Article

Perceptual and Motor Skills
2020, Vol. 127(5) 891–911

DOI: 10.1177/0031512520926805
journals.sagepub.com/home/pms
SAGE

Sex Differences in Relationships Between Perceived Coach-Induced Motivational Climates, Basic Psychological Needs, and Behavior Regulation Among Young Swimmers

F. Rodrigues[1,2,3], R. Macedo[4], L. Cid[1,3], D. S. Teixeira[5,6], D. A. Marinho[3,7], and D. Monteiro[1,3]

Abstract

This study analyzed independent and codependent effects of task- and ego-involving motivational climates on basic psychological need satisfaction and behavioral regulation (i.e., autonomous and controlled motivation) among young athletes.

[1]Sport Science School of Rio Maior (ESDRM-IPSantarém)
[2]Life Quality Research Center (CIEQV), Santarém, Portugal
[3]Research Center in Sport, Health and Human Development (CIDESD), Vila Real, Portugal
[4]Center for Organizational and Social Studies of P. PORTO
[5]Lusófona University of Humanities and Technology, Lisbon, Portugal
[6]Interdisciplinary Center for the Study of Human Performance, Lisbon, Portugal
[7]Department of Sport Science, University of Beira Interior, Covilhã, Portugal

Corresponding Author:
F. Rodrigues, Av. Dr. Mário Soares n 110, 2040-413 Rio Maior, Portugal.
Email: ptfiliperodrigues@gmail.com

Participants were young Portuguese female ($n = 114$) and male ($n = 324$) swimmers, nested within four different clubs. Participants completed a multisection survey, assessing motivational climates, basic psychological needs satisfaction, and behavioral regulation. We used polynomial regression analysis with surface response methodology to analyze the interactions between these constructs. We found that perceived task- and ego-involving motivational climates were not mutually exclusive; rather, their relationship depended on how athletes perceived coaches' behaviors and how coaches emphasized one or both climates. Coaches who fostered both motivational climates promoted positive outcomes among male (but not female) athletes.

Keywords
motivational climates, basic needs, behavior regulation, gender difference, polynomial regression approach

Introduction

Coaches have been seen as crucial figures for promoting athletes' motivation to maintain sport participation. In fact, motivational characteristics of the sport environment have been thought to play an essential influence on athletes' psychological, emotional and physical experiences (Roberts, 2012). A contemporary line of literature has examined the impact of coaching behavior on athletes' perceived motivational climate (Duda, 2013). Hence, we sought to understand how the athlete-perceived social-contextual aspect of the sport climate impacts athletes' experience of sports practice.

Theoretical Framework

Over recent decades, achievement goal theory (AGT; Nicholls, 1984) has greatly influenced sport psychology through its attempted explanation of how the motivational climate created by coaches impacts athletes' emotional, cognitive, and behavioral outcomes (Duda, 2013). According to original work with AGT by Nicholls (1984) and Ames and Archer (1988), athletes may perceive the coach-created motivational climate as either task- or ego-involving. In the sport context, the motivational climate athletes perceive refers to the environment coaches create by what they say or do, in both training and competition (Duda, 2013). A task-involving climate emphasizes learning and personal progress, with effort rewarded and mistakes considered part of the learning process; an ego-involving climate underlines a comparison of athletes' demonstrated competence, with results rewarded and mistakes punished (Keegan et al., 2011).

Investigations of the effects of coach-induced motivational climates on athletes have shown that, when a climate is perceived as task-involving versus ego-

involving, athletes tend to adopt more adaptive strategies conducive to their sport participation (Keegan et al., 2011; Miller et al., 2003). In fact, Monteiro, Borrego, et al. (2018) and Monteiro, Pelletier, et al. (2018) have associated AGT in this sport context with other theoretical frameworks such as self-determination theory (SDT; Ryan & Deci, 2017).

Similar to AGT, SDT posits that the social context can increase or hinder the athletes' satisfaction of basic psychological needs (BPN; Deci & Ryan, 2000). Needs for autonomy (e.g., feeling of volitional choice), competence (e.g., feeling of mastery when engaging with the environment), and relatedness (e.g., feeling of empathy and care by others) are said to be universal nutrients experienced by all individuals to different degrees (Deci & Ryan, 2000; Ryan et al., 2019).BPN satisfaction is critically important, as it is related to several positive sport outcomes for athletes, such as enjoyment and sport commitment (Monteiro, Borrego, et al., 2018). According to past studies, a task-involving climate has been associated with a significant positive effect, while an ego-involving climate can have a negative effect on BPN satisfaction (Álvarez et al., 2012; Duda, 2013; Monteiro, Pelletier, et al., 2018).

Several studies have also related AGT to SDT's motivational continuum (Monteiro, Pelletier, et al., 2018; Monteiro, Teixeira, et al., 2018). Ryan and Deci (2017) view motivation on a continuum between autonomous and controlled motivation. Autonomously motivated athletes are more likely to be effective in self-regulated behavior that tends to be intrinsically driven and exhibited for the inherent satisfaction of the action itself.In contrast, controlled motivated individuals engage in sports for other and self-imposed reasons such as to gain rewards or perceived approval and social recognition (Ryan & Deci, 2017). Past literature has shown that a task climate predicts autonomous motivation, while an ego climate predicts controlled motivation (Alesi et al., 2019; Monteiro, Teixeira, et al., 2018).

Current Research

From a theoretical standpoint, prior research has focused on the independent effects of task- and ego-involving climates solely on several outcome variables. Although these studies have had important practical value and have been of interest to coaches, it is possible empirically for athletes to perceive mixed motivational climates that are high on both task- and ego-involvement; however, these climate features have been thought to differentially affect athletes' need satisfaction and their regulatory behaviors toward further sport participation. According to AGT, task- and ego-involving climates are interdependent, meaning that high levels of one do not necessarily equate to low levels of the other (Ames, 1992; Nicholls, 1984). Because an experience of high (or low) levels of both motivational climates is possible, examining their interactional associations with needs satisfaction and sport practice seems paramount in importance.

In addition, most past research has examined athletes, independently of how their sex may affect their perceptions of motivational climates (Monteiro, Teixeira, et al., 2018). This represents a huge oversight, as people with different individual characteristics can perceive motivational climates differently (Keegan et al., 2011). Although SDT proposes that BPN are innate to all human beings, regardless of age, gender, and ethnic background, the codependent effect (i.e., interaction) of motivational climates based on AGT and SDT constructs are underresearched.

In this study, we relied on White's (2007) hypothesis that past theorists have not fully considered the possibility that task- and ego-involving climates may "operate" together.In addition, traditional statistical analysis (e.g., linear regression models, structural equation modeling) have limited statistical tests to the independent predictions of pairs of variables. In contrast, polynomial regression (PR) analysis with surface response methodology (Shanlock et al., 2010) can analyze multiple variables in multiple directions simultaneously. PR analysis can test a set of linear and nonlinear (i.e., quadratic) models resulting from regression-based data approaches in which task- and ego-involving climates are included separately and in terms of their square and product (codependent/interaction) terms (Brunet et al., 2015). Thus, PR permits us to investigate several theoretically centered models of effect: (a) the independent effects associated with the absolute scores of task and ego climates, (b) the effect of the degree of agreement between both task and ego climates, (c) the directional effect of the differentiation between task and ego climates, and (d) the effect of the degree of differentiation between task and ego climates. While the PR approach is still underresearched in SDT literature, academics (Brunet et al., 2015) have used it to investigate other variables in different contexts to contend with problems associated with difference scores and the need to analyze the respective impacts of degree of agreement, differentiation, and the interactions of two independent variables on a single outcome variable (Edwards, 2007).

Considering the limitations of past sport-related motivational climate research, we aimed to analyze the independent and codependent effects of task- and ego-involving motivational climates on basic need satisfaction and behavioral regulation (autonomous and controlled motivation) among young male and female swimmers. To the best of our knowledge, this is the first attempt to examine the product of motivational climates on several outcomes. We hypothesized (a) a task-involving climate would positively predict BPN satisfaction and autonomous motivation, while it would be negatively associated with controlled motivation (Duda, 2013) and (b) an ego-involving climate would positively predict controlled motivation, while it would be negatively associated with BPN satisfaction and autonomous motivation (Monteiro, Teixeira, et al., 2018). Moreover, the interaction of these two climates together might predict several outcomes, depending on the degree of agreement/differentiation between male and female athletes' climate

perceptions. As male athletes have been found to be more competitive and goal-involving (Monteiro, Borrego, et al., 2018), we suspected that the independent and interaction effect of task and ego climates could still lead to positive BPN satisfaction and autonomous motivation among males, while the interaction of both task and ego climates would be associated with negative BPN satisfaction and autonomous motivation among women.

Method

Participants

The participant sample for this study consisted of young Portuguese female ($n = 114$) and male ($n = 324$) swimmers, nested within four different swimming clubs. Participants were aged from 18–21 years ($M = 18.11$, $SD = 1.95$), and they reported having been engaged with their current team for an average of 2.42 ($SD = 0.78$) years. Their weekly training ranged from 2–5 sessions ($M = 3.56$, $SD = 1.21$) ranging in length from 90–180 minutes ($M = 128.51$, $SD = 19.45$).

Procedure

Subsequently, we contacted the National Swimming Federation to explain our study objectives, and after this agency granted its agreement, we examined an initially larger participant database in order to select potential participants according to the following two inclusion criteria: (a) aged $\geq$ equal 18 years and $\leq$21 years and (b) competitive experience $\geq$2 years. We contacted potential participants by telephone and sought their voluntary study participation. Potential participants were randomly contacted, based on the previous reported inclusion criteria. Contacts were made during January 2017 and June 2019. Response rate was approximately 74%. We obtained participants' informed consent prior to soliciting their completion of an online multisection survey measuring the motivational tenets under analysis here.

Instruments

All participants completed translated and validated measures in Portuguese, to avoid potential interpretation conflicts or biased results. Participants were asked to rate how much they agreed with response item statements using different scoring scales. We aggregated individual scores for all participants by averaging responses into composite factors and then used these aggregated values in all subsequent analyses.

We measured the athletes' perceptions of the motivational climate with the Motivational Climate Sport Youth Scale—Portuguese version (Monteiro, Borrego, et al., 2018). This eight-item two-factor scale assesses both a task-involving climate (four items: e.g., "The coach makes me feel good when I

improve a skill,") and an ego-involving climate (four items: e.g., "The coach pays most attention to the best athletes,") in accordance with the AGT framework. The statement "Here are some statements about what your current team is like. Please read each one and mark a cross on the number that is most correct for you" preceded the measure, and participants responded on a Likert-type scale anchored from 1 (*totally disagree*) to 5 (*totally agree*). The subscales have demonstrated satisfactory levels of internal consistency in previous sport-related research (Monteiro, Teixeira, et al., 2018: task = .73, ego = .75; Treasure & Roberts, 2001: task = .84, ego = .85).

We used the Basic Psychological Needs Exercise Scale—Portuguese version adapted to sport settings (Monteiro et al., 2016) to assess the athletes' degree of BPN satisfaction. This scale consists of 12 items to assess the degree to which participants experienced satisfaction of the three psychological needs: (a) autonomy (4 items: e.g., "I feel that the way I train is the way I want to do"); (b) competence (4 item: e.g., "I feel training is an activity which I do very well"); and (c) relatedness (4 items: e.g., "My relationships with the people I train with are close"). The stem "When I practice my sport generally . . . " preceded the 12-item instrument, and responses were provided on a 5-point scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). We calculated a composite score of BPN satisfaction similar to previous research (Monteiro, Teixeira, et al., 2018: BPN satisfaction = .84–.85).

We used the Behavioral Regulation in Sport Scale—Portuguese version (Monteiro et al., 2019) to assess the type of motivation athletes endorsed during training. This six-dimension 24-item instrument (4 items each) examines each of the behavioral regulations according to the SDT continuum by asking participants how they regulate their motivation toward their sport: amotivation (4 items: "It is not clear to me anymore; I do not really think my place is in sport"), external regulation (4 items: "For the prestige of being an athlete."), introjected regulation (4 items: "Because I would feel bad if I was not taking time to do it."), identified regulation (4 items: "Because it is one of the best ways to maintain good relationship with my friends."), integrated regulation (4 items: "Because it is an extension of me."), and intrinsic motivation (4 items: "For the pleasure I feel while executing certain difficult movements."). The statement "I participate in my sport . . . " preceded the 24-item measure and participants rated how true each statement was for them on a 7-point scale ranging from 1 (*not true to me*) to 7 (*completely true to me*). Our aim was to examine young swimmers' autonomous and controlled motivational patterns (Monteiro, Teixeira, et al., 2018). In addition, as these were persistent swimmers with more than two years of training experience, they did not seem to express amotivation (Teixeira et al., 2019).We calculated composite scores for controlled motivation (external and introjected regulation) and autonomous motivation (identified and for integrated regulation and intrinsic motivation) using the

same procedures as were used in previous sport-related research (Monteiro, Pelletier, et al., 2018: autonomous = .73, controlled = .74).

Statistical Analysis

Descriptive statistics (means, *SD*s, skewness, and kurtosis), and Pearson's correlations were calculated for all of the variables under analysis for each gender of participant. Cutoffs for normality were considered based on prior guidelines (Gravetter & Wallnau, 2014); we accepted scores within −2/+2 and −7/+7 for skewness and kurtosis, respectively.Data were also screened for multivariate outliers using Mahalanobis distances (critical value ≥5, $p < .001$). Composite reliability scores were calculated using Raykov (1997) formula, considering scores ≥0.70 as acceptable. There were no missing responses, given the way the online survey was setup.

Data were analyzed using a PR approach according to Edwards (2007). First, task- and ego-involving climate were centered and modeled as separate predictors (x_1 and x_2), along with the square of these centered variables (x_3 and x_4), and the product of these centered variables (x_5). Centering the motivational climates reduced possible multicollinearity issues and their higher order terms (Cohen et al., 2003). These coefficients examined the linear, nonlinear, and product relationship between motivational climates and each outcome. If the motivational climates in the PR that explained variance in the outcome variables were a statistically significant R^2, surface values (a_1, a_2, a_3, and a_4) were calculated and examined.

To calculate each surface value, the unstandardized regression coefficients and their respective standard error were transformed according to Kazén and Kuhl (2011). These four surface values represented the slope and the curvature of the two lines that comprised the response surface patterns in the three-dimensional graphs. To aid visual interpretation of the surface values, several three-dimensional graphs were created, based on Humberg et al. (2018): (a) motivational climates predicting BPN satisfaction, (b) motivational climates predicting autonomous motivation, and (c) motivational climates predicting controlled motivation.

Results

Preliminary Analysis

Descriptive statistics showed that athletes gave higher mean values for BPN satisfaction, and autonomous motivation when they perceived a task-involving climate compared with an ego-involving climate and controlled motivation. All variables were normally distributed, as skewness and kurtosis were contained within criteria cutoffs. While two multivariate outliers were

identified, a closer inspection did not reveal any data entry errors or significant out of range values; therefore, we decided to retain these outliers in subsequent analyses. The correlation matrix presented in Table 1 showed significant correlations among the independent and dependent variables: (a) a perceived task-involving climate was positively and significantly correlated with BPN satisfaction and autonomous motivation, whereas a task-involving climate was negatively associated with an ego-involving climate and controlled motivation and (b) an ego-involving climate was negatively and significantly correlated with BPN satisfaction and both autonomous and controlled motivation. Composite reliability displayed satisfactory coefficients ($>.70$).

PR Analysis

Table 2 shows variance, surface values, and unstandardized regression coefficients for female and male athletes. Motivational climates explained 29–42% of BPN satisfaction and behavioral regulations among female athletes and 22–30% of these variables among male athletes.

As theoretically expected, a task-involving climate positively predicted BPN satisfaction and autonomous motivation in both males and females. On the other hand, a task climate was significantly negatively associated with controlled motivation. Regarding an ego-involving climate, only the nonlinear regression was significantly associated with outcomes in male athletes, and no significant regression coefficients were found for the interaction of motivational climates and the outcomes under analysis.

Considering surface values, as the degree of agreement between climates increased (a_1), so did BPN satisfaction among athletes of both genders and BPN autonomous motivation among female athletes. A higher perceived task- versus ego-involving climate was positively associated with higher scores in BPN satisfaction and BPN autonomous motivation; however, a higher perceived ego-involving versus task-involving climate was associated with higher scores on BPN controlled motivation among both male and female athletes (a_3).Finally, greater differentiation between both climates was associated with higher scores on BPN satisfaction among male (but not female) athletes (a_4). For visual inspection, see Figures 1 to 6.

Discussion

Using PR analysis with response surface methodology and based on AGT and SDT tenets, we analyzed possible interactions of both athlete-perceived task- and ego-involving coach-induced motivational climates in a sport context to assess their relationship with these young swimmers' self-reported BPN satisfaction and behavioral regulation (i.e., autonomous and controlled motivation). In past research, both psychological needs satisfaction and behavioral

Table 1. Descriptive Statistics.

	Female athletes									Male athletes								
	M	SD	S	K	CR	1	2	3	4	M	SD	S	K	CR	1	2	3	4
1. Task	4.15	0.75	−1.49	3.01	.74					3.88	0.82	−1.20	1.42	.71				
2. Ego	2.65	0.54	0.39	−0.22	.71	−.56				2.97	0.87	0.06	−0.40	.82	−.52			
3. BPNS	3.93	0.59	−0.21	−0.25	.85	.41	−.40			3.76	0.49	−0.27	0.39	.77	.37	−.29		
4. AUTO	3.11	1.58	−0.09	−0.99	.80	.53	−.43	.53		3.34	1.58	0.06	0.39	.80	.42	−.32	.49	
5. CONT	2.58	1.21	−1.24	1.9	.77	.33	−.46	.42	.57	2.69	1.31	−1.13	0.39	.90	.19	−.49	.35	.49

Note. All correlations are significant at $p < .01$. BPNS = basic psychological needs satisfaction; AUTO = autonomous motivation; CONT = controlled motivation; *M* = mean; *SD* = standard deviation; S = skewness; K = kurtosis; CR = composite reliability.

Table 2. Explained Variance, Surface Values and Regression Coefficients.

	Female athletes			Male athletes		
	BPN satisfaction	Autonomous motivation	Controlled motivation	BPN satisfaction	Autonomous motivation	Controlled motivation
Constant	3.14	4.01	4.25	4.11	5.23	3.87
Task centered (x_1)	.55*	.54	−.38*	.29*	.34*	−.36*
Ego centered (x_2)	−.06	−.05	.58*	−.07	−.10	.51*
Task squared (x_3)	.23*	−.02	.13	.07	−.01	−.19
Ego squared (x_4)	−.03	.19	.39	.11*	.28*	.33*
Interaction (x_5)	−.12	−.06	.31	−.02	.12	.25
R^2	.42	.29	.33	.22	.23	.30
a_1	.49*	.49*	.19	.23*	.25	.14
a_2	.08	.12	.83	.16	.40	.40
a_3	.61*	.58*	−.94*	.36*	.44*	−.86*
a_4	.32	.24	.21	.20*	.16	−.11

Note. $+a_1$ = when motivational climate ratings are in agreement, the outcome increases as motivational climates ratings increase; $-a_1$ = when motivational climates ratings are in agreement, the outcome decreases as motivational climates ratings increase; $+a_2$ = the line of perfect agreement as it relates to the outcome is positive and a convex surface (i.e., upward curving); $-a_2$ = the line of perfect agreement as it relates to the outcome is negative and a concave surface (i.e., downward curving); $+a_3$ = higher task ratings relative to ego ratings is associated with higher scores on the outcome; $-a_3$ = higher ego ratings relative to task ratings is associated with higher scores on the outcome; $+a_4$ = the outcome increases more sharply as the degree of discrepancy between the motivational climates ratings increases; $-a_4$ = the outcome decreases more sharply as the degree of discrepancy between the motivational climates ratings increases. BPN = basic psychological needs.

*$p < .05$.

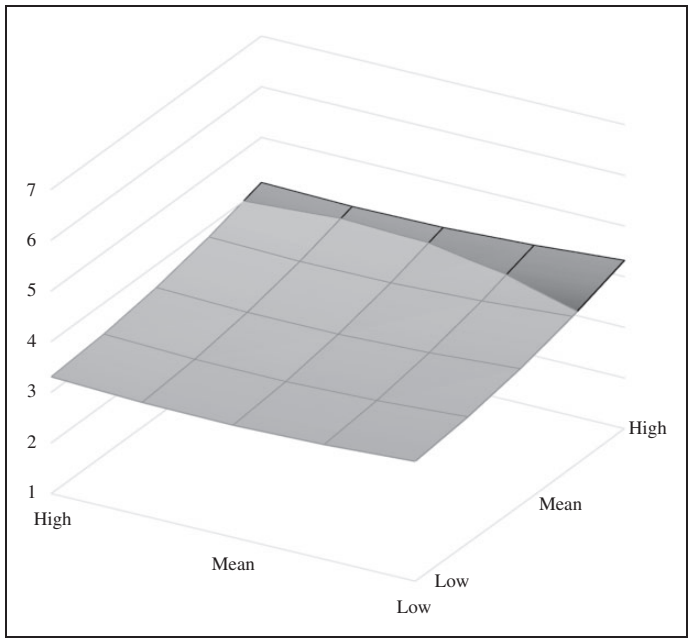

Figure 1. Motivational Climates on BPN Satisfaction in Female Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: BPN satisfaction.

regulation have been found to be closely related to how athletes experience sport participation, and both variables can relate to sport commitment or dropout. Our results present new insight regarding how motivational climates can be perceived differently by males and females and how these perceptions impact self-reported needs satisfaction and behavioral regulations.

Considering both AGT and SDT theoretical frameworks, the distinction between task- and ego-involving climates and their composite interaction have important value. These perceived climates, both independently and in combination, characterize athletes' perceptions of their coaches and differentially impact several motivational determinants. Data from this study now extend past findings that focused only on the independent (but not combined) effects of task- and ego-involving climates on BPN satisfaction (Álvarez et al., 2012; Monteiro, Pelletier, et al., 2018; Monteiro, Teixeira, et al., 2018) and behavioral regulations (Monteiro et al., 2014). In our use of PR to close the knowledge gap on how an interaction of these climates might affect several outcomes (Shanlock et al., 2010), we found that the perception of both climates and their interaction have different outcomes for male and female athletes, as previously suggested by some scholars (Roberts et al., 1996; White, 2007).

As athletes' degree of agreement between perceived task- and ego-involving climates increased, so did the self-reported BPN satisfaction of both male and female swimmers in this study. In other words, as our participants' agreement regarding climate ratings increased (a_1), male and female participants perceived higher levels of BPN satisfaction (see Figures 1 and 4). Also, among females only, higher agreement between perceived climates was significantly associated with autonomous motivation (see Figure 2). The highest level of BPN satisfaction and autonomous motivation was generally on the back corner of the three-dimensional graph where task- and ego-involving climates were both at their highest. On the other hand, BPN satisfaction was at its lowest at the front left side of the graph, meaning that, in contrast to an assumption in the literature that an ego-involving climate was associated with negative outcomes such as controlled motivation (Monteiro, Pelletier, et al., 2018) or ill-being (Keegan et al., 2011), our data showed that even the combined interaction between task-involving and ego-involving climates can be associated with positive outcomes.

Considering the direction of the discrepancy between athletes' perceptions of sport climates, a_3, we found a significant negative score in which controlled motivation was high when the climate was perceived to be higher in ego-involving than in task-involving qualities. Figures 3 and 6 depict these results at the left corner of the graph, showing that a high ego-involving climate combined with a low task-involving climate was associated with high controlled

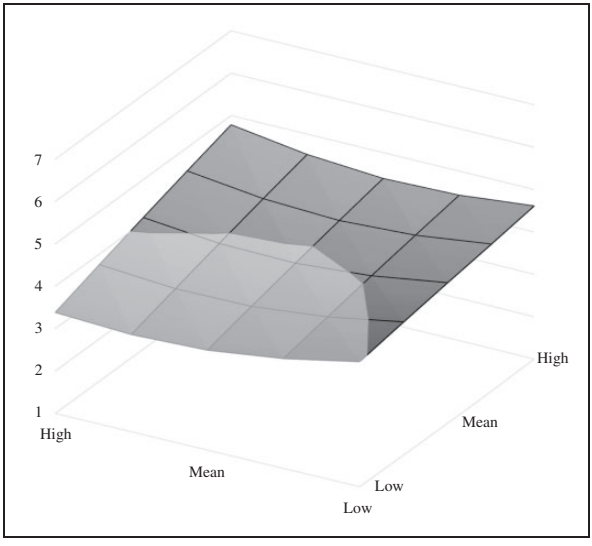

Figure 2. Motivational Climates on Autonomous Motivation in Female Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: autonomous motivation.

motivation. In contrast, a positive and significant a_3 shows that high scores on a task-involving climate and low scores on an ego-involving climate were associated with high scores on autonomous motivation (at its highest in the right corner, as seen in Figures 2 and 4). These results are similar to previous findings (Gjesdal et al., 2018; Monteiro, Borrego, et al., 2018) in which task-involving climates tended to induce positive outcomes, while ego-involving climates were associated with negative outcomes. However, from a theoretical perspective, these results do not rule out the possibility that athlete-perceived motivational climates are not entirely independent; rather, they may coexist across time. In prior research, female and male athletes had more than 1 year of competitive experience and hence may have perceived both climates over a competitive/training season (Monteiro, Pelletier, et al., 2018).

Our Figures 1 and 4 show a significant positive a_4, reflecting a convex surface in which BPN satisfaction increased more sharply as the degree of discrepancy between athletes' perceptions of task-oriented and ego-involved climates increased. Male athletes who perceived a high task-involving and low ego-involving climate experienced more BPN satisfaction. However, only male participants tended to experience a nonlinear regression in which there was positive significance between ego climates and all outcomes under analysis (see Table 2).

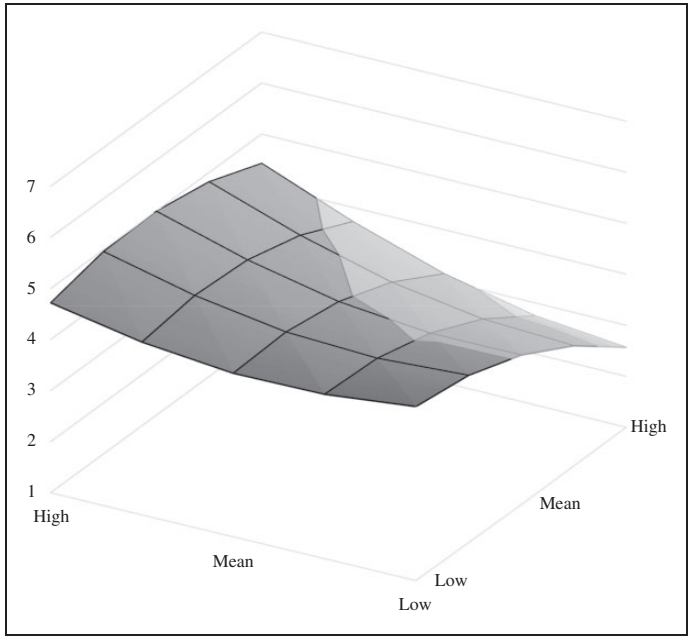

Figure 3. Motivational Climates on Controlled Motivation in Female Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: controlled motivation.

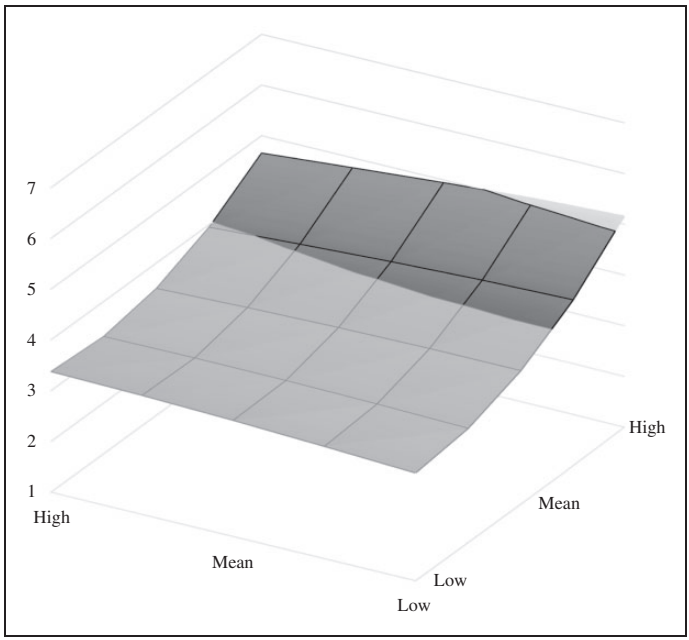

Figure 4. Motivational Climates on BPN Satisfaction in Male Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: BPN satisfaction.

That is, over time, male athletes who perceived only ego-involving climates tended to show more positive outcomes. Looking at Figures 3 to 6, males who perceived high levels of both task orientation and ego involvement in the motivational climate experienced not only BPN satisfaction but also significant autonomous and controlled motivation. These results can be seen as consistent with reports from past studies that male athletes are more competitive than women (Hayward et al., 2012), perhaps allowing them to experience positive motivation on several outcome measures from both task-involving and ego-involving climate characteristics, similar to results reported in other studies (Miller et al., 2003).

Limitations

Despite the novel contributions and implications of this research, our work has limitations. First, we relied upon self-report questionnaires from athletes all around Portugal but did not collect data from coaches and did not learn which coaches' athletes were considering when rating their perceptions of motivational climates. Future studies should explore the interaction of these self-reported perceptions with others' perceptions. As an indication of possible problems with self-report, Rocchi and Pelletier (2018) recently reported that

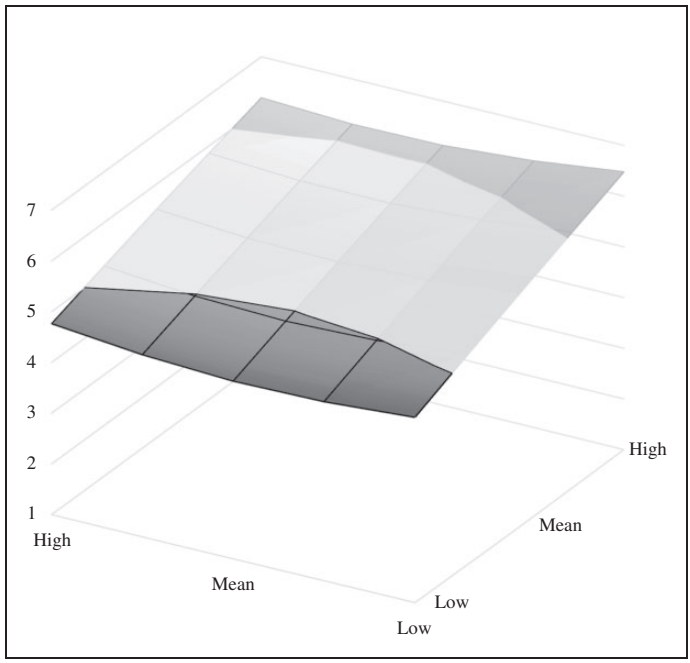

Figure 5. Motivational Climates on Autonomous Motivation in Male Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: autonomous motivation.

70% of coaches either over reported or underreported their own interpersonal behaviors, leading to distinctly different player BPN satisfaction or frustration scores. In addition, our final sample size was only moderate, especially for female athletes, compared with other studies using the same statistical methodology in analyses with other variables (Brunet et al., 2015; Rocchi & Pelletier, 2018). Our smaller sample may have negatively affected statistical power for these analyses. In addition, we used only young athletes, excluding other sample characteristics (e.g., age category, sport experience) that might have been relevant. Therefore, we suggest replicating the present research with larger samples and other participant characteristics. We did not measure motivational orientation. Results could differ when analyzing goal and motivational orientation on each outcome measure. As past research has shown that motivational climates and achievement goal orientations are orthogonal, these dimensions might influence self-determined motivation (Duda, 2013) and deserve further study.Future studies should also consider the 3×2 achievement model proposed by Elliot et al. (2011) when examining achievement goals on several motivational determinants. Finally, as this study was cross-sectional and correlational, longitudinal research is needed in order to permit causal inferences between these

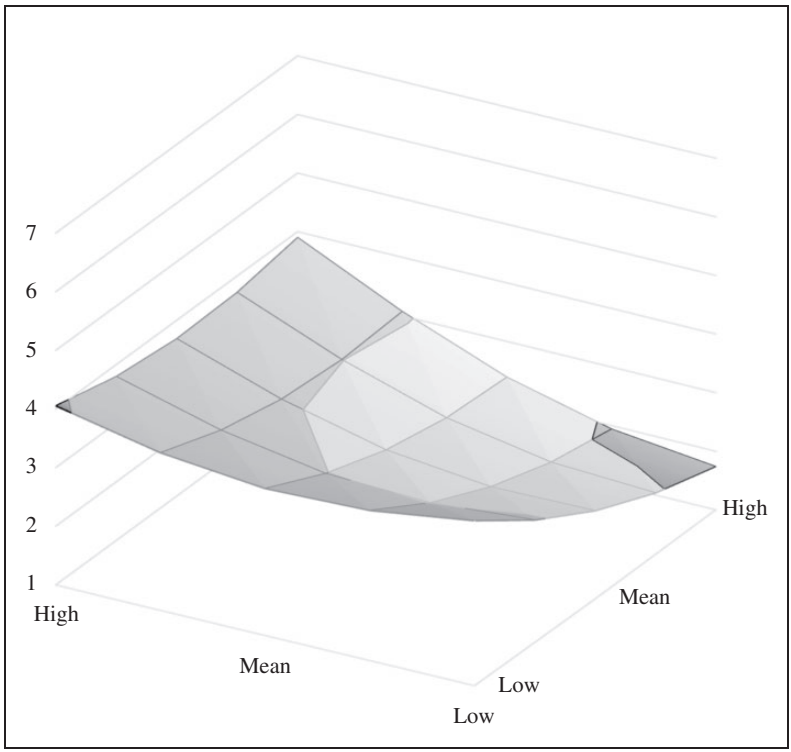

Figure 6. Motivational Climates on Controlled Motivation in Male Athletes. *x*-axis: task climate; *y*-axis: ego climate; *z*-axis: controlled motivation.

variables. Future research might also study other outcomes such as burnout or depression, common symptoms of athletes. As there are many negative psychological experiences perceived by athletes in the sport context, these feelings could be better represented by need frustration than by need satisfaction (Bartholomew et al., 2011). Thus, the possible relationship between a controlling motivational environment (i.e., ego-involving climate) and BPN perception could provide a deeper understanding with the inclusion of the need frustration (Vaansteenkiste & Ryan, 2013).

Conclusion

This study suggested that task-involving and ego-involving coach induced motivational sport climates are not mutually exclusive; rather, athletes' perceptions of these climate qualities may be a function of how athletes perceive coaches' behaviors and how coaches emphasize either or both climates over time. For

example, during competition, coaches may foster an ego-involving climate, while, during training, they may adopt more task-involving behaviors, focusing on increasing physical and psychological strength and then promoting team building and social bonds (Harwood et al., 2015; Keegan et al., 2014). Findings of this study have theoretical and practical implications. For researchers, this study showed the importance of measuring the effects of combined motivational climates in their interactions with athlete gender and several sport participation measures. We found the athlete-perceived task-involving climate to be most associated with autonomous motivation for athletes of both genders. Among males, even the combined task-involving and ego-evolving motivational climates were associated with autonomous forms of motivation, theoretically promoting sport persistence. Among females, the interaction of task- and ego-involving climates decreased BPN satisfaction and was associated with negative outcomes. Practically, we found support for coaches' continued efforts to emphasize task-involving motivational climates, though coaches might bear in mind that even ego-involving behaviors can produce positive outcomes among both male and female athletes. All coaches face moments when they must endorse mainly ego-involving climate behaviors (e.g., administration constraints may force coaches to select the best players for game play), and coaches should be aware of how to communicate these needs to athletes, even while they work to reduce dropout risk and other negative effects of too much ego-involvement in the motivational climate. Task- and ego-involving climates can have a codependent effect on athletes' motivation toward sport participation, and results from this study can help bridge an understanding of nuances between independent and interaction effects of these two variables on several outcomes.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The authors obtained approval for this research protocol from the Ethics Committee (UID/DTP/04045/2013) prior to data collection.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the National Funding through the Portuguese Foundation for Science and Technology, I.P., under the project UID04045/2020 for the authors Luís Cid, Daniel Marinho, and Diogo Monteiro and under the project UIDP/04748/2020 for the author Filipe Rodrigues.

ORCID iDs

F. Rodrigues https://orcid.org/0000-0003-1327-8872
L. Cid https://orcid.org/0000-0001-8156-3291
D. S. Teixeira https://orcid.org/0000-0003-4587-5903
D. Monteiro https://orcid.org/0000-0002-7179-6814

References

Alesi, M., Gómez-López, M., Chicau Borrego, C., Monteiro, D., & Granero-Gallegos, A. (2019). Effects of a Motivational Climate on Psychological Needs Satisfaction, Motivation and Commitment in Teen Handball Players. *International journal of environmental research and public health*, *16*(15), 2702. https://doi.org/10.3390/ijerph16152702

Álvarez, M., Balaguer, I., & Castillo, I. (2012). The coach-created motivational climate, young athletes' well-being, and intentions to continue participation. *Journal of Clinical Sport Psychology*, *6*, 166–179. https://doi.org/10.1123/jcsp.6.2.166

Ames, C. (1992). Achievement goals, motivational climate and motivational processes. In G. Roberts (Ed.), *Motivation in sport and exercise* (pp. 161–176). Human Kinetics.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology*, *80*(3), 260–267. https://doi.org/10.1037/0022-0663.80.3.260

Bartholomew, K., Ntoumanis, N., Ryan, R., & Thogersen-Ntoumani, C. (2011). Psychological need thwarting in the sport context: assessing the darker side of athletic experience. *J Sport Exerc Psychol*, *1*, 75–102. https://doi.org/10.1123/jsep.33.1.75

Brunet, J., Gunnell, K., Gaudreau, P., & Sabiston, C. (2015). An integrative analytical framework for understanding the effects of autonomous and controlled motivation. *Personality and Individual Differences*, *84*, 2–15. https://doi.org/10.1016/j.paid.2015.02.034

Cohen, J., Cohen, P., West, S., & Aiken, L. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum Associates.

Deci, E., & Ryan, R. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/s15327965pli1104_01

Duda, J. (2013). The conceptual and empirical foundations of Empowering Coaching™: Setting the stage for the PAPA project. *International Journal of Sport and Exercise Psychology*, *11*(4), 311–318. https://doi.org/10.1080/1612197x.2013.839414

Edwards, J. (2007). Polynomial regression and response surface methodology. In C. Ostroff & A. Judge (Eds.), *Perspectives on organizational fit* (pp. 361–372). Jossey-Bass.

Elliot, A. J., Murayama, K., & Pekrun, R. (2011). A 3 × 2 achievement goal model. *Journal of Educational Psychology*, *103*(3), 632–648. https://doi.org/10.1037/a0023952

Gjesdal, S., Stenling, A., Solstad, B., & Ommundsen, Y. (2018). A study of coach-team perceptual distance concerning the coach-created motivational climate in youth sport. *Scandinavian Journal of Medicine and Science in Sports*, *29*, 132–143. https://doi.org/10.1111/sms.13306

Gravetter, F., & Wallnau, L. (2014). *Essentials of Statistics for the Behavioral Sciences* (8th ed.). Cengage Learning: Wadsworth, Belmont, CA.

Harwood, C., Keegan, R., Smith, J., & Raine, A. (2015). A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychology of Sport and Exercise*, *18*, 9–25. https://doi.org/10.1016/j.psychsport.2014.11.005

Hayward, M., Deaner, R. O., Geary, D. C., Puts, D. A., Ham, S. A., Kruger, J., Fles, E., Winegard, B., & Grandis, T. (2012). A sex difference in the predisposition for physical competition: Males play sports much more than females even in the contemporary U. S. *PLoS One*, *7*(11), e49168. https://doi.org/10.1371/journal.pone.0049168

Humberg, S., Nestler, S., & Back, M. (2018). Response surface analysis in personality and social psychology: Checklist and clarifications for the case of congruence hypotheses. *Social Psychological and Personality Science*, *10*(3), 409–419. https://doi.org/10.1177/1948550618757600

Kazén, M., & Kuhl, J. (2011). Directional discrepancy between implicit and explicit power motives is related to well-being among managers. *Motivation & Emotion*, *35*, 317–327. https://doi.org/10.1007/s11031-011-9219-8

Keegan, R., Harwood, C., Spray, C., & Lavallee, D. (2014). A qualitative investigation of the motivational climate in elite sport. *Psychology of Sport and Exercise*, *15*(1), 97–107. https://doi.org/10.1016/j.psychsport.2013.10.006

Keegan, R., Spray, C., Harwood, C., & Lavalle, D. (2011). From 'motivational climate' to 'motivational atmosphere': A review of research examining the social and environmental influences on athlete motivation in sport. In R. Keegan, C. Spray, C. Harwood, & D. Lavalle (Eds.), *Sport psychology* (pp. 1–55). NovaScience Publications.

Miller, B., Roberts, G., & Ommundsen, Y. (2003). Effect of motivational climate on sportspersonship among competitive youth male and female football players. *Scandinavian Journal of Medicine and Science in Sports*, *14*(3), 193–202. https://doi.org/10.1046/j.1600-0838.2003.00320.x

Monteiro, D., Borrego, C., Silva, C., Moutao, J., Marinho, D., & Cid, L. (2018). Motivational climate sport youth scale: Measurement invariance across gender and five different sports. *Journal of Human Kinetics*, *61*, 249–261. https://doi.org/10.1515/hukin-2017-0124

Monteiro, D., Marinho, D., Moutão, J., Couto, N., Antunes, R., & Cid, L. (2016). Adaptation and validation of the Portuguese version of basic psychological needs exercise scale (BPNESp) to the sport domain and invariance across football and swimming. *Motricidade*, *12*(4), 51. https://doi.org/10.6063/motricidade.9372

Monteiro, D., Moutão, J., Baptista, P., & Cid, L. (2014). Clima motivacional, regulação da motivação e perceção de esforço dos atletas no futebol [Motivational climate, behavioral regulation and perceived effort in soccer players]. *Motricidade* [Motricidade], *10*(4), 94–104. https://doi.org/10.6063/motricidade.10(4).3453

Monteiro, D., Pelletier, L., Moutão, J., & Cid, L. (2018). Examining the motivational determinants of enjoyment and the intention to continue of persistent competitive swimmers. *International Journal of Sport Psychology*, *49*(6), 484504. https://doi.org/10.7352/IJSP.2018.49.484

Monteiro, D., Teixeira, D., Travassos, B., Mendes, P., Moutao, J., Machado, S., & Cid, L. (2018). Perceived effort in football athletes: The role of achievement goal theory and self-determination theory. *Frontiers in Psychology*, *9*, 1575. https://doi.org/10.3389/fpsyg.2018.01575

Monteiro, D., Teixeira, D., Vitorino, A., Moutao, J., Rodrigues, F., Machado, S., & Cid, L. (2019). Behavioral regulation sport questionnaire: Gender and sport invariance in Portuguese athletes. *Perceptual and Motor Skills*, *126*(2), 323–341. https://doi.org/10.1177/0031512519825700

Nicholls, A. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review*, *91*(3), 328–346. https://doi.org/10.1037/0033-295X.91.3.328

Raykov, T. (1997). Estimation of Composite Reliability for congeneric measures. *Applied Psychological Measurement*, *21*(2), 173–184. https://doi.org/10.1177/01466216970212006

Roberts, G. (2012). Motivation in sport and exercise from an achievement goal theory perspective: After 30 years, where are we? In G. Roberts & D. Treasure (Eds.), *Advances in Motivation in Sport and Exercise* (pp. 5–58). Human Kinetics.

Roberts, G., Treasure, D., & Kavussanu, M. (1996). Orthogonality of achievement goals and its relationship to beliefs about success and satisfaction in sport. *The Sport Psychologist*, *10*(4), 398–408. https://doi.org/10.1123/tsp.10.4.398

Rocchi, M., & Pelletier, L. (2018). How does coaches' reported interpersonal behavior align with athletes' perceptions? Consequences for female athletes' psychological needs in sport. *Sport, Exercise, & Performance Psychology*, *7*(2), 141–154. https://doi.org/10.1037/spy0000116

Ryan, R., Bradshaw, E., & Deci, E. (2019). A history of motivation theories in psychology. In R. Sternberg & W. Pickren (Eds.), *The Cambridge handbook for the intellectual history of psychology* (pp. 391–411). Cambridge University Press.

Ryan, R., & Deci, E. (2017). *Self-determination theory. Basic psychological needs in motivation, development, and wellness*. Guildford Press.

Shanlock, L., Baran, B., Gentry, W., Pattison, S., & Heggestad, E. (2010). Polynomial regression with response surface analysis: A powerful approach for examining moderation and overcoming limitations of difference scores. *Journal of Business and Psychology*, *25*(4), 543–554. https://doi.org/10.1007/sl0869-010-9183-4

Teixeira, D. S., Pelletier, L. G., Monteiro, D., Rodrigues, F., Moutao, J., Marinho, D., & Cid, L. (2019). Motivational patterns in persistent swimmers: A serial mediation analysis. *Eur J Sport Sci*, 1–10. https://doi.org/10.1080/17461391.2019.1675768

Treasure, D., & Roberts, G. (2001). Students' perceptions of the motivational climate, achievement beliefs, and satisfaction in physical education. *Research Quarterly for Exercise & Sport*, *72*(2), 165–175. https://doi.org/10.1080/02701367.2001.10608946

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration*, *23*(3), 263–280. https://doi.org/10.1037/a0032359

White, S. (2007). Parent-created motivational climate. In S. Jowett & D. Lavalle (Eds.), *Social psychology in sport* (pp. 132–133). Human Kinetics.

Author Biographies

F. Rodrigues is an assistant lecturer at Escola Superior de Desporto de Rio Maior (ESDRM – IPSantarém) and his research focuses on motivational and cognitive theories to understand health-related behavior change in diverse domains. Other areas of research interest include health psychology, interpersonal behaviors, coaching and neuropsychology.

R. Macedo is a researcher in the field of social sciences, focusing on health-related outcomes and correlates of culltural differences. Her ares of interest are green product purchase, environmental and health concerns as well as the determinants of positive psychological consequences.

L. Cid, PhD in Sport Sciences (since December 2010), is a professor at the Sport Science School of Rio Maior of the Polytechnic Institute of Santarém (since September 2004) and a senior researcher of the Research Center in Sport, Health and Human Development (since January 2011). Currently, he is the director of the School (since December 2018). Previously he was the subdirector of the school (April 2015–November 2018) and Scientific Coordinator of sports and exercise psychology department (March 2014–April 2018). His academic research field is linked to motivational determinants in sport, physical activity, and healthy lifestyles.

D. S. Teixeira is a young professor and researcher with a multidisciplinary background and professional practice in several areas of his academic training. He has a degree in Physical Education and Sport; a postgraduation degree in Health, Nutrition, and Exercise; a master's degree in Exercise and Wellness; and a PhD degree in Physical Activity and Health. His research focuses on motivational and emotional determinants and their relationship with the quality of practice in several health and sport contexts.

D. A. Marinho, associate professor at the Sport Sciences Department at UBI – University of Beira Interior since 2008, and Member of the Research Centre in Sports, Health and Human Development (Portugal). Graduated from the University of Porto (UP) in Sport and Physical Education in 2004; Doctorate in Sport Sciences at University of Trás-os-Montes and Alto Douro (UTAD), in 2009; Habilitation in Sport Sciences at UBI in 2013. He is a member of the technical staff of the Portuguese Swimming Federation since 2013, responsible for the Pedagogic Courses of the Portuguese coaches and coordinator of the Evaluation and Control Training Centre and Youth teams.

D. Monteiro is a PhD in Sports Science. He has a degree in Sport and Exercise Psychology and master's degree in Sport and Exercise Psychology. His academic/research field is linked to motivational determinants in sport and exercise and behavioral change, with a special focus on sedentary behavior, physical activity, healthy lifestyles, well-being, exercise adherence, sport dropout, and persistence.