorsch et al., 2020; Lopes et al., 2024; Rouquette et al., 2021). These roles involve multiple forms of support, where parents typically provide emotional (e.g., understanding needs), informational (e.g., guidance on career and educational balance), and tangible support (e.g., transport and finances), while both parents and coaches maintain appropriate behaviors to support the coach–athlete relationship (Hauser et al., 2024). When aligned, these subsystems function like interconnected gears, facilitating comprehensive athletes' development through a positive environment and the cultivation of various psychosocial skills, including life skills, coping strategies, and psychological resilience (Rouquette et al., 2021; Simons & Bird, 2023; Swann et al., 2018).

The sports skills learned under the encouragement of subsystems, such as communication, leadership, and time management, are transferred and applied by athletes to interact effectively with the world and are referred to as life skills (Mossman et al., 2021; Silva et al., 2022; Vealey, 2024). Among these psychosocial skills, coping skills play a crucial role in problem-solving and conflict resolution by relying on behavioral and cognitive management mechanisms (Rose et al., 2023; Silva et al., 2022). Coping skills involve strategies to regulate external or internal demands that surpass the athlete's available resources (Rose et al., 2023; Silva et al., 2022). For example, athletes can utilize coping skills to regulate emotions during a highly competitive match or to resolve conflicts with or among their peers. Another vital psychosocial skill for athletes is psychological resilience, which refers to the ability to face and overcome difficulties and risks while continuing to perform daily tasks effectively (Ostaszewski, 2020; Trigueros et al., 2019). An athlete who experiences personal adversities, such as family issues, yet maintains their training routine and competitive performance demonstrates strong psychological resilience.

Beyond their definition, these psychosocial skills have distinct learning moments and applications. For instance, life skills may be intentionally or unintentionally taught by coaches during sports practice and later applied by athletes to manage their study routines (Mossman et al., 2021; Silva et al., 2022; Vealey, 2024). When learning coping skills, athletes can actively use these resources to maintain balanced stress levels, whether in a sports competition or while taking an academic exam (Fogaca, 2021; Rose et al., 2023; Silva et al., 2022). Meanwhile, psychological resilience reflects the individual resources and experiences that enable athletes to stay engaged and/or recover quickly after a sports defeat or receiving a low grade (Ostaszewski, 2020; Trigueros et al., 2019).

The subsystems and psychosocial skills directly stimulate athletes' development throughout their life cycle and, consequently, impact their mental health (Foster & Chow, 2020). For instance, parents and coaches can hinder development through negative performance evaluations, pressure for results, harsh criticism, violent behaviors, and other comments perceived negatively by young athletes (Lopes et al., 2024; Mossman et al., 2021; Swann et al., 2018). Conversely, environments where coaches and parents adopt strategies that foster positive development are associated with beneficial effects on mental health (Evans et al., 2017; MacDonald et al., 2020; Mossman et al., 2021; Swann et al., 2018).

Indeed, prior research has established the importance of these individual components. For instance, specific environmental structures, such as participating in team sports and high-frequency participation, are associated with fewer internalizing problems in children (Moeijes et al., 2018). Regarding the agents, adolescents perceive both coaches and parents as key support individuals for their mental health (Swann et al., 2018). Furthermore, interventions focused on mental health literacy and resilience (Vella et al., 2021), as well as psychological skills training (often facilitated by coach support), have proven effective in promoting athlete well-being (Wang et al., 2025). While these studies establish the importance of individual components, recent review (e.g., Hauser et al., 2024) emphasize that sport development environments are complex systems comprised multiple features (such as coaches, parents, and organizational support). However, few studies have employed an integrated framework to interpret these interconnected factors (like environment, the team, and the family) as a unified system, controlling for indirect and correlated effects among variables (Mossman et al., 2021; Rouquette et al., 2021; Trigueros et al., 2019). Similarly, limited research has utilized a comprehensive mental health framework, such as a dual-continuum model (Keyes, 2014). This gap may hinder a comprehensive understanding of outcomes, even though some studies in sport have demonstrated its application (Rouquette et al., 2021; Vella et al., 2021).

As presented by the HMYSS, agents function as interconnected gears (Dorsch et al., 2020). Given this interdependence, understanding the conceptual pathways through which these different subsystems, agents, and psychosocial skills interact allows for an integrated comprehension of the Brazilian sports landscape for mental health promotion. Therefore, this study aimed to examine the relation of subsystems on the psychosocial skills of young Brazilian athletes and how these skills associated to mental health. Specifically, we addressed the following research questions: (1) How do environmental, team, and family subsystems associate the development of psychosocial skills in adolescent athletes? (2) How do these psychosocial skills relate to mental health outcomes (sport well-being and psychosocial difficulties)? (3) To what extent do psychosocial skills mediate the relation between sport subsystems and mental health outcomes in adolescent athletes? Understanding these relations is essential for designing evidence-based interventions that foster both athletic and personal development, ultimately promoting long-term well-being in young athletes.

Based on the HMYSS framework, we hypothesized that positive relations within the team and family subsystems, as well as favorable environmental contexts, would be positively associated with the development of psychosocial skills (life skills, coping, and resilience), which in turn would predict higher levels of sport well-being and lower psychosocial difficulties.

Method

Study design

This study followed a cross-sectional design with a sample of athletes from different sports across two contexts. The investigation was quantitative, with variables collected through validated questionnaires that assessed the Heuristic Model of the Youth Sport System (HMYSS), psychosocial skills, and the mental health of young athletes. The analysis tested the pathways of relations between the variables leading to mental health.

Procedures

The study sample was conveniently selected from two distinct sports contexts. The first is a huge Brazilian sports club located in a large city in Minas Gerais/BR with an estimated population of 2316 million people. The second consists of three small sports units maintained by the municipal structure of three small cities within the same microregion in Paraná/BR, with a combined population of 102,034 people (59,250 + 28,759 + 14,025). These two contexts were selected as they represent a stark contrast in available resources, which is characteristic of the Brazilian sport landscape. The “large city” context is a nationally renowned high-performance club (recognized as a club that develops Olympic athletes), characterized by a fully professional structure, multidisciplinary teams (including sports psychologists), specialized facilities, and high-quality equipment. The “small cities” context consists of municipal organizations operating with scarce resources, shared multi-sport facilities (often a single court), and only a single coach responsible for the entire modality across different age groups.

Data collection took place between July and December 2023. Researchers sent e-mails to participants with project information, along with the research questionnaires administered via an online form (Google Forms). The eligibility criteria were, being aged between 12 and 17 years and practice a sport in the contexts analyzed. This age range reflects the standard age group for secondary school students in Brazil.

Measurements

The main measurements include Sport Well-being, Psychosocial Difficulties, Psychosocial Resilience, Coping skills, Life skills, Athlete/Coach Relationship, Type of Sport, Region.

The measurements were classified according to personal characteristics, the three subsystems of the HMYSS, psychosocial skills, and mental health. The personal characteristics are:

Age, Gender, Self-report of diagnosis of diseases/disorders (long-term; short-term), Sedentary Behavior (hour/week), Sleeping Time (hours/night). Environmental Subsystem: Region (Large city; Small cities), Type of Sport (Team; individual), Funding (No scholarship; Scholarship), Level of Competition (Municipal or Regional; National or International). Family Subsystem: Parenting Rearing Behavior. Team Subsystem: Training Frequency (hour/week), Time practicing the sport (in years) Athlete/Coach Relationship. Psychosocial Skills: Life Skills, Coping Skills, Psychological Resilience. Mental Health: Sport Well-Being, Psychosocial Difficulties.

Multiple measurements were used to multifactorial understand the sport scenario and control for confounding factors and were selected based on their theoretical and empirical relevance. Age, gender, and funding are standard sociodemographic covariates. Level of competition and Time practicing the sport captures structural differences in sport engagement (Vella et al., 2017; Walton et al., 2021). Previous Diagnosis accounts for preexisting clinical conditions, while training frequency, sedentary behavior, and sleeping time reflect behavioral patterns known to effect adolescent mental health (Moeijes et al., 2018; Walton et al., 2021).

Data collection

The form was used to assess athletes via eight questionnaires and included general questions as well. The questionnaires, authors, and descriptions of all measurements are found in supplementary material 1.

To summarize, the EMBU-p instrument (Kobarg et al., 2010) was used to assess perceptions of parental rearing behaviors from the athlete’s perspective (Parenting Rearing Behavior). The Coach–Athlete Relationship Questionnaire (CART-Q) assesses the athlete’s perception of their relationship with their coach (Vieira et al., 2015).

To measure psychosocial variables, three questionnaires were adopted. The Life Skills Scale for Sport—LSSS was used to observe life skills acquisition through sport (Nascimento-Junior et al., 2020). The Athletic Coping Skills Inventory—ACSI-28 (Miranda et al., 2018) was employed to assess coping skills. The Sport Resilience Scale—SRS (Bicalho et al., 2021) was used to evaluate athletes’ psychological resilience.

To operationalize the dual continua model of mental health (Keyes, 2014), we assessed both sport well-being and indicators of psychosocial difficulties. The Mental Health Continuum in Sport—Short Version (S-MHC) was used to capture athletes’ well-being (Tozetto et al., 2024), while the Strengths and Difficulties Questionnaire (SDQ) served as a behavioral screening tool for emotional and behavioral symptoms commonly associated with mental health problems in adolescents (Fleitlich et al., 2000). These symptoms are referred to in this study as Psychosocial Difficulties.

In all questionnaires, higher values indicate positive outcomes for the constructs, except for the SDQ, where higher values indicate greater psychosocial difficulties. Prior to the main data collection, a pilot test ($N = 5$) was conducted to assess clarity and completion time, which ranged from 15 to 25 minutes. No issues occurred during this phase, the

participants reported full understanding of the questions, and no modifications were required for the final form. To mitigate order effects and participant fatigue, the presentation order of the questionnaires was randomized for each participant.

Data analysis

The data were tabulated into an Excel spreadsheet and exported to the RStudio data analysis software, version 2021.09.0. Descriptive statistics included absolute and relative frequencies, means, and standard deviations. The data were imputed using the MICE package and the Predictive Mean Matching (PMM) method (Lee & Carlin, 2017).

Structural Equation Modeling (SEM) from the *lavaan* package was employed to understand the paths between variables leading to mental health, using the MLR (Maximum Likelihood with Robust Standard Errors) estimation method. To separate the types of variables and the logic of the paths, the division between the environmental, family, and team subsystems was followed. The tested order was: Personal Characteristics → Environmental Subsystem → Family and Team Subsystem → Psychosocial Skills → Mental Health. Model 1 (initial) included all hypothesized paths between variables, representing the full theoretical model. Model 2 (final) retained only the statistically significant paths ($p < .05$) and was obtained using a backward elimination procedure to remove nonsignificant paths iteratively. The script in R for initial and final models are presented in Supplementary Material 2.

The fit indices included the following criteria and cutoff points: degrees of freedom (df) equal to or greater than 1, p -value of the chi-square test (χ^2) above 0.05, χ^2/df ratio less than 3.00. The Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) above 0.95 indicating good fit. Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) below 0.08 indicating good fit (Kline, 2015). Modification indices (MI) for residual covariances were also considered. Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-size Adjusted Bayesian Information Criterion (SIBIC) were considered, with lower values indicating better model fit. Bootstrapping was performed for 1000 resamples and estimate the robust 95% confidence intervals for the standardized estimate (β stan.) (Kline, 2015).

Sample size

Various recommendations on sample size for SEM studies can be found in the literature, ranging from 10 to 20 subjects per variable (Costello & Osborne, 2005; Kline, 2015). Considering the 19 collection measurements presented, the required sample size was estimated to range from 190 to 380 athletes.

Ethics

The study was approved by the Ethics Committee for Research with Human Beings at the Federal University of Santa Catarina (CEPSH-UFSC; Opinion No. 5.955.858). All participants were properly informed about the procedures and agreed to the

Informed Consent Form and Assent Form in accordance with Resolution 466/12 of June 12, 2012, from the National Health Council/Brazil and the Helsinki Declaration.

Results

Data from 312 athletes were analyzed. The sports practiced by the adolescents were as follows: 74 (23.7%) futsal, 112 (35.9%) volleyball, 36 (11.5%) swimming, 27 (8.7%) tennis, 20 (6.4%) judo, 27 (8.7%) basketball, 14 (4.5%) artistic gymnastics, and two (0.6%) trampoline gymnastics. Table 1 presents descriptive information for the athletes by region. Descriptive information about the gender can be found in supplementary materials 3.

Long-term diagnoses represent athletes with the following conditions: asthma ($n = 20$), type 1 diabetes ($n = 4$), rhinitis ($n = 3$), dermatitis ($n = 2$), myocarditis ($n = 1$), hemophilia ($n = 1$), juvenile myoclonic epilepsy ($n = 1$), dyslexia ($n = 1$), supra-ventricular tachycardia ($n = 1$).

Short-term diagnoses represent athletes with the following conditions: eating disorders ($n = 6$), anxiety disorder ($n = 26$), attention-deficit/hyperactivity disorder (ADHD) ($n = 18$), depression disorder ($n = 1$), obsessive-compulsive disorder (OCD) ($n = 5$), bipolar disorder ($n = 1$), anterior cruciate ligament injury (ACL) ($n = 1$), panic disorder ($n = 1$).

The fit indices are presented in Table 2. Model 1 presented appropriate adjustment indices, except for the χ^2 p -value. The χ^2 p -value is sensitive to small discrepancies between the theoretical model and the observed data, however the other indices present excellent indices (Kline, 2015). The fit indices of model 2 were excellent and better than those of model 1, considering that the AIC, BIC, and SABIC were lower for model 2 compared to model 1.

Table 3 presents the effects of each significant path observed between the variables for the final model. The final model presents a correlation of -0.134 ($p = .038$) between the Sport Well-being and Psychosocial Difficulties, a finding that empirically supports the dual-continuum model (Keyes, 2014), demonstrating that the constructs are distinct (small effect size) yet related ($p < .05$). Control paths can be found in supplementary material 4. During the analysis, the modification indices did not show any relevant additional path.

Sport well-being is positively inclined by psychological resilience ($\beta = 0.215$, $p < .001$), coping skills ($\beta = 0.191$, $p = .006$), life skills ($\beta = 0.166$, $p < .001$), and the athlete/coach relationship ($\beta = 0.226$, $p < .001$). In contrast, the parenting rearing behavior ($\beta = 0.043$, $p = .297$) are not significant predictors. Individual sport negatively affects sport well-being ($\beta = -0.115$, $p = .028$), while being from small cities has no significant relation ($\beta = -0.086$, $p = .206$).

Psychosocial difficulties were negatively predicted by psychological resilience ($\beta = -0.062$, $p = .005$), and parenting rearing behavior ($\beta = -0.149$, $p < .001$). In contrast, being from the small cities was associated with higher psychosocial difficulties ($\beta = 0.102$, $p < .001$). Coping skills ($\beta = -0.027$, $p = .444$), life skills ($\beta = 0.018$, $p = .400$), the athlete–coach relationship ($\beta = -0.003$, $p = .914$), and individual sport ($\beta = -0.014$, $p = .599$) did not show significant effects.

Psychological resilience was significantly and positively predicted by coping skills ($\beta = 0.561$, $p < .001$) and life skills

Table 1. General information about athletes across regions.

Categorical Variables	Large City n (%)	Small Cities n (%)
Region	248 (79.5%)	64 (20.5%)
Gender		
Male	161 (64.9%)	10 (15.6%)
Female	87 (35.1%)	54 (84.4%)
Type of Sport		
Team	149 (68.3%)	64 (100%)
Individual	99 (31.7%)	–
Funding		
No scholarship	175 (70.6%)	–
Scholarship	73 (29.4%)	–
Level of Competition		
Municipal or Regional	104 (41.9%)	55 (85.9%)
National or International	144 (58.1%)	9 (14.1%)
Self-reported Diagnosis		
Long-term diagnosis	24 (9.7%)	7 (10.9%)
Short-term diagnosis	29 (11.7%)	16 (25.0%)
Continuous variables	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Age (in full years)	14.5 $\pm$ 1.8	13.2 $\pm$ 1.3
Practice Time of the Sport (in full years)	5.9 $\pm$ 2.3	1.9 $\pm$ 1.9
Training frequency (hours/week)	11.1 $\pm$ 6.0	5.2 $\pm$ 3.1
Sedentary Behavior (hours/week)	13.1 $\pm$ 9.8	15.8 $\pm$ 10.7
Sleeping time (hours/night)	7.8 $\pm$ 1.10	7.6 $\pm$ 1.20
Sport Well-Being	4.3 $\pm$ 0.49	3.9 $\pm$ 0.60
Psychosocial Difficulties	0.41 $\pm$ 0.18	0.58 $\pm$ 0.23
Psychological Resilience	2.92 $\pm$ 0.57	2.72 $\pm$ 0.59
Coping Skills	1.88 $\pm$ 0.41	1.60 $\pm$ 0.37
Life Skills	3.18 $\pm$ 0.59	2.68 $\pm$ 0.68
Athlete/Coach Relationship	6.53 $\pm$ 0.49	6.08 $\pm$ 0.75
Parenting Rearing Behaviour	2.36 $\pm$ 0.37	2.13 $\pm$ 0.42

Note. $\bar{x}$ = Mean; N = Absolute frequency; % = Relative frequency; SD = Standard deviation.

Table 2. Fit indices for the initial and final models.

	df	χ^2	χ^2/df	CFI	TLI	RMSEA (IC95%)	SRMR	AIC	BIC	SABIC
Model 1	70	95.87*	1.37	0.989	0.955	0.034 (0.013; 0.051)	0.060	14055.4	15204.5	14230.8
Model 2	138	152.76	1.11	0.992	0.988	0.019 (0.000; 0.034)	0.044	9503.0	9798.7	9548.1

Note. df = degrees of freedom; χ^2 = chi-square test; TLI = Tucker–Lewis index; CFI = comparative index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SABIC = Sample-size Adjusted Bayesian Information Criterion; * = $p < .05$.

($\beta = 0.333$, $p < .001$). Being from the small cities also contributed positively ($\beta = 0.138$, $p = .021$). In contrast, the athlete–coach relationship ($\beta = -0.079$, $p = .327$) was not significant predictors of psychological resilience. Parenting rearing behavior demonstrated a marginal effect ($\beta = 0.165$, $p = .053$), and type of sport ($\beta = -0.094$, $p = .204$) showed no significant association with psychological resilience.

Coping skills were positively related by life skills ($\beta = 0.323$, $p < .001$), and parenting rearing behavior ($\beta = 0.146$, $p = .006$). In contrast, participating in individual sports had a negative relation ($\beta = -0.106$, $p = .008$). No significant effects were found for the athlete/coach relationship ($\beta = 0.001$, $p = .995$) or from the region ($\beta = -0.034$, $p = .541$).

Regarding predictors of life skills, the athlete/coach relationship showed a positive effect ($\beta = 0.416$, $p < .001$) and parenting rearing behavior also contributed positively ($\beta = 0.178$, $p = .046$). Additionally, participating in individual sports had a negative relation ($\beta = -0.218$, $p = .002$) and being from the small cities was associated with a negative effect ($\beta = -0.472$, $p < .001$).

Figure 1 shows the standardized coefficients of the significant paths and the explained variances of the variables (R^2) of the final model.

Discussion

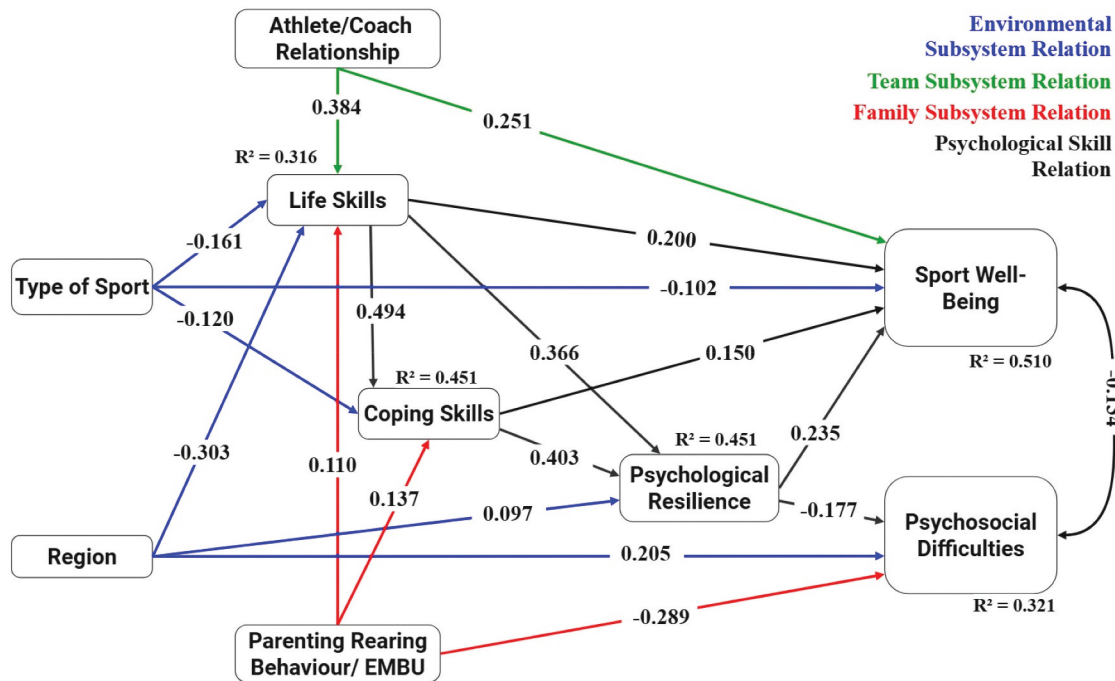
The objective of this study was to investigate the integrated pathways through which environmental, parental, and team subsystems relate to the psychosocial skills and mental health of young Brazilian athletes. The results demonstrated that psychosocial skills, such as life skills, coping skills, and psychological resilience, along with the coach–athlete relationship and sport type, play a fundamental role in the promotion of sport well-being. However, only region, resilience, perceived coach–athlete relationship, and parenting rearing behavior were associated with reduced psychosocial difficulties.

This study analyzed, through the adoption of the HMYSS, the interaction of different pathways related to the mental health of young athletes (Dorsch et al., 2020; Keyes, 2014). The adoption of integrated models that

Table 3. Direct paths adjusted through the structural equation model between the analyzed variables at model 2.

Direct paths	β	95% CI	SE	β stan.	95% CI	P-value
Sport Well-Being						
Psychological Resilience	0.215	(0.111/0.319)	0.053	0.235	(0.126/0.345)	<0.001
Coping Skills	0.191	(0.056/0.327)	0.069	0.150	(0.035/0.262)	0.006
Life Skills	0.166	(0.071/0.261)	0.049	0.200	(0.079/0.322)	0.001
Athlete/coach relationship	0.226	(0.133/0.318)	0.047	0.251	(0.145/0.349)	<0.001
Parenting Rearing Behaviour	0.043	(-0.038/0.125)	0.042	0.059	–	0.297
Type of Sport (individual)	-0.115	(-0.219/-0.012)	0.053	-0.102	(-0.191/-0.004)	0.028
Region (small cities)	-0.086	(-0.220/0.047)	0.068	-0.066	–	0.206
Psychosocial Difficulties						
Psychological Resilience	-0.062	(-0.105/-0.019)	0.022	-0.177	(-0.302/-0.05)	0.005
Coping Skills	-0.027	(-0.095/0.041)	0.035	-0.054	–	0.444
Life Skills	0.018	(-0.024/0.061)	0.022	0.057	–	0.400
Athlete/coach relationship	-0.003	(-0.067/0.060)	0.032	-0.010	–	0.914
Parenting Rearing Behaviour	-0.149	(-0.205/-0.094)	0.028	-0.289	(-0.411/-0.177)	<0.001
Type of Sport (individual)	-0.014	(-0.065/0.037)	0.026	-0.031	–	0.599
Region (small cities)	0.102	(0.048/0.156)	0.027	0.205	(0.099/0.308)	<0.001
Psychological Resilience						
Coping Skills	0.561	(0.393/0.728)	0.086	0.403	(0.287/0.515)	<0.001
Life Skills	0.333	(0.227/0.440)	0.054	0.366	(0.243/0.478)	<0.001
Athlete/coach relationship	-0.079	(-0.237/0.079)	0.081	-0.081	–	0.327
Parenting Rearing Behaviour	0.165	(-0.002/0.332)	0.085	0.112	–	0.053
Type of Sport (individual)	-0.094	(-0.238/0.051)	0.074	-0.076	–	0.204
Region (small cities)	0.138	(0.021/0.255)	0.060	0.097	(0.014/0.183)	0.021
Coping Skills						
Life Skills	0.323	(0.263/0.383)	0.031	0.494	(0.402/0.583)	<0.001
Athlete/coach relationship	0.001	(-0.128/0.129)	0.065	0.001	–	0.995
Parenting Rearing Behaviour	0.146	(0.041/0.251)	0.054	0.137	(0.043/0.233)	0.006
Type of Sport (individual)	-0.106	(-0.185/-0.028)	0.040	-0.120	(-0.206/-0.031)	0.008
Region (small cities)	-0.034	(-0.141/0.074)	0.055	-0.033	–	0.541
Life Skills						
Athlete/coach relationship	0.416	(0.300/0.531)	0.059	0.384	(0.283/0.482)	<0.001
Parenting Rearing Behaviour	0.178	(0.003/0.354)	0.089	0.110	(0.002/0.22)	0.046
Type of Sport (individual)	-0.218	(-0.353/-0.083)	0.069	-0.161	(-0.255/-0.062)	0.002
Region (small cities)	-0.472	(-0.654/-0.290)	0.093	-0.303	(-0.407/-0.185)	<0.001

Note. β = unstandardized estimate; 95% CI = 95% confidence interval; SE = standard error; β stan. = standardized estimate.

**Figure 1.** Directional relation between the variables studied.

consider multiple pathways and controls between variables is essential for a comprehensive understanding of these phenomena (Garrido et al., 2022; Sun et al., 2016). Traditional models, based on univariate analyses, fail to capture the complexity of interactions between subsystems (Vella et al., 2017). Approaches such as SEM allow for the simultaneous analysis of multiple factors, providing a comprehensive view of underlying mechanisms and dynamic interactions between subsystems, skills, and mental health (Kline, 2015).

The environmental subsystem

Engaging in an individual sport negatively related to life skills, coping skills and sport well-being compared to team sports. The absence of frequent social interactions and teamwork, which are intrinsic characteristics of team sports, may account for these findings (Greydanus et al., 2023; Pluhar et al., 2019; Swann et al., 2018). The social setting of team sports can facilitate the development of interpersonal skills such as leadership, communication, and conflict resolution (Pluhar et al., 2019; Swann et al., 2018). In contrast, athletes in individual sports tend to face challenges that are more centered on self-management and can play for goal-oriented reasons rather than for enjoyment (Evans et al., 2017; Pluhar et al., 2019). These findings suggest that sport agents working with individual athletes should intentionally include group-based activities, such as peer interaction exercises or mentorship dynamics, to promote interpersonal skills and support psychosocial development.

Furthermore, the type of sport showed no direct relation to psychological resilience or psychosocial difficulties. However, our results suggest an indirect negative effect on psychosocial difficulties due to the negative association of life skills, coping skills, and sport well-being. This relation is consistent with previous studies that identified an association between different types of sport and psychosocial difficulties (Evans et al., 2017; Pluhar et al., 2019). These findings provide further insight into the effects of individual sports on mental health, highlighting the potential benefits of structural changes that promote the teaching of life skills and coping skills (Evans et al., 2017; Pluhar et al., 2019).

We observed that athletes from the small cities exhibited a negative association on life skills, and a positive relation on psychological resilience and psychosocial difficulties. In small-town settings, where sports participation depends almost entirely on a coach, the lack of specialized training or external stimuli may hinder life skills development (Rossing et al., 2018; Tozetto et al., 2017; Vaughan et al., 2022). This contrasts with high-performance clubs, where greater awareness is fostered by multidisciplinary teams, encouraging strategies to foster life skills development in young athletes (Moeijes et al., 2018; Rato Barrio et al., 2021; Rossing et al., 2018; Vaughan et al., 2022). Athletes from less populated cities, however, encounter greater challenges due to limited infrastructure and resources, which may cultivate emotional adaptation and a resilient mind-set in response to their specific context (Rato Barrio et al., 2021). A negative relation on life skills can lead to greater difficulties in daily life and create a need to overcome these adversities

through psychological resilience (Keyes, 2014; Newman et al., 2022; Silva et al., 2022). Thus, an explanation suggesting that greater psychosocial difficulties increase psychological resilience due to lower life skills may better fit the small cities than the tested model. Therefore, in small-town contexts, investing in the development and retention of coaches, along with the inclusion of external professionals—such as psychologists or social educators—is essential to support life skills development and reduce the emotional burden that often leads to reactive resilience.

No significant relation was found between the region and coping skills or sport well-being. This indicates that, in an analysis adjusted for multiple factors, the environmental subsystem of small or big towns does not have a direct relation on these dimensions. However, the results confirm that the environmental subsystem is indirectly related the coping skills and sport well-being through the path of life skills and psychological resilience. This highlights the importance of initiatives aimed at recruiting multidisciplinary teams, such as sports psychologists and social workers, to foster practices that support the comprehensive development of young athletes.

The team subsystem

The coach–athlete relationship positively related to life skills acquisition and sport well-being. Trust and support by the coach creates a favorable climate for learning and a more satisfying sports experience (Cronin & Allen, 2018). Cronin and Allen (2018) identified life skills development as a mediating factor in the link between coaching and well-being. This suggests that negative perceptions of the coach may heighten feelings of pressure or insecurity, impairing the ability to manage challenges and increasing the likelihood of emotional difficulties in athletes (Mossman et al., 2021; Rato Barrio et al., 2021). These findings are in line with the review by Hauser et al. (2024) which identifies the support and quality of the coach–athlete relationship as essential and functional characteristics of talent development environments that promote youth well-being. This underscores the importance of coaches being aware of the perceptions they instill in their athletes. Clear and consistent communication, along with actions that convey support and appreciation, can enhance psychosocial skills and mitigate psychosocial risks, fostering a healthier setting for comprehensive development (MacDonald et al., 2020; Rato Barrio et al., 2021; Simons & Bird, 2023). Accordingly, coach development programs should include training on managing athletes' perceptions, with emphasis on effective communication and feedback strategies that reinforce their sense of value and psychological safety, ensuring that support is expressed in ways clearly perceived by youth athletes.

However, the lack of a direct link with coach–athlete relationships and psychological resilience suggests that the coach indirectly contributes to overcoming challenges. This reinforces the need for coach development programs to move beyond technical instruction and include content on autonomy-supportive behaviors, as these indirectly foster key psychological traits associated with resilience in young athletes. Indeed, Hauser et al. (2024) found that the absence of

instruction in essential psychosocial competencies (e.g., self-responsibility, autonomy, and pressure management) actively impaired the personal growth trajectory of young athletes. Trigueros et al. (2019) found that athletes' resilience was shaped by factors such as self-determination, self-esteem, and emotional intelligence. These factors, in turn, are modulated by various forms of psychological control exerted by the coach, including rewards and intimidation—thus indirectly shaping the development of these psychosocial skills (Trigueros et al., 2019).

The family subsystem

Parenting rearing behavior had a positive relation on life skills and coping skills and a negative relation on psychosocial difficulties. Positive parental involvement plays a key role in the development of athletes' skills and directly serves as a protective factor against developmental issues (Lopes et al., 2024; Mossman et al., 2021; Walton et al., 2021). The results dismiss the notion that negative parenting practices—focused on winning at all costs, surpassing others, and punishing mistakes—could paradoxically foster life skills development (Lopes et al., 2024; Mossman et al., 2021). Parents with higher life skills and coping skills may implement positive parenting practices in raising their children, who subsequently adopt and replicate these behaviors as athletes (Lopes et al., 2024). However, given their direct paths on psychosocial difficulties, it is plausible to hypothesize that negative parenting practices contribute to athletes' psychosocial difficulties (Walton et al., 2021). These findings highlight the importance of offering parent-focused education initiatives within sport programs, aimed at promoting tangible behaviors, informational and emotional support that enhance psychosocial development and prevent psychosocial difficulties in youth athletes. The review by Hauser et al. (2024) reinforces this, noting that environmental characteristics, like parenting, are rarely purely functional; the same relationship can be a source of good support or, conversely, of dysfunctional pressure.

Conversely, parenting rearing behavior was not associated with sport well-being. This lack of association suggests that factors within the proximal team subsystem—such as interactions with coaches and teammates—are more decisive for sport well-being (Mossman et al., 2021). This finding suggests that the subsystems within the HMYSS model (Dorsch et al., 2020) may not be equally influential across all outcomes. Specifically, for sport-specific well-being, the family subsystem may be functionally more distant than the team subsystem, precisely because parents are generally not present during the daily training context where this well-being is primarily experienced (Dorsch et al., 2020; Mossman et al., 2021). In this sense, sport programs should strengthen the social climate within training settings—through coach and peer-focused strategies—as a primary avenue for promoting well-being in athletes, especially when parental presence is limited.

The psychosocial skills

The positive effect between life skills and coping skills indicates that learning sports skills and transferring them to other

contexts helps improve athletes' ability to cope when facing adversity (Silva et al., 2022). Both were positively associated with psychological resilience, supporting adaptability and recovery in challenging situations. These findings support the hypothesis that life skills foster the development of coping skills, and together they strengthen psychological resilience (Silva et al., 2022; Wang et al., 2025).

Psychosocial skills had positive effects on sport well-being, indicating that a range of competencies—including communication and teamwork (life skills), emotional regulation (coping skills), and persistence (psychological resilience)—contribute to a healthier and more meaningful sport experience (Cronin & Allen, 2018; Vealey, 2024; Wang et al., 2025). These skills help athletes cope with the emotional and competitive pressure of sports (Fogaca, 2021; Laureano et al., 2014; Rose et al., 2023) and play a role in adaptation and recovery from daily adversities (Schweickle et al., 2023). Thus, the learning of intra- and interpersonal skills enable athletes to act autonomously and take responsibility for their actions, being part of their personal development (Hauser et al., 2024). These results reinforce the need for structured sport-based interventions that intentionally teach life skills with real-world applications, as this approach strengthens coping strategies and fosters the development of long-term psychological resilience.

Among psychosocial skills, only an increase in psychological resilience was associated with a reduction in psychosocial difficulties, underscoring its role as a key protective factor for young athletes in challenging contexts (Foster & Chow, 2020; Ostaszewski, 2020; Schweickle et al., 2023; Vella et al., 2021). Programs that foster resilience through experiential challenges, guided reflection, and support systems may therefore be particularly effective in helping athletes manage adversity and prevent emotional difficulties. This result aligns with Schweickle et al. (2023), who found that resilience acted as a mediator in enhancing well-being and reducing psychological distress. However, the data were analyzed in two unconnected models, omitting potential correlations between different variables and a possible indirect effect on the outcome.

On the other hand, life skills and coping skills exhibited no direct effects on psychosocial difficulties. Fogaca (2021) found similar results, in which improvements in coping skills were not linked with reduced depressive symptoms. This lack of direct effect suggests that these skills alone are insufficient to mitigate difficulties but instead contribute indirectly by strengthening psychological resilience. Psychological resilience mediates the relation between psychosocial skills and the reduction of psychosocial difficulties, highlighting the importance of interventions that enhance athletes' adaptability (Foster & Chow, 2020; Schweickle et al., 2023; Wang et al., 2025). Therefore, programs aiming to reduce emotional and behavioral problems in youth sport should target resilience as a central outcome, which can be fostered through the development of life and coping skills.

Limitations and strengths

This study adopted a cross-sectional design, limiting the ability to infer causal relation between the analyzed

variables. However, SEM enabled the simultaneous examination of multiple pathways and relation, offering a robust framework for exploring complex subsystem interactions. A further methodological consideration was the adoption of the conventional ($\alpha = 0.05$) significance level for path inclusion. While this could be viewed as a limitation in a complex model, it was mitigated in two key ways: first, we employed bootstrapping to ensure robust estimates, and second, our interpretation was not driven by p-values alone. Rather, we focused on the practical significance of the standardized beta coefficients (i.e., effect sizes), which are displayed in the main model figure. This approach ensures that the magnitude of relation, not just their statistical threshold, guides our conclusions. Additionally, the model adjustments were presented in the supplementary material 4 and can be used to understand the dynamics related to athletes' personal characteristics and other factors.

Conducting the study with athletes from two different regions of Brazil may limit the generalizability of the findings to other cultural or sports contexts with differing levels of structural support. Especially because the sample context analyzed represents the two geographic macroregions with the highest concentration of resources, as well as the highest Municipal Human Development Index (MHDI) (PNUD, 2017). Nevertheless, incorporating both a nationally recognized club and microregions allowed for a broader representation of sport contexts, emphasizing how structural disparities shape psychosocial skills and mental health.

Finally, while the integrated model accounted for subsystems and psychosocial skills, it did not consider external factors such as sociocultural and educational characteristics or additional association from agents like siblings, peers, and psychologists. Nonetheless, focusing on key variables within the sports context establishes a strong foundation for future studies to incorporate these dimensions and deepen the understanding of this topic.

Conclusion

This study provides empirical evidence that partially supports our initial hypothesis regarding the integrated pathways of the youth sport system to the mental health of young Brazilian athletes, while providing empirical answers to our core research questions. Regarding the first research question, our findings reveal that the team (via athlete-coach relationship) and parental subsystems (via parent rearing behavior) are associated with the development of life skills and resilience, although participation in individual sports and residing in small cities represent significant structural barriers to this development.

In relation to the second research question, the evidence demonstrates that three psychosocial skills are strongly related to sport well-being, while resilience and positive parental behavior act as important buffers against psychosocial difficulties. Finally, concerning the third research question regarding the extent to which psychosocial skills

mediate the relation between sport subsystems and mental health outcomes, the integrated structural equation model confirms that psychosocial skills serve as an important pathway that translates the influence of sport subsystems into mental health outcomes. Collectively, these results highlight that while the team environment promotes well-being through life skills, the environmental and parental subsystems are more determinant in mitigating psychosocial difficulties.

Practical applications

Ultimately, this study offers a practical framework for guiding youth sport policies and interventions, suggesting that mental health strategies should be subsystem-specific rather than universal. Since the athlete-coach relationship is a strong determinant of sport well-being and life skills, professional development for coaches should prioritize the cultivation of high-quality relational climates and the explicit teaching of life skills. Targeted support is especially necessary for athletes in individual sports, who demonstrated lower levels of coping and life skills in our findings.

Furthermore, given that parental rearing behavior is significantly associated with psychosocial difficulties, sports organizations should implement family-based interventions to educate parents on supportive behaviors that help mitigate these difficulties. The findings also reinforce the need for targeted initiatives to enhance support in resource-scarce contexts, such as small cities. Coaches, parents, and sport administrators can leverage these findings to design initiatives aligned with the specific structural goals of their regions, ensuring that support services are integrated into areas of higher environmental vulnerability. By training these agents to foster the integrated development of psychosocial skills, organizations can more effectively promote adolescent athletes' mental health across diverse sporting contexts.

Future perspectives

Future research is essential to address the primary limitation of this study, causality. While our SEM model was grounded in strong theoretical (HMYSS) and empirical evidence, its cross-sectional nature cannot confirm directionality. We therefore propose a detailed longitudinal follow-up study to track developmental trajectories (e.g., with 6- and 12-month follow-ups). This approach would enable cross-lagged panel analysis, clarifying (for example) whether an increase in psychological skills predicts a subsequent reduction in psychosocial difficulties.

This longitudinal framework should also expand the model in two key ways. First, it should elucidate the underlying mechanisms of the Environmental Subsystem. Our "Region" variable served as a robust proxy for structural disparities, but future studies must measure the specific, fine-grained resource indicators (e.g., coach qualification levels, facility quality, availability of sports psychology services) to test specific mediation paths. Second, the model should integrate the other socio-cultural variables (such as parental education and socioeconomic status) and additional agents (like peers, siblings, psychologists, and physiotherapists) previously mentioned.

Additionally, broadening the sports context to include different types of sports and competitive levels remains necessary to provide insights into the specific demands of sports participation and their relation on young athletes' development. Additionally, for research examining a single subsystem rather than the entire model, analytical strategies that specifically account for selection bias could be employed to further strengthen causal inferences about a specific pathway (e.g., the impact of parental education programs).

Disclosure statement

In accordance with journal policy and our ethical obligations as a researcher, we declare that one of the authors, COVL, is professionally affiliated with one of the institutions where data collection took place. However, this affiliation did not influence the responses provided by the participating athletes, nor is the author involved in the relationships assessed in the study (i.e., those between athletes, parents, and coaches). We have fully disclosed this information and confirm that there are no conflicts of interest that could have influenced the conduct or outcomes of this research. The other authors have nothing to declare.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author, WRT. The data are not publicly available due to ethical restrictions, as they contain sensitive information from adolescent participants.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author used Gemini in order to clarify of language. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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