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Disentangling the Effects of Ego and Task-Involving Climate Perceptions on Cohesion in Youth Sport

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The present study evaluated how the combination of ego- and task-involving climate perceptions related to youth soccer athletes' perceptions of team cohesion. We hypothesized that athletes would perceive their group to be less cohesive as ego climate perceptions increased in salience relative to task climate perceptions. In addition, the factor structure and longitudinal measurement invariance of Youth Sport Environment Questionnaire (YSEQ)—Portuguese version was also analyzed. A total of 956 national level youth male soccer athletes' belonging to 49 different teams participated in the study. Using a prospective design with two time points, the polynomial regression with a response surface analysis indicated that the effect of an ego-involving climate on task cohesion varied as a function of task-involving climate perceptions. Specifically, athletes reported lower levels of task cohesion as ego-involving climate perceptions began to predominate over task-involving climate perceptions. Furthermore, a strong task-involving climate buffered against the negative effects of ego-involving climate perceptions on task cohesion. Regarding social cohesion, we only observed a positive linear association between task-involving climate perceptions and social cohesion. Our findings support the validity and reliability of two factors underlying the YSEQ and its longitudinal invariance across time in an elite youth sample. Future studies should strive to replicate these results in other sports and with female athletes. Our results provide insight into how task-involving and ego-involving climate perceptions combine to shape how elite youth athletes view their group environment.


Keywords: cohesion, motivational climate, response surface analysis, youth, group dynamics

As many youth organized sport programs take place in a group environment, scholars have drawn attention to how the quality of the social environment in sport teams is strongly connected to experiences in youth sport (Bruner et al.,

2020). Indeed, if the goal is to understand people's sport experiences, one must understand groups and their social dynamics (Eys & Brawley, 2018). As elite youth athletes invest substantial time and effort toward their pursuit of

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excellence in sport, it is perhaps not surprising that the relationships athletes form with coaches and teammates serve as important sources of motivation and social support (Keegan et al., 2014; Weiss et al., 2021). In the present study, we investigated how motivational climate connects to athletes' perceptions of cohesion in a sample of elite youth sport participants.

Group cohesion is widely recognized as an important variable implicated in athletes' sport experiences (Eys et al., 2020). Cohesion can be considered as both an input to and an outcome of other group processes, and therefore is conceptualized as a dynamic emergent state (Eys & Brawley, 2018). As defined by Carron et al. (1998), cohesion is "... reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" (p. 213). In youth contexts, cohesion can be differentiated based broadly on task and social concerns (Eys et al., 2009). Team cohesion is positively associated with numerous participation outcomes, including adherence (Bruner & Spink, 2011), effort and sacrifice (Prapavessis & Carron, 1997), team success (Filho et al., 2015), collective efficiency, cognitive anxiety (Borrego et al., 2012), and improved friendships (Herbison et al., 2017). Given the numerous benefits of fostering a cohesive group environment, researchers have sought to better understand the factors that shape perceptions of cohesion.

Motivational climate is a key variable that appears to be closely connected to athletes' perceptions of cohesion. Motivational climate refers to "individuals' composite views concerning the situationally emphasized goal structures operating in an achievement setting" (Duda, 2001, p. 144). With its roots in achievement goal theory (Nicholls, 1984), motivational climate entails both task-involving and ego-involving dimensions. Whereas individual improvement and effort are emphasized in a *task-involving climate*, performance outcomes and inter-individual comparisons are emphasized in an *ego-involving climate*. Although multiple social agents (e.g., coaches, parents, teammates) can bear an influence on motivational climate perceptions, a substantial literature has focused on coaches due to their influence on both team strategy and training, as well as the frequency of opportunities they have to reinforce or discourage motivationally relevant behavior through interactions with

athletes (Keegan et al., 2014). Here, we focus on the coach-initiated motivational climate.

Generally, a task-involving climate is positively related to both task and social cohesion, whereas an ego-related climate is negatively related to task and social cohesion (e.g., Horn et al., 2012). However, these distinct forms of motivational climate do not operate in isolation from one another. Using the Group Environment Questionnaire (GEQ), Heuzé et al. (2006) revealed that athletes who perceived a combination of high ego- and low task-involving climate, early in the season, reported decreased levels of both task and social cohesion at midseason in elite adult female basketball and handball participants. Subsequent research by Eys et al. (2013) with the Youth Sport Environment Questionnaire (YSEQ) found a similar pattern, albeit with a different methodological approach. Eys et al. identified motivational climate profiles among secondary school students (i.e., competitive but not elite) that varied according to levels of task-involvement and ego-involvement. The first cluster corresponded to a strong task climate but weak ego climate, the second cluster referred to a moderate task climate but strong ego climate, the third cluster captured a moderate task climate with a weak ego climate, and the fourth reflected a weak task climate with a strong ego climate. Crucially, athletes classified according to the cluster with a strong task climate and weak ego climate tended to report higher levels of task and social cohesion than athletes in the remaining clusters. A quasi-experimental study with recreational youth sport showed that athletes perceived higher levels of both task and social cohesion when coaches promoted task-related behaviors as encouraged through an intervention protocol, compared with athletes coached by individuals in a control condition (McLaren et al., 2015). Taken together, prior work provides support to propose that the degree to which ego-involving climate perceptions predominate over task-involving climate perceptions may be crucial to understanding the link between motivational climate and cohesion.

The main objective of the present study was to evaluate how the combination of ego and task climate perceptions jointly affected youth soccer athletes' perceptions of team cohesion. We expected the discrepancy between task climate and ego climate perceptions to strongly predict youth athletes' perceptions of team cohesion.

We hypothesized that athletes would perceive their group to be less cohesive as ego-involving climate perceptions increased in salience relative to task-involving climate perceptions. Whereas task and social cohesion should be highest when task climate is high and ego climate is low, we also expect task and social cohesion to be lowest when task climate is low and ego climate is high. In the current research, we used polynomial regression with response surface analysis (RSA) to examine how ego climate and task climate perceptions combined to jointly predict athletes' perceptions of team cohesion. Although RSA is a powerful technique to examine congruence effects (i.e., if congruence between two psychological constructs leads to higher values on a criterion variable; Humberg et al., 2019), RSA also provides insight into how the magnitude and direction of a discrepancy between two variables are related to a criterion variable, which in the current research, refers to athletes' perceptions of cohesion (Shanock et al., 2010). As it pertains to understanding the relations between motivational climate and cohesion, RSA enabled us to examine the independent contributions of each form of motivational climate, the predominance of one climate over the other, the direction of the discrepancy in climate perceptions (i.e., the effect of ego climate predominating over task climate vs. the effect of a task climate predominating over an ego climate), and nonlinear relationships.

Pursuing this main objective will advance prior work in two ways. First, we evaluated the confluence of task and ego climate on perceptions of cohesion in an elite youth sample. This represents a distinct context from what has been studied previously and thus enables the identification of constraints on generality (i.e., phenomena may vary across target populations; Simons et al., 2017). A second key contribution lies in the unique properties of RSA to simultaneously test effects of congruence, elevation in the variables, and non-linear patterns.

For example, previous work used RSA to document how as athletes' role experiences approached and exceeded their role expectations, this positively predicted task and social cohesion (Benson, Eys, et al., 2016). Crucially, this analytic approach highlighted that athletes' actual role experiences (and not their initial expectations) primarily accounted for this pattern—a distinction with important practical implications (i.e., efforts should be directed toward creating

positive experiences rather than attempting to lower expectations). Similarly, the ability to model climate perceptions across a three-dimensional plane with RSA provides an opportunity to uncover unique insights into how motivational climate patterns relate to cohesion.

A secondary objective was to adapt and validate the Youth Sport Environment Questionnaire (YSEQ) to the Portuguese sport context, with elite soccer youth players, since it is a developmentally appropriate measure of cohesion for youth athlete. Building upon a well-established literature among adults, researchers have emphasized cohesion as a key variable in relation to youth athletes' sport experiences. As the YSEQ has been used primarily in English-speaking countries, an important question is whether the findings from those studies are generalizable to other populations or cultures. Furthermore, cohesion is conceptualized as an emergent group state, which implies that cohesion perceptions are dynamic and subject to change (Eys & Brawley, 2018). Until now, however, the YSEQ has not been tested for longitudinal invariance. Without establishing longitudinal invariance, it is difficult to ascertain whether changes in the YSEQ, or lack thereof, may be attributable to true effects (e.g., intervention, team building, developmental), or to the effects of an unstable, time-dependent measure. Indeed, if the psychometric properties of the YSEQ are unstable, researchers might draw spurious conclusions about the relations between cohesion and other constructs. Therefore, one should be cautious in making any interpretations regarding findings based on scales without establishing first that the scale is consistent across time. In the current research, we assessed the YSEQ's factor structure, internal consistency values, discriminant validity, concurrent and the constancy of the validity of the measurement at two different points in time.

Method

Participants

Participants included a total of 956 youth soccer players from Portuguese national competition, aged between 12 and 19 years, belonging to 49 different teams (see Table 1 for a detailed breakdown of the independent subsamples). The translation sample included 30 male adolescent

Table 1
Sample Characteristics

Independent samples	<i>N</i>	Ages	Training experience (years)
Translation	30 (2 teams)	12–19 ($M = 15.10$; $SD = 1.20$)	1–12 ($M = 6.26$; $SD = 2.95$)
Calibration	386 (20 teams)	12–19 ($M = 15.12$; $SD = 1.28$)	1–12 ($M = 6.08$; $SD = 2.86$)
Validation	387 (20 teams)	12–18 ($M = 14.53$; $SD = 1.19$)	1–13 ($M = 6.17$; $SD = 2.84$)
Longitudinal	153 (7 teams)	12–16 ($M = 14.69$; $SD = 1.13$)	1–12 ($M = 6.21$; $SD = 2.92$)

soccer athletes between the ages of 12 and 19 years, who took part in the adaptation phases that aimed to evaluate the language of the Portuguese version. We intentionally sampled from the most popular team sport and with the largest number of participants in Portugal. The longitudinal sample was used to evaluate our main hypotheses pertaining to how task and ego climate perceptions would jointly interact in predicting cohesion.

Procedure

Ethical approval for the study was obtained from the ethical commission of the first author's university. Prior to data collection, each club within the soccer association was contacted to participate in the research. Coaches were then contacted requesting permission to survey their athletes and letters of information were sent to parents or caregivers and athletes. Written consent was obtained for all parents or caregivers of the participants. For subsample calibration and validation, the measure was completed in the second phase of the sport season. For the longitudinal study, questionnaires were completed first in December and again in April. All the questionnaires were completed in the middle of the week, in a quiet environment, and in the presence of one of the researchers. Participants placed completed surveys into an envelope provided by the research team, ensuring anonymity.

Instruments

Cohesion

To assess perceptions of team cohesion, participants completed the Portuguese version of the Youth Sport Environment Questionnaire—YSEQp (adapted from, Eys et al., 2009). All statements of the YSEQ (Eys et al., 2009) were adapted using a two-stage process. First, a

bilingual speaker translated the scale into Portuguese. Next, a second translator independently translated the Portuguese version back to the original. The first author followed the translation and back-translation processes to assure the translation's conceptual validity. Second, the translated items were reviewed by a panel of experts (Worthington & Whittaker, 2006). The panel consisted of two sport psychologists and two youth sport soccer coaches with experience in conducting research in the sport area. Experts provided feedback about the items included in the translated version of the questionnaire and no changes were noted, except Item 3. "As a team, we are all on the same page." This item cannot be translated literally due to cultural nuances in Portuguese. Thus, we modified the wording to correctly contextualize the item's meaning. The two versions of the item were compared and debated through in-depth analysis of each version, ultimately agreeing on the most correct translation. With the initial Portuguese version of the scale, a pilot study was conducted with 30 youth soccer players, to obtain feedback about the language and whether it was appropriate for the athletes in question.

The YSEQp is an 18-item scale that assesses two dimensions of cohesion: Task (e.g., *I like the way we work together as a team*) and Social (e.g., *I spend time with my teammates*). Eight items for task cohesion, eight items for social cohesion, and two spurious (negatively worded items), with response options ranging from 1 (*strongly disagree*) to 9 (*strongly agree*). Higher scores reflect higher perceptions of cohesion.

Motivational Climate

The Portuguese version of the Motivational Climate Sport Youth Scale (MCSYSp, Monteiro et al., 2018) was used to assess coach-initiated motivational climates in youth sports. The questionnaire consists of 12 items, assessing task

climate (e.g., *The coach made players feel good when they improved a skill*) and ego climate (e.g., *Winning games was the most important thing for the coach*) with response options ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The confirmatory factor analysis (CFA) in the present study displayed good model fit: $\chi^2(19) = 82.17$, $\chi^2/df = 4.32$; B-S $p < .001$, CFI = 0.986, TLI = 0.974, SRMR = 0.026, RMSEA = 0.054, 90% CI [0.042, 0.067].

Statistical Analysis

Descriptive statistics including means and standard deviations were analyzed. All analyses were conducted using Mplus version 8.4 (Muthén & Muthén, 2017). We conducted a Confirmatory Factor Analysis (CFA) to test the psychometric properties of the measurement model. Although our analyses focus on the individual-level, to account for the hierarchical structure of the data (i.e., athletes nested within teams), we used the MLR estimator with the type = complex function in Mplus, which produces standard errors that are robust to non-normality and adjusted for non-independence. For CFA, recommendations from several authors (Byrne, 2016; Hair et al., 2019) were used and the following goodness-of-fit indexes were adopted: Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Standard Mean Root Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) and its Confidence Interval (90% CI). The following cut-off values were assumed: CFI, TLI $\geq .90$, SRMR, and RMSEA ≤ 0.08 (Hair et al., 2019). Internal consistency of each subscale was obtained via composite reliability, considering .70 as cut-off value (Hair et al., 2019). Average Variance Extracted (AVE) was estimated to evaluate convergent validity and values > 0.50 were considered acceptable. Discriminant validity was achieved when AVE of each construct had values above squared correlations between all factors of the model (Hair et al., 2019). As it pertains to statistical power, the sample size for the calibration and validation confirmatory factor analyses exceeded recommendations based on simulation work with a two-factor model and fewer indicators per latent variable (i.e., a power of .81 was achieved with five indicators under the following conditions: normally distributed = 175, non-normally = 265; Muthén & Muthén, 2002).

Multi-Group Analysis

For the cross-validation (calibration sample vs. validation sample) and longitudinal invariance (Time 1 vs. Time 2), suggestions and recommendations of Byrne (2016) and Chen (2007) were used: First, we examined whether the measurement model presented a good fit to the data for each group. Second, configural, metric, scalar, and residual invariance were performed. The following criteria were used: configural invariance ΔCFI less than 0.01; metric invariance $\Delta SRMR$ less than 0.030 and $\Delta RMSEA$ less than 0.015 (Chen, 2007); scalar invariance $\Delta SRMR$ less than 0.010; and measurement invariance $\Delta RMSEA$ less than 0.015 (Chen, 2007).

As the MLR estimator used by Mplus produces a Satorra–Bentler scaled chi-square, we performed scaling corrections when calculating the $S\chi^2$ difference test (Muthén & Muthén, 2017). As the statistical power and precision of estimates for measurement invariance tests depend on the interplay between several factors, such as the number of indicators per factor, communality of items, and sample size, it is possible that a larger sample would increase the likelihood of detecting measurement non-invariance (Meade & Bauer, 2007).

Polynomial Regression and RSA

As athletes were nested within groups and they were completing group-referent questionnaires (i.e., perceptions of cohesion and motivational climate), it was necessary to account for non-independence in the regression analyses. To statistically determine the amount of between-team variance in the variables, we first conducted a null unconditional model for each variable. The intraclass correlation coefficients indicated varying amounts of variance were explained by group membership (task-related climate = 19.6%; ego-related climate = 0.70%; task cohesion = 9.4%; social cohesion 0.1%). Thus, we used a fixed effects model to partial out the effects of group membership and obtain a purer estimate of the individual-level associations. Based on simulation work comparing a range of analyses when there were less than 16 observations at the group-level, the fixed effects approach was optimal for retaining statistical power and reducing bias in the parameter estimates (McNeish & Stapleton, 2016).

A fixed effects model involves creating $k-1$ dummy variables based on team membership and including these variables in the main regression model as cluster effects.

As a first step for the RSA, we first checked whether there were a sufficient number of discrepant cases (i.e., athletes perceiving a stronger task climate than ego climate; athletes perceiving a stronger ego climate than task climate). Following the procedure outlined by Fleenor et al. (1996), we computed standardized scores for task climate and ego climate perceptions. Athletes whose task climate perceptions differed by at least a half standard deviation from their ego climate perceptions were classified as having a discrepant score. According to these criteria, we identified 124 discrepant cases: Sixty eight cases where task climate perceptions were stronger than ego climate perceptions; 56 cases where ego climate perceptions were stronger than task climate perceptions; 29 non-discrepant cases. Additional criteria required for conducting RSA involve using commensurate scales for the predictor variables, centering the predictor variables, checking for multicollinearity between the predictors, and using sensitive enough measures to detect non-linear and interactive effects (Humberg et al., 2019). All these criteria were met in the present study.

In two separate polynomial regression models, we included six dummy variables for team membership, task climate, ego climate, an interaction term between ego and task climate (i.e., ego climate*task climate), and the quadratic terms for ego climate (i.e., ego climate²) and task climate (i.e., task climate²) as predictors of task and social cohesion. Both ego climate and task climate were grand-mean centered. In all models, we used the MLR estimator, which produces standard errors that are robust to non-normality.

Response surface test values were calculated when significant variance was explained by the polynomial regression model (Shanock et al., 2010). The sample of 153 participants provided .80 power ($\alpha = .05$) to detect small-to-medium sized effects ($f^2 = .08$, $r^2 = .07$) at this stage of the analysis. When there was no justification to model the response surface patterns, we evaluated a multivariate regression model without the interaction and quadratic terms.

Here, we briefly describe the substantive information provided by the β coefficients derived

from the response surface tests. The β coefficient $a1 (= b1 + b2)$ denotes the slope along the line of congruence where ego climate and task climate perceptions are in agreement. The next surface test value, $a2 (= b3 + b4 + b5)$, represents the curvature along this slope. The β coefficient $a3 (= b1 - b2)$ denotes the slope along the line of incongruence between ego and task climate. This details how the direction of the discrepancy relates to cohesion. Specific to our hypothesis, a negative slope would indicate that cohesion levels decrease as ego climate perceptions begin to predominate over task climate perceptions. The curvature along this line is represented by $a4 (= b3 - b4 + b5)$.

To visually represent the response surface patterns, we generated a three-dimensional representation of the variables (see Figure 1). Two lines were added to the floor of the figure, each of which corresponds to the $a1$ and $a3$ response surface test values. The dotted line corresponds to the line of congruence wherein ego climate and task climate perceptions are in agreement. The uniform line corresponds to ego climate perceptions as they increase in strength and begin to predominate over task climate perceptions.

Results

Preliminary Analysis

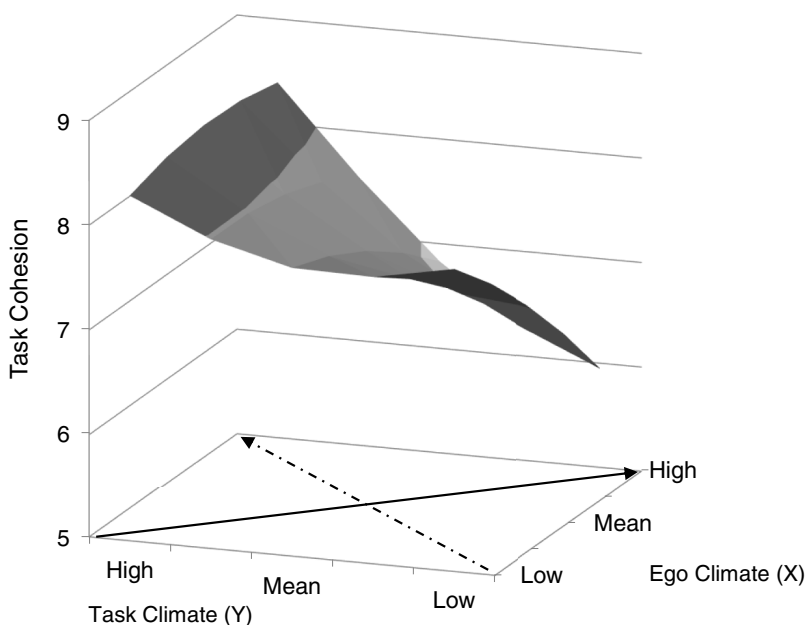
Missing values (<0.1%) were imputed using maximum likelihood estimation. Descriptive analysis revealed no violations of univariate distribution, with Skewness and Kurtosis values between -2 to $+2$ and -7 to $+7$, respectively. No univariate and multivariate outliers were found. Next, we followed Nevitt and Hancock (2001) recommendations using Bollen–Stine Bootstrap (2000 samples) since Mardia's coefficient exceeded the expected value (>5) for multivariate kurtosis in all samples under analysis.

Confirmatory Factor Analysis

Descriptive statistics are present in Table 2, which demonstrate high mean scores for both factors. In addition, a significant positive correlation existed between social cohesion and task cohesion, as suggested by the theoretical model. Relative to the results of the adjustment of the model's individual variables, factorial validity

Figure 1

Response Surface Pattern Depicting How the Combination of Task Climate and Ego Climate Predicts Task Cohesion



was present, that is, all items had a factorial weight on the respective factor ($\geq .50$ and all statistically significant $p < .05$). Regarding internal consistency, in both factors the values of composite reliability (CR) had good internal consistency ($\geq .70$). The AVE values supported convergent validity in all samples (Hair et al., 2019). The square of the correlation in all samples was less than the AVE (Hair et al., 2019), supporting discriminant validity.

Regarding CFA analysis, results revealed that the measurement model fit the data well, on all samples under analysis: calibration sample, $\chi^2 = 285.012$ (103); $p < .001$, TLI = .917, CFI = .929,

SRMR = .055, RMSEA = .068, 90% CI [.058, .077]; validation sample, $\chi^2 = 299.948$ (103), $p < .001$, TLI = .957, CFI = .963, SRMR = .055, RMSEA = .070, 90% CI [.061, .081]; Time 1, $\chi^2 = 215.17$ (103); $p < .001$, TLI = .921, CFI = .932, SRMR = .050, RMSEA = .084, 90% CI [.068, .100]; and Time 2, $\chi^2 = 209.681$ (103); $p < .001$, TLI = .926, CFI = .937, SRMR = .052, RMSEA = .082, 90% CI [.066, .098].

Multi-Group Analysis

The a priori measurement model (i.e., two factors, 16 items) was invariant across samples

Table 2

Descriptive Analysis, Composite Reliability, Convergent and Discriminant Validity, and Factorial Loadings Range

Samples	TC, $M \pm SD$	SC, $M \pm SD$	CR (TC)	CR (SC)	AVE-CT	AVE-CS	r	Range FW-TC	Range FW-SC
Calibration sample	7.17 \pm 1.24	6.91 \pm 1.40	.92	.92	.59	.61	.66	.65–.90	.55–.88
Validation sample	7.30 \pm 1.39	6.89 \pm 1.58	.91	.92	.57	.60	.59	.62–.82	.71–.85
Time 1	7.58 \pm 1.04	6.88 \pm 1.44	.90	.92	.54	.59	.53	.55–.90	.70–.84
Time 2	7.44 \pm 1.12	7.21 \pm 1.25	.91	.92	.55	.60	.54	.59–.90	.68–.85

Note. TC = task cohesion; SC = social cohesion; M = mean; SD = standard deviation; CR = composite reliability; AVE = average variance extracted; r = interfactor correlation; FW = standardized factor loadings.

(Table 3) and over time. The obtained values indicate that the same number of factors were present in each group and that each of the factors were associated with the same set of items (i.e., configural invariance); the YSEQp presented the same significance in samples over time (i.e., metric invariance); comparison of the latent and observed averages was valid across samples and over time (scalar invariance) as well as residual invariance (which supports the comparison between the observed items). Also, data revealed no differences between time points, which means that both constructs (i.e., task and social cohesion) were perceived equally at different times of season.

Polynomial Regression and RSA: How Motivational Climate Relates to Task and Social Cohesion

Task Cohesion

The regression coefficients for the polynomial regression models are summarized in Table 4. Ego climate was a significant negative predictor of task cohesion ($b = -0.32$, $SE = 0.13$, $p = .014$), whereas task climate was a significant positive predictor of task cohesion ($b = 0.68$, $SE = 0.18$, $p < .001$). The quadratic term for task climate was also significant ($b = 0.31$, $SE = 0.09$, $p = .001$). The polynomial regression model explained significant variance in task

cohesion perceptions ($R^2 = 30\%$, $p < .001$) and thus we proceeded to the RSA.

A three-dimensional representation of the relations between motivational climate and task cohesion is depicted in Figure 1, where task climate ($SD = 0.55$) and ego climate ($SD = 0.74$) were plotted at $\pm 2 SD$ from the grand mean. Along the line of congruence, there was a significant positive convex slope ($a1: b = 0.37$, $SE = 0.17$, $p = .032$; $a2$ surface test value: $b = 0.57$, $SE = 0.18$, $p = .002$). This means when task and ego climate perceptions were similar, climate perceptions became an increasingly strong predictor of task cohesion. The significant negative slope along the line of incongruence indicated that task cohesion perceptions decreased as ego climate perceptions increased in salience relative to task climate perceptions ($a3: b = -1.00$, $SE = 0.27$, $p < .001$). As hypothesized, task cohesion was lowest when strong ego-involving climate perceptions were accompanied by weak task climate-involving climate perceptions.

Social Cohesion

The regression coefficients for both social cohesion models are summarized in Table 4. The polynomial regression model explained a non-significant amount of variance in social cohesion perceptions ($R^2 = 11\%$, $p < .001$) and thus we did not proceed the RSA. The multivariate regression without the polynomial

Table 3
Goodness-of-Fit Indexes of Longitudinal Invariance

CS-S	χ^2	df	$\Delta S\chi^2$	Δdf	p	CFI	ΔCFI	RMSEA	$\Delta RMSEA$	SRMR	$\Delta SRMR$
CI	584.682	206	—	—	—	.944	—	.069	—	.055	—
MI	605.381	220	30.00	14	.008	.943	-.001	.067	-.002	.071	.016
SI	614.729	234	25.26	14	.032	.944	.001	.065	-.002	.076	.005
RI	637.976	250	10.96	16	.812	.938	.024	.066	.001	.097	.021
T1-T2	χ^2	df	$\Delta S\chi^2$	Δdf	P	CFI	ΔCFI	RMSEA	$\Delta RMSEA$	SRMR	$\Delta SRMR$
CI	424.700	206	—	—	—	.935	—	.083	—	.051	—
MI	413.344	220	7.99	14	.890	.942	.007	.076	-.007	.053	.002
SI	403.863	234	10.61	14	.716	.949	.007	.069	-.007	.052	-.001
RI	383.955	250	6.69	16	.979	.960	.011	.059	-.010	.052	.000

Note. χ^2 = chi-squared; df = degrees of freedom; $\Delta S\chi^2 (df)$ = Satorra-Bentler scaled chi-square difference tests calculated using procedures outlined by Muthén and Muthén (2017); Δdf = differences in the degrees of freedom; ΔCFI = differences in the value of the comparative fit index; RMSEA = root mean square error of approximation; $\Delta RMSEA$ = differences in value of root mean square error of approximation; SRMR = standardized root mean square residual; $\Delta SRMR$ = differences in value of standardized root mean square residual; CI = configural invariance; MI = measurement invariance; SI = scale invariance; RI = residual invariance; CFI = comparative fit index; CS = calibration sample; VS = validation sample; Cal = calibration sample; Val = validation sample; T1 = Time 1; T2 = Time 2.

Table 4*Response Surface Models of How Ego and Task Climate Perceptions Predict Cohesion*

Variable	Task cohesion <i>b</i> (<i>SE</i>)	Social cohesion (M1), <i>b</i> (<i>SE</i>)	Social cohesion (M2), <i>b</i> (<i>SE</i>)
Constant	7.30	5.73 (0.59) ^{***}	5.05 (1.02) ^{***}
Cluster effect 1	-0.05 (0.23)	0.03 (0.09)	0.13 (0.34)
Cluster effect 2	0.21 (0.20)	0.10 (0.11)	0.22 (0.29)
Cluster effect 3	-0.48 (0.27)	0.14 (0.09)	0.61 (0.36)
Cluster effect 4	0.23 (0.36)	0.07 (0.11)	0.24 (0.48)
Cluster effect 5	0.09 (0.31)	0.10 (0.09)	0.33 (0.35)
Cluster effect 6	-0.62 (0.32)	-0.07 (0.12)	-0.44 (0.61)
Ego climate	-0.32 (0.13) [*]	-0.08 (0.10)	-0.18 (0.18)
Task climate	0.68 (.18) ^{***}	0.30 (0.11) ^{**}	0.56 (0.20) ^{**}
Ego climate ²	-0.06 (0.09)	-0.07 (0.10)	—
Ego climate × Task climate	0.32 (0.26)	0.12 (0.13)	—
Task climate ²	0.31 (0.09) ^{***}	0.13 (0.10)	—
<i>R</i> ² (overall model)	.30 ^{***}	.13	.11
Surface tests			
<i>a</i> ₁	0.37 (.17) [*]	—	—
<i>a</i> ₂	0.57 (.18) ^{**}	—	—
<i>a</i> ₃	-1.00 (.27) ^{***}	—	—
<i>a</i> ₄	-0.07 (.34)	—	—

Note. Values are unstandardized regression coefficients. Standard errors are in parentheses. *N* = 153. Cluster effects = Dummy coded variables created to partial out the effects of group membership (*k* - 1 = 6). Surface test values were not computed in the absence of a significant ΔR^2 .

p ≤ .01. * *p* ≤ .05. ** *p* ≤ .01. *** *p* ≤ .001.

and interaction terms showed that task climate perceptions positively predicted social cohesion ($b = 0.56$, $SE = 0.20$, $p = .006$). However, ego climate perceptions were not significantly associated with social cohesion ($b = -0.18$, $SE = 0.18$, $p = .320$).

Discussion

Understanding the factors associated with how youth athletes view their group environment and the effect of coaches' behaviors on the psychological well-being of the team is a crucial theme within the sport group dynamics literature. The purpose of the present study was to gain insight into (a) how the combination of ego climate and task climate perceptions jointly affected athletes' perceptions of team cohesion, and (b) the psychometric properties of the YSEQ in a Portuguese sport context with elite soccer youth players. To the best of our knowledge, this is the first study to use response surface analysis to examine how coach-initiated motivational climate predicted youth athletes' perception of cohesion in a highly competitive sporting context (i.e., national youth sport players) using age-appropriate instruments.

Regarding the prediction of task and social cohesion, RSA enabled us to examine the

independent contributions of each form of motivational climate, the predominance of one climate over the other, the direction of the discrepancy in climate perceptions (i.e., the effect of ego climate predominating over task climate vs. the effect of a task climate predominating over an ego climate), and nonlinear relationships. Specific to our main objective, we hypothesized that both task and social cohesion perceptions would decrease as ego climate perceptions increased in salience relative to task climate perceptions. The response surface patterns revealed partial support for our predictions. As hypothesized, athletes tended to report lower levels of task cohesion as the strength of ego-involving climate perceptions began to overshadow task-involving climate perceptions. However, this same response surface pattern was not detected in relation to social cohesion. Social cohesion was unrelated to ego climate perceptions but positively associated with task climate perceptions. Taken together, a coach-initiated motivational climate that emphasizes outcome-oriented social comparisons at the expense of self-improvement and learning appears to weaken athletes' perceptions of unity surrounding the achievement of group objectives and team common goals. Although our results align with other studies (Eys et al., 2013;

Heuzé et al., 2006), the response surface patterns provide a more nuanced view of how these two motivational climate variables interact in relation to task cohesion.

A second pattern revealed by the RSA was that the overall strength of climate perceptions became an increasingly strong predictor of task cohesion when task and ego climate perceptions were similar. One point is that a task-involving climate can co-exist with an ego-involving climate, which has been documented in prior work with climate profiles (Eys et al., 2013). Furthermore, our results suggest that a strong task-involving climate may buffer against the potentially harmful effects of an ego-involving climate. A possible explanation for this relation resides within the framework of social interdependence (SIT, Johnson & Johnson, 2005). Even though teammates directly compete against one another for playing time and status within the group, athletes in task interdependent sports share mutual interests because they depend on each other (Van Puyenbroeck et al., 2018). Intrateam competition is omnipresent in high-level sport, and perhaps inevitable as teammates push one another in the pursuit of excellence, largely because of its selective nature (e.g., playing time distribution depends on performance comparisons with other players in the same position). The potential value of harnessing intrateam competition is recognized by athletes and coaches, who intentionally engineer “game-like” opportunities in training sessions (Harenberg et al., 2016).

Indeed, other scholars have made similar points regarding the potential value of an ego climate in competitive but not elite sport contexts, so long as it is accompanied by task climate perceptions (Eys et al., 2013; Horn et al., 2012). Recognizing that coaches must constantly adapt to situational demands, Eys et al. noted “it may be possible for coaches to approach competitions/matches in an ego-involving manner while creating a more task-involving climate during practice sessions” (Eys et al., 2013, p. 380). This point aligns with temporal models of teamwork that highlight how teams can transition between developmental periods (i.e., transition phases) and action phases (Marks et al., 2001).

As creating a developmentally appropriate motivational atmosphere is important, it is worthwhile to note that social comparisons—both within and between teams—increase with age and expertise as athletes progress toward the

investment/mastery phase (Côté et al., 2003). Put simply, social comparisons are ubiquitous in competitive elite youth sport. From a practical standpoint, given that coaches must work within the constraints of their sport context and represent only one of multiple social agents (Keegan et al., 2010), coaches should focus on managing the elements of the motivational climate over which they have influence. As the roles of coaches change from “helper” to “specialist,” an ego-involving motivational climate that emphasizes procedural fairness in terms of how playing time is distributed and provides rewards that are commensurate with individual performance may be viewed favorably by elite-level athletes, and these behaviors would not detract from the promotion of mastery goals (see Keegan et al., 2010).

The present study also evaluated the two-factor structure of the YSEQ (Eys et al., 2009) in the Portuguese context. Adapting the questionnaire into Portuguese required certain contextual modifications to the original to ensure that the translation had the highest possible item comprehension for the sample of 12–19 years old Portuguese athletes. From a descriptive standpoint, athletes reported high average levels of cohesion, with slightly higher task than social cohesion perceptions, which aligns with other youth sport studies that have employed the YSEQ (McLaren et al., 2015, 2017; McLaren & Spink, 2016; Spink et al., 2018; Taylor & Bruner, 2012). The reliability and validity results support the YSEQ on psychometric and construct validity grounds. The YSEQp revealed adequate levels of internal consistency in all subsamples. In addition, the positive correlations between the task and social cohesion dimensions are consistent with prior work on conceptual and empirical grounds. All measurement models were supported based on recommended cut-off values (Byrne, 2016; Hair et al., 2019).

By definition, cohesion is inherently temporal but sport researchers have rarely modeled cohesion longitudinally and tested its measurement invariance across time (Eys & Brawley, 2018; Salas et al., 2015). Using multigroup analysis, our findings support the measurement invariance of the YSEQ factor structure, indicating it functions similarly for each independent group at different times. Together, these findings imply that there are no threats to longitudinal invariance for the Portuguese version of the YSEQ. In male soccer athletes, changes in the mean

scores of cohesion can reasonably be interpreted as changes in the cohesion, due to its multidimensional and dynamic nature. Overall, the psychometric properties of the YSEQp are similar to other validation studies of the YSEQ (Benson, Šiška, et al., 2016; Eys et al., 2009) lending additional support to the validity of the YSEQ as a measure of youth athletes' perceptions of cohesion. Furthermore, the current research provides novel evidence for the measurement invariance of the YSEQ across time. However, more studies are needed to examine longitudinal measurement invariance in the YSEQp. For example, the present study used only male athletes and a single sport (i.e., soccer). As the validation of an instrument is an ongoing process, and based on the results of this investigation, we recommend the continuation of studies on cohesion, following the same proceedings in a broader sample, diverse gender, type of sports, and level of competition. We also encourage the use of cross-culturally adapted questionnaires.

Limitations and Future Research Directions

Although the sample of elite youth sport participants and the use of validated questionnaires are strengths of the current investigation, the reliance on retrospective questionnaires to assess both cohesion and motivational climate is a limitation. As noted by Harwood and Thrower (2019), questionnaires only capture a snapshot of climate perceptions and may obscure important details about the motivational atmosphere in sport teams, and thus limit the practical recommendations that can be derived from such assessments. Although qualitative methods offer an avenue for unpacking the nuances of the motivational atmosphere in sport teams (Keegan et al., 2010), ecological momentary sampling would also help to elucidate how motivational climate perceptions vary from situation to situation, the role of different social agents across situations, and the consequences of such situation-specific changes.

Another limitation is that we focused solely on subjective perceptions from a single source (i.e., athlete ratings). One concern is the degree to which common method bias may account for the observed associations. From a study design perspective, however, the temporal separation between the predictor and criterion variable helps to reduce such bias. Second, modeling complex and non-linear associations also reduce concerns

over common method bias. Nonetheless, it would be beneficial for future researchers to either include multi-source ratings (e.g., athlete and coach ratings, Gjesdal et al., 2019) or assess objective outcomes such as team success. As a core objective of elite sport is team success, it will be important for future research to identify which combinations of motivational climate are optimal for performance.

A final point is that the present study focused on athletes' perceptions of cohesion and motivational climate at the individual-level rather than modeling these variables through a multilevel lens. We constrained our focus to the individual-level due to the number of teams across both time points and controlled for the effects of group membership. Nonetheless, recent developments have now made it possible to conduct multilevel RSA (Nestler et al., 2019).

Using RSA, our study illustrates the ways in which task-involving and ego-involving climate perceptions combine to shape how athletes view their group environment. Our results offer insight into how a coach-initiated motivational climate predominated by ego-involvement (relative to task-involvement) undermined athletes' perceptions of task cohesion. Furthermore, athletes reported the highest levels of task cohesion when they perceived a strong task-involving climate, suggesting a task-involving climate may buffer against the potentially harmful elements of an ego-involving climate. Our study also provided additional psychometric evidence supporting the YSEQ (i.e., longitudinal measurement invariance, factor structure validity, validating a Portuguese version of the YSEQ). If the goal is to foster a sense of cohesion among youth athletes at elite levels of competitive, coaches are advised to create a motivational climate that combines a strong perception of competence self-referenced by athletes, meaning, exerting effort, and improving one's skill, to ensure that athletes are not solely concerned with intrateam performance comparisons (i.e., showing that they are better than others or surpass normative standards).

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