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Longitudinal associations between peer motivational climate and athletes' sport related well-being: Examining the mediating role of autonomous and controlled motivation using a within- and between-level approach

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ABSTRACT

Objective. The present study objective is to examine (a) the links between temporal evolution of peer motivational climate and sport related well-being (SRWB), and (b) the mediational role of motivation in these relationships, using within and between level analyses. Method. 73 athletes aged 18-25 years completed questionnaires on peer motivational climate (peerMC), motivation, burnout, and engagement, every week among one month. Linear Mixed Models were used to analyze the data. Results. Task peerMC significantly predicted autonomous motivation at the within- and between-person level, burnout at the within-person level, and engagement at the within-person level. Moreover, autonomous motivation was identified as a mediator of the relationship between task peerMC and burnout at the within-person level, and task peerMC and engagement at the within- and between-person level. Ego peerMC significantly predicted autonomous motivation at the within-person level, and autonomous motivation was also confirmed as a mediator of the relationship between ego peerMC and burnout, as well as between ego peerMC and engagement at the within-person level. Conclusion. The results confirm that a task-oriented peerMC is likely to lead to the most positive consequences for athletes in terms of motivation and SRWB, whereas the ego-driven climate leads to more negative consequences.

Key Words: Autonomous Motivation, Burnout, Engagement, Peers, Task- and ego-involving motivational climate

INTRODUCTION

The physical and mental demands of sports participation, especially among athletes engaged in intensive context, can lead to a decrease in sport-related well-being (SRWB) (Bartholomew et al., 2011). However, based on the principles of positive psychology (Seligman & Csikszentmihalyi, 2000), studies have also highlighted factors that can promote well-being in this same context (Ntoumanis et al., 2012). Several authors recommend using the concept of athlete burnout (a multidimensional construct consisting of three dimensions: emotional/physical exhaustion, reduced sense of accomplishment, and sport devaluation) (Raedeke & Smith, 2008) to represent the negative aspect of SRWB. Conversely, some authors have suggested to use athlete engagement (a construct consisting of four dimensions: confidence, dedication, vigor, and enthusiasm) (Lonsdale et al., 2007), considered as the theoretical counterpart of athlete burnout, to represent the positive aspect of SRWB. As a result, the present study examines athlete burnout as a negative indicator, and athlete engagement as a positive indicator of SRWB.

Among the factors identified for the development of SRWB in the context of intensive sport for athletes, the social environment – including the impact of significant others – has been identified as a key factor (Gagné & Blanchard, 2007). However, among the studies that have examined the context influence on the SRWB, scares are those that have examined the role of peers. Meanwhile, athletes interact extensively with their peers before, during, and after training sessions and competitions and may uses them as a reference to assess their skill level (Smith, 2007). Peers are not only training partners, they also co-act, share goals, share time and form a group (Smith & Ullrich-French, 2020). Therefore, studying the role of the peer motivational climate (peerMC) seems relevant to more completely understand the motivational processes and the evolution of SRWB among athletes (Ntoumanis et al., 2012). The present study objective is to examine the role of the peerMC among athletes on positive and negative indicators of SRWB using within and between levels analyses.

PeerMC and SRWB

According to the Achievement Goal Theory (Ames, 1992; Nicholls, 1984), motivational climate relates to the goal structures and expectations operating within an achievement setting that elicit the formation of certain perspectives on success. Two forms of motivational climate have been identified (Ames, 1992; Ames & Archer, 1988): a mastery and an ego involving climate. Mastery involving climate represents a context characterized as emphasizing and rewarding effort and cooperation, focusing on learning, and self-

referenced criteria for success. Ego-involving climate refers to a context that involves reinforcement of social comparison and evaluation, within-group competition, punishment of mistakes, and norm-referenced criteria for success. In competitive sport context, research has consistently shown (cf. table 1 for a synthesis) that ego involving coach motivational climate was positively, and mastery involving coach climate was negatively related to negative indicators of SRWB (e.g., burnout) (Appleton & Duda, 2016; Isoard-Gautheur et al., 2013; Lemyre et al., 2008; Vitali et al., 2015). Research has also shown that coach ego involving motivational climate was negatively, and coach mastery involving climate was positively related to positive indicators of SRWB (e.g., engagement and subjective vitality) (Alvarez et al., 2012; Curran et al., 2015; Ntoumanis et al., 2012; Reinboth & Duda, 2006).

Very few studies have explored peerMC and its association with SRWB. Specifically, the work by Noutmanis and Vazou (Ntoumanis & Vazou, 2005) has led to the identification of three distinct task-involving features and two distinct ego-involving features. The task-involving features were improvement, relatedness support, and effort, whereas the ego involving features were intra-team competition / ability, and intra-team conflict. Improvement pertains to teammates encouraging and cooperating with one another, relatedness support involves valuing and accepting one another, and effort involves encouraging and reinforcing effortful involvement and persistence. The ego involving feature of intra-team competition / ability captures within-team competition and comparison, along with valuing most highly those teammates of greatest ability. Finally, intra-team conflict involves the display of unsupportive behaviors such as criticizing, "putting down", and laughing at teammates as well as complaining when the team loses.

Regarding peerMC in the competitive sport context, research has shown that ego involving peer motivational climate was positively, and mastery involving peer climate was negatively related to negative indicators of sport related well-being (e.g., burnout) (Ntoumanis et al., 2012; Smith et al., 2010). Research has also shown that ego involving motivational peer climate was negatively, and mastery involving peer climate was positively related to positive indicators of sport related well-being (e.g., subjective vitality) (Ntoumanis et al., 2012). However, to the best of our knowledge, little is known about the temporal dynamics of peerMC, especially over short periods of time. Furthermore, few previous studies have examined the mediators of the peerMC-SRWB relationship, which would provide a greater insight into the mechanisms involved in this relationship.

Mediating influence of motivation on the peerMC – SRWB relationship

Beyond the impact of the peerMC on SRWB, some authors have also highlighted its impact on individual motivations. Following Achievement Goal Theory (Ames, 1992) and Self-Determination Theory (Deci & Ryan, 2000), it is assumed that environments that promote a sense of choice and self-mastery such as when athletes perceive social agent's support as tack involving, they are more likely to be intrinsically

motivated toward their participation in sport. In the specific case of peerMC, Jõesaar and colleagues have confirmed that task-involving peerMC positively predicted athletes' intrinsic motivation (Jõesaar et al., 2011, 2012), and that ego-involving peerMC negatively predicted self-determined motivation (Hein & Jõesaar, 2015).

At the same time, it has been widely shown in the field of sport, that motivation is linked to well-being. Indeed, self-determined motivation has been shown to be a positive predictor of subjective vitality (Alvarez et al., 2012). Conversely, amotivation and controlled regulations have been associated with athlete burnout (Isoard-Gautheur et al., 2012).

In light of the elements presented above, it seems possible to assume the existence of a mediation through motivation. This assumption is corroborated by Jõesaar et al. (Jõesaar et al., 2011), who have demonstrated that task and ego-involving peerMC have an influence on persistence through basic needs satisfaction and intrinsic motivation. Moreover, in a recent study, autonomous motivation was identified as a partial mediator in the relationship between perceptions of a team task-involving climate and functional emotion, and controlled motivation partially mediated the relationship between a team ego-involving climate and dysfunctional emotion (Ruiz et al., 2016). However, this study looked at the general motivational climate in the team and not specifically at the climate created by the peers and used a cross-sectional correlational design that does not allow to reveal the temporal dynamics of the relationships examined.

Taking in consideration the weekly fluctuations in the relationships between peerMC, motivation, and SRWB

In cross-sectional studies that use surveys, analyses are mostly at the person-level, such that one simply compares people who are exposed to different environments. Cross-sectional studies cannot be used to examine how changes in the environment relate to changes in SRWB over time. To address this issue, and advance the existing SRWB-based research, it is critical to ascertain if longitudinal patterns of change in SRWB occur as a function of change in the perceived climate over time (i.e., within individual changes). Within individual changes refer to deviations from a person's average levels. This approach enables researchers to explore questions such as whether over time variability in athlete's motivation and SRWB may be explained by over time fluctuations in perceptions of peerMC. Disaggregating within and between individual levels of analyses will allows researchers to know if the observed relationships between variables exist within individual variations and/or on between individual differences. For example, a longitudinal study by Ntoumanis et al. (Ntoumanis et al., 2012) have examined how athletes' perceptions of coach and peer motivational climate predicted their moral attitudes, emotional well-being, and behavioral investment. In this study, measures were taken at the middle and the end of a competitive season, as well as at the start of the following season. Multilevel modeling analyses revealed that athletes' perceptions of peer and coach task-involving climates were predictive of more adaptive outcomes compared to perceptions of

ego-involving peer and coach climates. Specifically, the results highlight a negative relationship between the task-involving peerMC and burnout, both at the within and between levels. At the same time, commitment and subjective vitality were not equally related to the peerMC at the within and between individual levels. Indeed, at the within individual level, the ego-involving peerMC was negatively related to changes in commitment, while at the between individual level it was the task-involving peerMC that was positively related to commitment. Regarding subjective vitality, although at the between individual level it was positively related to the task-involving peerMC, there was no significant relationship between vitality and peerMC at the within individual level. The results of this study underscore the importance of considering both the within and between individual levels of analysis when looking at the relationships between peerMC and SRWB.

Objectives and Hypotheses

Based on the studies presented earlier, scarce are those which have examined the relations between peerMC, athletes' motivation and SRWB. Indeed, examining the relationships between peerMC and SRWB is critical to advancing scientific knowledge about the consequences of peerMC. Furthermore, the assumed mediation of motivation between the peerMC and SRWB has not been tested in the past. Testing this mediation would provide a better understanding of the mechanism by which the perception of peerMC predict SRWB. Finally, temporal fluctuations in the perception of peerMC and SRWB over short periods of time have not been examined yet. Studies on these aspects is needed to advance scientific knowledge about the temporal dynamic of SRWB among short periods of time. Thus, the objective of the present study is to overcome these limitations by (a) examining within and between individual relationships between peerMC and athletes' SRWB over a one-month period with weekly measures. The objective is also (b) to investigate the mediational role of motivation in the peerMC – SRWB relationship.

H1a: We hypothesized that mean scores on task (ego)-involving perceptions of peerMC would positively (negatively) relate to autonomous motivation and engagement and be negatively (positively) associated with controlled motivation and burnout.

H1b: Simultaneously, we expected that changes in perceptions of task (ego)-involving perceptions of peerMC would be positively (negatively) associated with changes in autonomous motivation and engagement, and negatively (positively) associated with changes in controlled motivation and burnout.

H2: We also hypothesize that motivation would mediates the relationship between peerMC and SRWB at both within and between individual levels.

METHOD

Participants and Procedure

The participants were male (N = 42) and female (N = 31) young adults aged 18-25 years practicing team (e.g., basketball, rugby, handball; N = 33) and individual sports (e.g., track and field, and cycling; N = 40). The athletes had a mean

hours of training per week of 7.76 (SD = 3.19). Forty of them were competing at the regional, 29 at the national, and 4 at the international competitive level.

Participants responded at online questionnaires every week at the end of the weekend (Sunday night to Monday night) for four weeks. The first time point was in the middle of the season to ensure that there was adequate time for a peerMC to have been established (Smith et al., 2005). Recall email to complete the questionnaire were sent if athletes have not done Monday afternoon each week. A four-week period was chosen because it corresponded to a period when both team and individual athletes were competing. This allowed the study to be carried out under fairly similar conditions for the athletes in these two sport groups. In addition, by examining weekly fluctuations over four weeks, we were able to measure whether athletes' perceptions fluctuated over a relatively short period of time during the sporting season, which had not been done before. Seventy-three participants have responded at time 1, 72 at time 2, 65 at time 3, and 61 at time 4.

All participants were treated according to American Psychological Association ethics guidelines regarding consent, confidentiality, and anonymity of responses. Questionnaires were matched over time using a coding system to protect anonymity. A correspondence list between the anonymity number and the email address was used to send reminders to participants. This list was destroyed at the end of the study.

Measures

Due to the repeated measure design of the present study, we choose to use single item for each sub-dimension of the constructs of interest. Indeed, it has been recommended to use single item in order to minimize respondent burden in this kind of design (Fisher et al., 2016). Single items were selected from existing measures by selecting the item with the highest loading in each sub-dimension in the exploratory factor analyses (Fisher et al., 2016) performed by the researchers who have validated each of the scales of interest in the present study (Supplementary material, Table S1 for detail)

Motivational Climate.

PeerMC was assessed via the Peer Motivational Climate for Youth Sport Questionnaire (PeerMCYSQ) (Ntoumanis & Vazou, 2005). The PeerMCYSQ consists of two higher order factors (i.e., ego and task-involving climate) which altogether included subscales tapping improvement (task), relatedness support (task), effort (task), and intra-team conflict (ego)[1].

Motivation.

Motivation regulations were assessed via the Behavior Regulation in Sport Questionnaire (BRSQ) (Lonsdale et al., 2008). The BRSQ consists

[1] About *intra-team competition/ability (ego)*, some participants in our study (i.e., mostly those who participate in individual sports) did not answer this question and indicated that it was not relevant in their case. Consequently, we retained only the sub-dimension of intra-team conflict to represent the ego-involving climate.

of six subscales tapping intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation[2].

Engagement.

Athlete engagement was assessed via the Athlete Engagement Questionnaire (AEQ) (Lonsdale et al., 2007). The AEQ consists of four subscales tapping perceived confidence, vigor, dedication, and enthusiasm.

Burnout.

Athlete burnout was assessed via the French Version of the Athlete Burnout Questionnaire (ABQ) (Isoard-Gautheur et al., 2010). The ABQ consists of three subscales measuring reduced sense of accomplishment, emotional and physical exhaustion, and sport devaluation.

Control variables.

Vazou et al. (Vazou et al., 2006) findings revealed male/female differences in the perceived peerMC. As a result, sex (i.e., 1 for male and 2 for female) was used as a control variable. Moreover, as the dynamics of peer interaction may differ between team and individual sports, we chose to control this variable as well (i.e., 1 for individual sport, 2 for team sport)

Statistical analyses

Linear Mixed Models (LMM) were used to test whether within and between individual differences in peerMC across weeks predicted motivation, burnout, and engagement, after controlling for covariates. LMM models provide results with acceptable type I error rates when data are hierarchically structured with repeated measurements (i.e., Level 1) nested within each individual (i.e., Level 2), because they account for the shared variance due to multiple observations within the same participant (i.e., non-independence) (Boisgontier & Cheval, 2016). LMM does not require an equal number of responses from all participants; therefore, individuals with missing values on one or more occasions were not exclude from the analysis (Raudenbush & Bryk, 2002). In a first step, an unconditional model (i.e., with no predictor; Model 0) was estimated for each variable, namely autonomous motivation, controlled motivation, burnout, and engagement. Intra-class correlations (ICC) were calculated from these models to estimate the amount of variance at the within- and between-person levels, which allowed us to determine whether conducting multilevel models was relevant (Singer & Willett, 2003). Next, to explore the effect of time on climate, in Model 1, time was added as fixed and random parameters to test whether variables change across the four measurement times, allowing intercept and slope to vary among individuals. In addition to this linear time effect, quadratic time effect was tested in an alternative model (Model 1bis). If model's fits were better than the first model, the quadratic effect of time was kept in

[2] This last subscale was not used in the study because we calculated autonomous motivation and controlled motivation scores which do not include this subscale.

next models. Then, task-involving peerMC (Model 2a) and ego-involving peerMC (Model 2b) were added to model 1 to test whether they predicted autonomous motivation, controlled motivation, burnout, and engagement, after controlling for covariates (i.e., sex and individual sport). In a third model, we added an interaction term between task-involving peerMC and time (Model 3a), and between ego-involving peerMC and time (Model 3b) to investigate whether between- and within-person differences in peer motivational climate over time can predict changes in autonomous motivation, controlled motivation, burnout, and engagement.

The analyses included time-varying (Level 1) and time-invariant (Level 2) predictors. In other words, each predictor was decomposed into two variables. Time-varying predictors were centered on each individual's unique mean over time (i.e., individual mean centering), which allowed a pure estimation of the within individual effects (Enders & Tofighi, 2007). Time-invariant predictors were centered on the sample mean (i.e., grand mean centering). We added these mean scores to ensure that our estimates of within individual change at Level 1 were not confounded with between individual differences (Raudenbush & Bryk, 2002). All models were fitted using the lme4 package (Bates et al., 2015) of the R software (R Development Core Team, 2019) with maximum likelihood method (ML) and an estimate of the effect size was reported using the conditional pseudo R2, which was computed using the Mu-MIn package (Barton, 2009).

To examine the mediating effect of (autonomous/controlled) motivation on the peerMC – burnout/engagement relationships, mediation analyses were performed. Following Baron & Kenny (Baron & Kenny, 1986) recommendations, paths a, b, c and c' were computed to test mediation. The a path from peerMC to autonomous and controlled motivation are presented in Model 2. The b and c paths from motivation to burnout and engagement, controlling for peerMC was tested with an additional model (Model 4). The c' path from peerMC to burnout and engagement are presented in Model 2 presented above. In line with the latest advances in the field, mediation was identified if both a and b were significant, independently of c' path (Yzerbyt et al., 2018; Zhao et al., 2010). Then, the significance of the product-of-coefficients (a*b) was tested using the 'mediation' package (Tingley et al., 2014), performing Monte Carlo sampling method (MacKinnon et al., 2004). Monte Carlo sampling method was preferred to other calculations methods since they provide the best ratio between Type I and Type II errors (Yzerbyt et al., 2018). To satisfy the criteria for mediation, the 95% confidence intervals (95% CI's) for the product-of-coefficients must not include zero. Finally, the proportion of the peerMC – burnout/engagement mediated by autonomous/controlled motivation was calculated using the equation: % of total effect mediated = 1-(c'/c) (MacKinnon, 2008).

RESULTS

Descriptive Statistics, Bivariate Correlations, and Intra-Class Coefficients

Table 2 presents means, standard deviations and correlations for between- and within-person variables. Correlation matrices

indicate that burnout was correlated to autonomous motivation, controlled motivation, engagement, peerMC (task and ego) at the between- and within-person levels. Engagement was correlated to autonomous motivation, engagement, peerMC (task and ego) at the between-person level, and to autonomous motivation, controlled motivation, engagement, task-involving peerMC at the within-person level. The intraclass correlation coefficients were ρI = .31 for burnout, ρI = .45 for engagement, ρI = .38 for autonomous motivation, and ρI = .60 for controlled motivation respectively, indicating that a considerable proportion of the total variance (between 31 % and 60 %) was attributable to the between-person level, confirming the relevance of disaggregating between- and within-person effects.

We also tested whether task-involving peerMC (Supplementary material, Table S2), ego-involving peerMC (Supplementary material, Table S2), autonomous motivation (Supplementary material, Table S3), controlled motivation (Supplementary material, Table S4), burnout (Supplementary material, Table S5), and engagement (Supplementary material, Table S6) change over time. Results showed that all these variables did not significatively change over time (Models 1). In addition, results indicated that adding quadratic effect of time did not improve significantly models fit.

PeerMC as Predictor of Mean Levels and Change in Motivation, Burnout and Engagement

We have tested whether task-involving peerMC (Model 2a) and ego-involving peerMC (Model 2b), as well as their interaction with time (Model 3a and 3b), predicted autonomous motivation (Supplementary material, Table S3), controlled motivation (Supplementary material, Table S4), burnout (Supplementary material, Table S5) and engagement (Supplementary material, Table S6), both at the within and the between-person level (See figure 1 for a synthesis of the study results). Regarding autonomous motivation (Supplementary material, Table S2), results showed that sex (b = -7.95, p = .004) and individual sport (b = 5.71, p = .034), predicted autonomous motivation while age (b = .75, p = .306) did not predict autonomous motivation, meaning that women and athletes in individual sports reported lower autonomous motivation. Moreover, task-involving peerMC predicted autonomous motivation at the within-person level (b = .34, p = .001) and at the between-person level (b = .21, p = .007) (Model 2a). In addition, results showed that changes of task-involving peerMC over time did not predicted autonomous motivation both at the within-person level (b = .09, p = .125) and at the between-person level (b = .07, p = .110) (Model 3a). Results also showed that ego-involving peerMC predicted lower autonomous motivation at the within-person level (b = -.13, p = .043) but not at the between-person level (b = -.07, p = .504) (Model 2b). In addition, results showed that changes of task-involving peerMC over time did not significantly predicted higher autonomous motivation both at the within-person level (b = -.04, p = .622) and at the between-person level (b = -.01, p = .761) (Model 3b).

Regarding controlled motivation, results showed that sex (b = -4.24, p = .494), age (b = .83, p = .607) and individual sport (b = -11.46, p = .061) did not significantly predict controlled motivation, so that there were no differences of controlled motivation between women/men, younger/older people, and athletes in individual/collective sport. Moreover, task-involving peerMC did not significantly predict controlled motivation both at the within-person level (b = .12, p = .223) and at the between-person level (b = .28, p = .109) (Model 2a). In addition, results showed that

changes of task-involving peerMC over time did not significantly predict controlled motivation both at the within-person level (b = .12, p = .194) and at the between-person level (b = .30, p = .167) (Model 3a). Results also showed that ego-involving peerMC did not significantly predict controlled motivation at the within-person level (b = .09, p = .367), or at the between-person level (b = -.03, p = .695) (Model 2b). In addition, results showed that changes of task-involving peerMC over time did not significantly predict controlled motivation at the within-person level (b = .04, p = .723) and at the between-person level (b = .08, p = .289) (Model 3b).

Regarding burnout, results showed that sex (b = 4.38, p = .130), age (b = .37, p = .630) and individual sport (b = .26, p = .927) did not significantly predict burnout, so that there are no differences of burnout between women/men, younger/older people, and athletes in individual/collective sport. Moreover, task-involving peerMC significantly predicted lower burnout at the within-person level (b = -.17, p = .006) but not at the between-person level (b = -.12, p = .113) (Model 2a). In addition, results showed that changes of task-involving peerMC over time did not significantly predict burnout at the within-person level (b = -.07, p = .247) but significantly predicted burnout at the between-person level (b = -.14, p = .021) (Model 3a). This last result means that burnout decreased quicker over weeks for individuals who reported the higher levels of task-involving peerMC compared to those who reported the lower levels of task-involving peerMC over time. Moreover, ego-involving peerMC did not significantly predict burnout both at the within-person level (b = .07, p = .247) and at the between-person level (b = .16, p = .100) (Model 2b). In addition, results showed that the changes of ego-involving peerMC over time did not significantly predict burnout at the within-person level (b = .05, p = .419) and at the between-person level (b = -.01, p = .868) (Model 3b).

Regarding engagement, sex (b = -9.58, p = .003) significantly predicted engagement, but not age (b = .78, p = .360) and individual sport (b = -.34, p = .360), so that women reported lower engagement. Moreover, results showed that task-involving peerMC significantly predicted higher engagement at the within-person level (b = .17, p = .007), but not at the between-person level (b = .11, p = .217) (Model 2b). In addition, results showed that changes of task-involving peerMC over time did not significantly predicted engagement both at the within-person level (b = -.01, p = .895) and at the between-person level (b = .07, p = .206) (Model 3a). Results also showed that ego-involving peerMC did not significantly predicted engagement both at the within-person level (b = .06, p = .170) and at the between-person level (b = .11, p = .638) (Model 2b). In addition, results showed that change of task-involving peerMC over time did not significantly predict lower engagement both at the within-person level (b = .08, p = .297) and at the between-person level (b = -.05, p = .403) (Model 3b).

Motivation as a Mediator of the PeerMC - Burnout / Engagement Relationships

Finally, we tested whether autonomous (and controlled) motivation mediated the relationships between task (and ego) peerMC and burnout/engagement, after controlling for covariates. To separately examine these mediation effects at both between- and within-person level, we used Zhang and colleagues study's recommendations (2009) to appropriately test multilevel mediation and for differentiating within-group versus between-group effects in multilevel settings. The path a coefficients were displayed in Supplementary material Table S6 for autonomous motivation at the within- (Model 5a) and the between-person level (Model 5b), and for

controlled motivation at the within- (Model 5c) and the between-person level (Model 5d). The results of the test of path b (i.e., effects of autonomous/controlled motivation on burnout/engagement, controlling for task (ego) peerMC) are displayed in Model 4.

As can be seen in Table 3, autonomous motivation was confirmed as a mediator of the relationship between task-involving peerMC and burnout at the within-person level (b = -.10, 95% CI [-.17, -.05]), but not at the between-person level. Autonomous motivation was also a mediator of the relationship between task-involving peerMC and engagement at the within-person level (b = .16, 95% CI [.10, .24]), and at the between-person level (b = .17, 95% CI [.04, .30]). In addition, autonomous motivation was also confirmed as a mediator of the relationship between ego-involving peerMC and burnout (b = .04, 95% CI [.01, .09]), as well as between ego-involving peerMC and engagement (b = -.06, 95% CI [-.13, -.01]), at the within-person level, but not at the between-person level.

On the other hand, controlled motivation was not a mediator of the relationship between task-involving peerMC and burnout, and task-involving peerMC and engagement, both at the between- and at the within-person level. In the same vein, controlled motivation was not a mediator of the relationship between ego-involving peerMC and burnout, and ego-involving peerMC and engagement, both at the between-person level and at the within-person level.

Table 1. Synthesis of published articles examining both motivational climate (peer and/or coach) and SRWB indicators (i.e., subjective vitality, athlete engagement, and/or athlete burnout).

References	Social agent's motivational climate	Type of study	Outcome(s)
Alvarez et al. (2012)	Coach	Cross-sectional	Subjective Vitality
Curran et al. (2015)	Coach	Cross-sectional	Engagement
Isoard-Gautheur et al. (2013)	Coach	Between-subject prospective	Burnout
Ntoumanis et al. (2012)	Peer & Coach	Within and between-subject	Subjective Vitality and Burnout
Reinboth et al. (2004)	Team	Cross-sectional	Emotional and Physical Exhaustion
Reinboth & Duda (2006)	Team	Cross-sectional	Subjective Vitality
Smith et al. (2010)	Peer	Cross-sectional	Burnout
Vitali et al. (2015)	Coach	Cross-sectional	Burnout
Lemyre et al. (2008)	Coach	Between-subject prospective	Burnout

Table 2. Descriptive statistics and correlations matrix of study variables

		M	SD	ICC	1	2	3	4	5	6	7	8	9
1	Sex[a]	-	-	-	--	-0.25***	0.11	0.00	0.00	0.00	0.00	0.00	0.00
2	Age	3.45	1.89		-0.25***	--	-0.24***	0.00	0.01	0.01	0.00	0.00	0.00
3	Individual Sport	-	-	-	0.11	-0.24***	--	0.00	0.00	0.00	0.00	0.00	0.00
4	Autonomous Motivation	77.46	17.56	0.38	-0.34***	0.17**	0.17**	--	-0.15*	-0.36***	0.48***	0.37***	-0.14*
5	Controlled Motivation	41.55	32.07	0.60	-0.16**	0.09	-0.22***	0.02	--	0.13*	-0.21***	0.11	0.09
6	Burnout	40.22	17.23	0.31	0.20**	-0.04	0.00	-0.18**	0.33***	--	-0.56***	-0.17**	0.13*
7	Engagement	70.27	18.87	0.45	-0.33***	0.21***	-0.08	0.68***	-0.10	-0.50***	--	0.21***	-0.09
8	Peer Motivational Climate - Task	66.16	20.95	0.48	-0.20**	0.11	0.09	0.39***	0.17**	-0.18**	0.27***	--	-0.16**
9	Peer Motivational Climate - Ego	17.50	20.52	0.45	-0.22***	0.27***	-0.45***	-0.06	0.24***	0.13*	0.13*	-0.30***	--

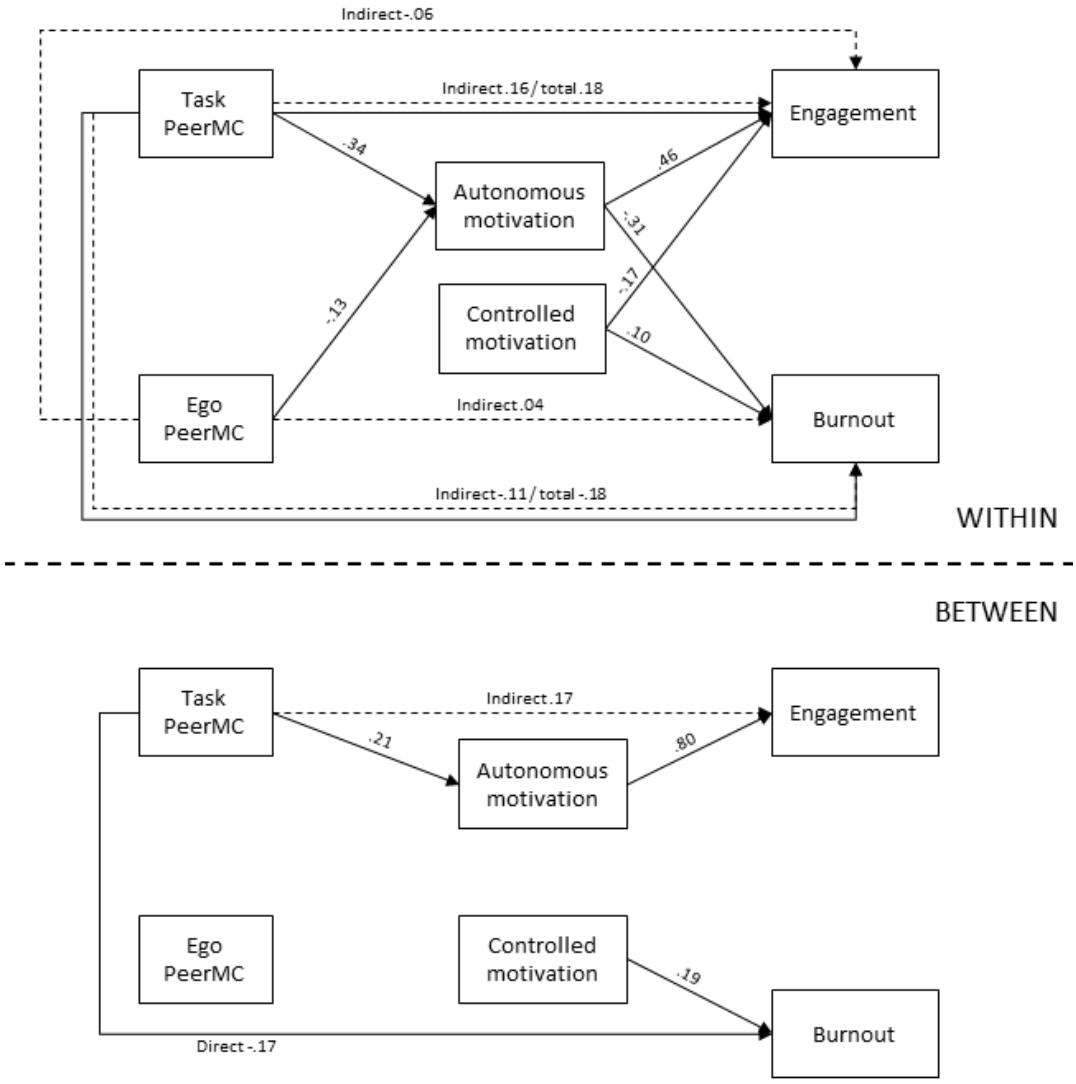
Note. Correlations below the diagonal are between-person level correlations (N = 72). Correlations above the diagonal are within-person level correlations (n = 365). * $p < .05$, ** $p < .01$, *** $p < .001$. M = Mean. SD = Standard Deviation. ICC = Intra-Class Coefficient, referring to percent of variance at the between-person level for the considered variable. [a]0 = Female, 1 = Male.

Table 3. Multilevel mediation results for burnout and engagement

				Burnout			Engagement		
Independant Variable	Mediator	*Within or Between level*	Effect	Estimate	95% CI lower	95% CI upper	Estimate	95% CI lower	95% CI upper
Task PMC	Autonomous	*Within level*	Indirect	**-.11**	**-.17**	**-.05**	**.16**	**.10**	**.24**
			Direct	-.07	-.19	.06	.02	-.09	.14
			Total	**-.18**	**-.31**	**-.05**	**.18**	**.06**	**.30**
		Between level	Indirect	-.03	-.10	.03	**.17**	**.04**	**.30**
			Direct	-.10	-.27	.06	-.02	-.16	.13
			Total	-.13	-.30	.03	.15	-.05	.33
Task PMC	Controlled	*Within level*	Indirect	.01	-.01	.04	-.02	-.06	.01
			Direct	**-.17**	**-.29**	**-.07**	**.19**	**.06**	**.30**
			Total	**-.16**	**-.28**	**-.05**	**.17**	**.03**	**.29**
		Between level	Indirect	.05	-.01	.13	-.03	-.08	.01
			Direct	**-.17**	**-.32**	**-.01**	.15	-.02	.32
			Total	-.12	-.28	.05	.12	-.06	.30
Ego PMC	Autonomous	*Within level*	Indirect	**.04**	**.01**	**.09**	**-.06**	**-.13**	**-.01**
			Direct	.02	-.09	.14	-.03	-.14	.09
			Total	.07	-.05	.19	-.09	-.21	.04
		Between level	Indirect	.01	-.02	.06	-.05	-.21	.10
			Direct	.16	-.03	.36	.08	-.09	.24
			Total	.17	-.03	.37	.03	-.21	.26
Ego PMC	Controlled	*Within level*	Indirect	.01	-.01	.04	-.02	-.05	.01
			Direct	.06	-.07	.18	-.06	-.18	.06
			Total	.07	-.06	.19	-.08	-.21	.05
		Between level	Indirect	.05	-.03	.14	-.03	-.10	.01
			Direct	.11	-.06	.29	.07	-.15	.29
			Total	.16	-.04	.36	.04	-.19	.27

Note. Results are significant if the 95% CIs do not include zero. PMC = Peer Motivational Climate.

Figure 1. Study results synthesis.



Note. Only significant relationships are represented. Solid lines represent direct or total effect and dotted lines represent indirect effect.

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DISCUSSION

The aim of the present study was to examine the relationships between peerMC and SRWB at the within and between individual level, and the mediational role of motivation in the peerMC - SRWB relationship. In doing so, we used linear mixed models' analysis to disaggregate levels of analysis. Results indicated that task-involving peerMC was related to autonomous motivation at the within and the between level, to burnout at the within and between level, and to engagement at the within level. Ego-involving peerMC was only related to the autonomous motivation at the within level. Moreover, autonomous motivation was a mediator of the task-involving peerMC – burnout and the ego-involving peerMC – burnout and engagement relationships at the within level, and of the task-involving peerMC – engagement relationship at the between level.

PeerMC and SRWB

In the sport context, ego-involving peerMC has consistently been positively related to burnout whereas task-involving peerMC has consistently been negatively related to burnout (Ntoumanis et al., 2012; Smith et al., 2010). In the present study, we formulated hypotheses regarding both the within and between individual level of analysis, that task (ego)-involving perceptions of peerMC would positively (negatively) relate to autonomous motivation and engagement and be negatively (positively) associated with controlled motivation and burnout.

In line with these hypotheses and past studies results, our results at the between level showed that the average level of perceived task-involving peerMC is positively related to the autonomous motivation level and negatively related to the burnout level. Specifically, the participants with the highest levels of perceived task-involving peerMC during the study were also those who report the highest level of autonomous motivation and the lowest levels of burnout, controlling for sex, age, and type of sport. The present study results also showed that changes of task-involving peerMC over time significantly predicted burnout at the between-person level. This last result means that burnout decreased quicker over weeks for individuals who reported the higher levels of task-involving peerMC compared to those who reported lower levels of task-involving peerMC time. These results corroborate those of Smith et al. (2010) and Ntoumanis et al. (2012), who found that a task-involving peerMC is negatively related to burnout and positively related to vitality. Taken together, these results indicate that a task-oriented motivational climate can promote SRWB among athletes. They also extend previous results by indicating that the temporal dynamics of the motivational climate predicts the weekly evolution of athlete burnout over one month.

In addition to these results, at the within level, our results have shown that on weeks when the perceived task-involving peerMC is higher than usual, participants reported higher levels of engagement and autonomous motivation, and lower levels of burnout. Our results have also shown that on weeks when the perceived ego-involving peerMC is higher than usual, participants

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reported lower levels of autonomous motivation. These results, following on from the previous ones, confirm the findings of Smith et al. (Smith et al., 2010) and Ntoumanis et al. (Ntoumanis et al., 2012) and extend them to the concept of engagement, by demonstrating that it is positively linked to the task-involving peerMC. In addition, unlike previous studies, our results looked at intra-individual variations in climate perception and its relationship to motivation and sport-related well-being and highlighted the importance of looking at weekly variations in motivational climate and their relationships to variations in motivation and SRWB.

Mediating influence of motivation on the peerMC-SRWB relationship

In the competitive sport context, Jõesaar et al. (Jõesaar et al., 2011) have demonstrated that task and ego-involving peerMC have an influence on persistence through basic needs satisfaction and intrinsic motivation. Moreover, Ruiz et al. (Ruiz et al., 2016) have shown that autonomous motivation is a mediator of the team task-involving motivational climate – functional emotions relationships, and that controlled motivation is a mediator of the team ego-involving motivational climate – dysfunctional emotions relationships. As a result, we hypothesize that motivation would mediates the relationship between peerMC and SRWB at both within and between individual levels. The present study results showed that the average level perceived task-involving peerMC is linked to the average level of autonomous motivation which in turn is linked to the average level of engagement. Complementary analysis, revealed the existence of an indirect only mediation effect (Zhao et al., 2010) of motivation on the task-involving peerMC – engagement relationship at the between level. This result suggests that the task-involving peerMC has a positive effect on engagement at the interpersonal level only through its effect on autonomous motivation, which in turn influences athlete's engagement. Moreover, at the within level of analysis, results of the present study showed that on weeks when the perceived task-involving peerMC is higher than usual – or when the ego-involving peerMC is lower than usual – participants reported higher level than usual of autonomous motivation which in turn was linked to lower levels of burnout and higher levels of engagement. Complementary analysis, revealed the existence of a complementary mediation effect (Zhao et al., 2010) of motivation on the task-involving peerMC – burnout and engagement relationships, and an indirect only mediation effect (Zhao et al., 2010) of motivation on the ego-involving peerMC – engagement relationship at the within level. In the continuation of Jõesaar's and Ruiz findings (Jõesaar et al., 2011; Ruiz et al., 2016), the results of the present study extend those of previous studies by highlighting the mediating role of motivation at both the within and between level on the peerMC - SRWB relationship. Autonomous motivation plays a central role in the relationship between the peerMC and SRWB, whether we are interested in the average levels of the variables reported

by individuals or the weekly fluctuations they report at the within level.

Taking in consideration the weekly fluctuations in the relationships between peerMC, motivation, and SRWB

Disaggregating within and between individual levels of analyses allows researchers to know if the observed relationships between variables exist only on short term within individual variations and/or on between individual differences. The results of the present study show that the relationships found both at the within and between levels are in the same direction and conform to the achievement goal theory (Ames, 1992; Nicholls, 1989) and previous studies (Jõesaar et al., 2011; Ntoumanis et al., 2012; Ruiz et al., 2016; Smith et al., 2010), in the sense that a task-oriented climate is positively related to autonomous motivation and engagement, and negatively related to controlled motivation and burnout. At the same time, a task-oriented climate is negatively related to autonomous motivation and engagement, and positively related to burnout. However, these relationships are not systematically found at both levels of analysis. Considering the between level, only the task climate seems to be related to autonomous motivation, engagement, and burnout. However, looking at the within level has made it possible to highlight in the present study that when participants perceive a higher task-involving peerMC and a lower ego-involving peerMC than usual, they have a higher level of autonomous motivation and engagement, and a lower level of burnout than usual. Moreover, autonomous motivation plays a mediating role in these relationships.

Limitations and future research

A first limitation of our study is that it focused on peerMC. However, there is evidence that coach and parent can also be predictors of important outcomes in competitive sport (Isoard-Gautheur et al., 2013; Waldron & Krane, 2005; White et al., 2004). An interesting question would be to examine the potentially negative effect of a discrepancy between the different climates created by different social agents (e.g., what happens if the parents create a climate involving the task while the coach and peers create a climate involving the ego).

A second limitation in the present study is the existence of complementary mediation effect (Zhao et al., 2010). According to Zhao et al. (Zhao et al., 2010), despite the mediator identified is consistent with hypothesized theoretical framework, a complementary mediation effect indicates that we tested an incomplete theoretical framework, and that we must consider the likelihood of an omitted mediator in the "direct" path. Indeed, several mediating variables may have impacted the relationship between climate and well-being outside of motivation. For example, Gustafsson and collaborator have identified that frustration with lack of results, lack of control, mood disturbances, and increased cortisol are possible early signs of burnout which can be influenced by the context, and therefore be considered as additional potential mediators

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to be taken into account (Gustafsson et al., 2011).

A third limitation is that this study lay on self-reported measure with single items. Social psychologists have long found that self-reported measures are vulnerable to several biases that may hinder their validity, particularly self-presentation (Baumeister, 1982), self-deception (Greenwald, 1988), and self-ignorance (Wilson et al., 1989) biases. To circumvent these biases, social psychologists have been searching for alternative ways to evaluate constructs of interest in their studies. It then seems appropriate in future studies to move towards more direct measures of sport related well-being (e.g., neurophysiological measures) that would allow to improve the identification of high levels well-being in the sport context.

Despite the aforementioned limitations, the present study makes a unique contribution to the literature by examining the relationships between peerMC and SRWB and testing the mediation influence of motivation between the peerMC and SRWB at both the between and within level of analysis. The present study thus allowed to highlight the temporal fluctuations in the perception of peerMC and SRWB over short periods of time and assumed mediation influence of motivation.

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Contributions

Contributed to conception and design: SIG, DT

Contributed to acquisition of data: SIG

Contributed to analysis and interpretation of data: SIG, CG

Drafted and/or revised the article: SIG, CG, DT

Approved the submitted version for publication: SIG, CG, DT

Declaration of interest

Authors have no competing interests to declare.

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Data and Supplementary Material Accessibility

Data and Supplementary Material are available at: www.osf.io/ osf.io/6k7s2/

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Table S1. Single item selection for all questionnaires

Questionnaires' dimensions	Item choosen for the single item version	Factor loading of the selected item (or mean for the item if multiple validation studies)	Range of factor loading of the other items of the dimension
Peer motivational climate: PeerMCYSQ (Ntoumanis & Vazou, 2005)			
Improvement	"Offer to help their teammates develop new skills"	.747	[.603 - .679]
Relatedness support	"Make their teammates feel accepted"	.713	[.637 - .706]
Effort	"Encourage their teammates to keep trying after they make a mistake"	.622	[.473 - .594]
Intra-team competition / Ability	"Try to do better than their teammates"	.673	[.410 - .609]
Intra-team conflict	"Make negative comments that put their teammates down"	.721	[.570 - .636]
Motivation: BRSQ (Lonsdale et al. 2008)			
External regulation	"Because I feel pressure from other people to play"	.873	[.820 - .850]
Introjected regulation	"Because I would feel guilty of I quit"	.883	[.770 - .840]
Identified regulation	"Because the benefits of sport are important to me"	.770	[.633 - .697]
Integrated regulation	"Because what I do in sport is an expression of who I am"	.743	[.665 - .693]
Intrinsic motivation	"Because I like it"	.895	[.730 - .850]
Engagement: AEQ (Lonsdale et al. 2007)			
Confidence	"I feel capable of success in my sport"	.827	[.710 - .810]
Dedication	"I am dedicated to achieving my goals in sport"	.830	[.707 - .817]
Vigor	"I feel energetic when I participate in my sport"	.850	[.663 - .837]
Enthusiasm	"I feel excited about my sport"	.850	[.723 - .800]
Burnout: ABQ (Isoard-Gautheur et al., 2010 ; Raedeke & Smith, 2001, 2008)			
Emotional/physical exhaustion	"I feel so tired form my training that I have trouble finding energy to do other things"	.83	[.76 - .83]
Reduced sense of accomplishment	"I feel successful in my sport"	.82	[.58 - .72]
Sport devaluation	"I don't care as much about my performance as I used to"	.68	[.63 - .68]

Table S2. Unstandardized estimates for linear mixed models predicting Task and Ego Peer Motivational Climate

	Task Peer Motivational Climate								**Ego Peer Motivational Climate**							
	Model 0				Model 1				Model 0				Model 1			
Predictors	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	65.09	1.97	61.23 – 68.94	**<0.001**	64.99	2.88	59.34 – 70.64	**<0.001**	17.05	1.83	13.46 – 20.63	**<0.001**	14.69	2.51	9.76 – 19.62	**<0.001**
Time					0.03	1.01	-1.94 – 2.00	0.976					0.98	0.85	-0.70 – 2.65	0.252
Random Effects																
Level 1 intercept variance	240.28				201.34				227.63				223.44			
Level 2 intercept variance	224.99				288.56				188.97				111.98			
Level 2 slope variance					25.71								1.74			
Akaike Information Criteria	2362.462				2362.916				2340.970				2343.489			
-2*log (lh)	-1178.231				-1175.458				-1167.485				-1165.744			
Pseudo R^2	0.4835691				0.5660013				0.4536041				0.463522			

Table S3. Unstandardized estimates for linear mixed models predicting autonomous motivation

	Model 0				**Model 1**				**Model 2a**			
Predictors	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	77.56	1.50	74.62 – 80.50	**<0.001**	76.66	2.34	72.07 – 81.25	**<0.001**	76.88	7.10	62.96 – 90.79	**<0.001**
Time					0.38	0.77	-1.13 – 1.89	0.625	0.34	0.71	-1.05 – 1.74	0.631
Sex									-7.95	2.75	-13.34 – -2.56	**0.004**
Age									0.75	0.73	-0.68 – 2.18	0.306
Indivual Sport									5.71	2.70	0.42 – 11.01	**0.034**
Task PMC - Between									0.21	0.08	0.06 – 0.36	**0.007**
Task PMC - Within									0.34	0.06	0.22 – 0.45	**<0.001**
Ego PMC - Between												
Ego PMC - Within												
Task PMC x Time - Between												
Task PMC x Time - Within												
Ego PMC x Time - Between												
Ego PMC x Time - Within												
Random Effects												
Level 1 intercept variance		190.33				190.00				161.44		
Level 2 intercept variance		115.51				103.86				118.21		
Level 2 slope variance						0.05				0.57		
AIC		2275.764				2281.456				2238.853		
log-Likelihood		-1134.882				-1134.728				-1108.427		
Pseudo R2		0.3776876				0.3790282				0.4764462		

Table S3. Unstandardized estimates for linear mixed models predicting autonomous motivation (continued)

	Model 2b				**Model 3a**				**Model 3b**			
Predictors	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	78.50	7.74	63.33 – 93.67	**<0.001**	77.48	7.00	63.77 – 91.20	**<0.001**	78.80	7.76	63.59 – 94.02	**<0.001**
Time	0.57	0.76	-0.92 – 2.05	0.456	0.23	0.71	-1.16 – 1.62	0.749	0.53	0.76	-0.96 – 2.02	0.485
Sex	-9.86	2.87	-15.50 – -4.23	**0.001**	-7.62	2.71	-12.93 – -2.32	**0.005**	-9.85	2.87	-15.47 – -4.23	**0.001**
Age	1.00	0.77	-0.51 – 2.50	0.194	0.59	0.72	-0.82 – 2.01	0.412	0.98	0.77	-0.53 – 2.48	0.204
Indivual Sport	5.41	3.12	-0.70 – 11.51	0.083	5.48	2.66	0.28 – 10.69	**0.039**	5.33	3.12	-0.78 – 11.43	0.087
Task PMC - Between					0.02	0.14	-0.25 – 0.30	0.878				
Task PMC - Within					0.10	0.16	-0.20 – 0.41	0.507				
Ego PMC - Between	-0.07	0.10	-0.26 – 0.13	0.504					-0.03	0.15	-0.33 – 0.27	0.851
Ego PMC - Within	-0.13	0.06	-0.26 – -0.00	**0.043**					-0.03	0.20	-0.43 – 0.37	0.871
Task PMC x Time - Between					0.07	0.05	-0.02 – 0.16	0.110				
Task PMC x Time - Within					0.09	0.06	-0.02 – 0.20	0.125				
Ego PMC x Time - Between									-0.01	0.05	-0.11 – 0.08	0.761
Ego PMC x Time - Within									-0.04	0.07	-0.18 – 0.11	0.622
Random Effects												
Level 1 intercept variance	184.34				159.16				184.39			
Level 2 intercept variance	83.56				121.17				85.62			
Level 2 slope variance	0.01				0.79				0.00			
AIC	2270.643				2237.970				2274.343			
log-Likelihood	-1124.321				-1105.985				-1124.171			
Pseudo R2	0.475698				0.4025455				0.4011277			

Table S4. Unstandardized estimates for linear mixed models predicting controlled motivation

	Model 0				**Model 1**				**Model 2a**			
Predictors	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	40.42	3.10	34.35 – 46.50	**<0.001**	41.57	4.16	33.42 – 49.73	**<0.001**	63.08	15.70	32.31 – 93.84	**<0.001**
Time					-0.46	1.21	-2.84 – 1.92	0.704	-0.47	1.18	-2.78 – 1.85	0.693
Sex									-4.24	6.20	-16.39 – 7.92	0.494
Age									0.83	1.61	-2.33 – 3.98	0.607
Indivual Sport									-11.46	6.11	-23.44 – 0.52	0.061
Task PMC - Between									0.28	0.17	-0.06 – 0.61	0.109
Task PMC - Within									0.12	0.09	-0.07 – 0.30	0.223
Ego PMC - Between												
Ego PMC - Within												
Task PMC x Time - Between												
Task PMC x Time - Within												
Ego PMC x Time - Between												
Ego PMC x Time - Within												
Random Effects												
Level 1 intercept variance		411.01				384.84				386.03		
Level 2 intercept variance		615.20				673.82				624.12		
Level 2 slope variance						17.34				12.08		
AIC		2530.988				2533.773				2540.404		
log-Likelihood		-1262.494				-1260.887				-1259.202		
Pseudo R2		0.5994891				0.6261331				0.6171905		

Table S4. Unstandardized estimates for linear mixed models predicting controlled motivation (continued)

Predictors	**Model 2b**				**Model 3a**				**Model 3b**			
(Intercept)	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
Time	56.26	16.57	23.79 – 88.74	**0.001**	63.44	15.74	32.59 – 94.28	**<0.001**	55.69	16.63	23.09 – 88.29	**0.001**
Sex	-0.55	1.21	-2.93 – 1.83	0.650	-0.50	1.18	-2.81 – 1.81	0.674	-0.52	1.20	-2.88 – 1.84	0.664
Age	-4.70	6.22	-16.89 – 7.50	0.451	-4.19	6.22	-16.38 – 7.99	0.500	-4.52	6.24	-16.74 – 7.71	0.469
Indivual Sport	0.84	1.62	-2.34 – 4.02	0.606	0.77	1.62	-2.41 – 3.94	0.636	0.85	1.63	-2.34 – 4.04	0.602
Task PMC - Between	-6.66	6.79	-19.97 – 6.65	0.327	-11.58	6.13	-23.59 – 0.43	0.059	-6.58	6.81	-19.94 – 6.78	0.334
Task PMC - Within					0.34	0.25	-0.15 – 0.84	0.176				
Ego PMC - Between					-0.10	0.26	-0.61 – 0.41	0.702				
Ego PMC - Within	0.30	0.22	-0.13 – 0.73	0.167					0.11	0.29	-0.46 – 0.67	0.713
Task PMC x Time - Between	0.12	0.09	-0.06 – 0.31	0.194					0.00	0.32	-0.62 – 0.63	0.989
Task PMC x Time - Within					-0.03	0.08	-0.18 – 0.12	0.695				
Ego PMC x Time - Between					0.09	0.10	-0.10 – 0.28	0.367				
Ego PMC x Time - Within									0.08	0.08	-0.07 – 0.23	0.289
Random Effects									0.04	0.12	-0.19 – 0.27	0.723
Level 1 intercept variance												
Level 2 intercept variance	375.23				384.57				375.73			
Level 2 slope variance	691.23				629.71				662.63			
AIC	19.03				11.27				16.45			
log-Likelihood	2540.813				2543.449				2543.670			
Pseudo R2	-1259.407				-1258.725				-1258.835			
Predictors	0.6201615				0.6314382				0.6318887			

Table S5. Unstandardized estimates for linear mixed models predicting burnout

	Model 0				Model 1				Model 2a				Model 2b			
Coeffcient	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	40.25	1.41	37.49 – 43.01	**<0.001**	41.20	2.78	35.76 – 46.64	**<0.001**	33.16	7.58	18.30 – 48.01	**<0.001**	28.59	7.80	13.30 – 43.89	**<0.001**
Time					-0.32	0.99	-2.26 – 1.62	0.749	-0.32	0.97	-2.22 – 1.58	0.741	-0.46	0.97	-2.35 – 1.44	0.637
Sex									4.38	2.89	-1.30 – 10.05	0.130	6.51	2.86	0.91 – 12.11	**0.023**
Age									0.37	0.76	-1.13 – 1.87	0.630	0.16	0.76	-1.34 – 1.65	0.838
Indivual Sport									0.26	2.84	-5.31 – 5.83	0.927	2.00	3.10	-4.07 – 8.07	0.518
Task PMC - Between									-0.12	0.08	-0.29 – 0.04	0.133				
Task PMC - Within									-0.17	0.06	-0.29 – -0.05	**0.006**				
Ego PMC - Between													0.16	0.10	-0.03 – 0.36	0.100
Ego PMC - Within													0.07	0.06	-0.05 – 0.19	0.243
Task PMC x Time - Betw.																
Task PMC x Time - With.																
Ego PMC x Time - Betw.																
Ego PMC x Time - With.																
Autonomous Mot. - Betw.																
Autonomous Mot. - With.																
Controlled Mot. - Betw.																
Controlled Mot. - With.																
Random Effects																
Level 1 intercept variance			203.17				142.19				135.46				143.22	
Level 2 intercept variance			91.69				339.96				339.93				282.61	
Level 2 slope variance							37.58				36.32				34.10	
AIC			2278.928				2268.739				2266.049				2271.024	
log-Likelihood			-1136.464				-1128.369				-1122.025				-1124.512	
Pseudo R^2			0.3109711				0.515559				0.5401498				0.5371368	

Table S5. Unstandardized estimates for linear mixed models predicting burnout (continued)

	Model 3a				Model 3b				Model 4a			
Coeffcient	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	32.52	7.48	17.86 – 47.18	**<0.001**	28.73	7.83	13.37 – 44.08	**<0.001**	33.10	7.49	18.41 – 47.79	**<0.001**
Time	-0.26	0.94	-2.09 – 1.58	0.784	-0.46	0.97	-2.36 – 1.43	0.632	-0.25	0.92	-2.05 – 1.54	0.782
Sex	4.14	2.86	-1.47 – 9.75	0.148	6.53	2.86	0.93 – 12.12	**0.022**	3.30	3.03	-2.64 – 9.23	0.276
Age	0.53	0.76	-0.95 – 2.02	0.481	0.14	0.76	-1.35 – 1.63	0.854	0.46	0.76	-1.03 – 1.96	0.544
Indivual Sport	0.46	2.81	-5.05 – 5.96	0.871	1.94	3.10	-4.14 – 8.02	0.531	0.98	2.90	-4.70 – 6.67	0.735
Task PMC - Between	0.21	0.16	-0.11 – 0.53	0.201					-0.10	0.09	-0.27 – 0.07	0.240
Task PMC - Within	0.01	0.16	-0.30 – 0.32	0.942					-0.07	0.06	-0.19 – 0.05	0.266
Ego PMC - Between					0.05	0.18	-0.30 – 0.39	0.783				
Ego PMC - Within					0.10	0.21	-0.30 – 0.51	0.626				
Task PMC x Time - Betw.	-0.14	0.06	-0.25 – -0.02	**0.021**								
Task PMC x Time - With.	-0.07	0.06	-0.19 – 0.05	0.247								
Ego PMC x Time - Betw.					0.05	0.06	-0.07 – 0.17	0.419				
Ego PMC x Time - With.					-0.01	0.07	-0.16 – 0.13	0.868				
Autonomous Mot. - Betw.									-0.12	0.12	-0.36 – 0.11	0.296
Autonomous Mot. - With.									-0.31	0.07	-0.45 – -0.18	**<0.001**
Controlled Mot. - Betw.												
Controlled Mot. - With.												
Random Effects												
Level 1 intercept variance	135.41				143.18				122.69			
Level 2 intercept variance	306.12				279.94				323.15			
Level 2 slope variance	32.00				33.57				32.06			
AIC	2263.527				2274.313				2248.630			
log-Likelihood	-1118.764				-1124.157				-1111.315			
Pseudo R^2	0.5122924				0.5128784				0.5797672			

Table S5. Unstandardized estimates for linear mixed models predicting burnout (continued)

	Model 4b				Model 4c				Model 4d			
Coeffcient	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	27.95	7.06	14.11 – 41.80	**<0.001**	29.24	7.74	14.08 – 44.40	**<0.001**	24.88	7.33	10.50 – 39.25	**0.001**
Time	-0.32	0.96	-2.21 – 1.57	0.741	-0.32	0.91	-2.10 – 1.47	0.727	-0.44	0.97	-2.34 – 1.46	0.649
Sex	5.71	2.66	0.50 – 10.91	**0.032**	4.70	3.04	-1.26 – 10.66	0.122	7.77	2.68	2.52 – 13.01	**0.004**
Age	0.35	0.70	-1.02 – 1.72	0.617	0.24	0.76	-1.26 – 1.73	0.754	0.21	0.71	-1.18 – 1.60	0.766
Indivual Sport	2.47	2.66	-2.75 – 7.68	0.353	2.84	3.13	-3.30 – 8.99	0.364	3.13	2.90	-2.56 – 8.81	0.281
Task PMC - Between	-0.17	0.08	-0.32 – -0.02	**0.029**								
Task PMC - Within	-0.17	0.06	-0.29 – -0.05	**0.004**								
Ego PMC - Between					0.16	0.10	-0.04 – 0.35	0.108	0.11	0.09	-0.07 – 0.29	0.237
Ego PMC - Within					0.03	0.06	-0.09 – 0.14	0.664	0.06	0.06	-0.06 – 0.18	0.344
Task PMC x Time - Betw.												
Task PMC x Time - With.												
Ego PMC x Time - Betw.												
Ego PMC x Time - With.												
Autonomous Mot. - Betw.					-0.14	0.11	-0.37 – 0.08	0.211				
Autonomous Mot. - With.					-0.34	0.06	-0.46 – -0.21	**<0.001**				
Controlled Mot. - Betw.	0.19	0.05	0.09 – 0.28	**<0.001**					0.17	0.05	0.07 – 0.26	**0.001**
Controlled Mot. - With.	0.10	0.05	0.01 – 0.19	**0.027**					0.09	0.05	-0.00 – 0.18	0.062
Random Effects												
Level 1 intercept variance	131.51				125.11				139.61			
Level 2 intercept variance	294.29				294.26				241.63			
Level 2 slope variance	36.54				30.44				35.08			
AIC	2251.931				2248.362				2261.157			
log-Likelihood	-1112.965				-1111.181				-1117.579			
Pseudo R^2	0.5531189				0.5699416				0.5283339			

Table S6. Unstandardized estimates for linear mixed models predicting engagement

	Model 0				Model 1				Model 2a				Model 2b			
Coeffcient	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	70.25	1.70	66.93 – 73.57	**<0.001**	68.25	2.54	63.27 – 73.22	**<0.001**	79.82	8.30	63.54 – 96.09	**<0.001**	79.89	8.30	63.63 – 96.16	**<0.001**
Time					0.83	0.88	-0.90 – 2.55	0.349	0.87	0.83	-0.75 – 2.50	0.291	0.83	0.82	-0.78 – 2.45	0.313
Sex									-9.58	3.26	-15.97 – -3.19	**0.003**	-9.44	3.26	-15.83 – -3.05	**0.004**
Age									0.78	0.86	-0.90 – 2.47	0.360	0.75	0.86	-0.94 – 2.43	0.386
Indivual Sport									-0.34	3.21	-6.63 – 5.94	0.914	-0.38	3.20	-6.66 – 5.91	0.907
Task PMC - Between									0.11	0.09	-0.07 – 0.29	0.217	-0.03	0.15	-0.31 – 0.26	0.845
Task PMC - Within									0.17	0.06	0.05 – 0.30	**0.007**	0.19	0.17	-0.14 – 0.52	0.268
Task PMC x Time - Betw.													0.07	0.05	-0.04 – 0.17	0.206
Task PMC x Time - With.													-0.01	0.06	-0.14 – 0.12	0.895
Ego PMC - Between																
Ego PMC - Within																
Ego PMC x Time - Betw.																
Ego PMC x Time - With.																
Autonomous Mot. - Betw.																
Autonomous Mot. - With.																
Controlled Mot. - Betw.																
Controlled Mot. - With.																
Random Effects																
Level 1 intercept variance		200.22				174.41				175.51				175.22		
Level 2 intercept variance		160.63				195.72				113.46				112.17		
Level 2 slope variance						15.45				9.16				8.43		
AIC		2304.408				2305.252				2294.620				2297.020		
log-Likelihood		-1149.204				-1146.626				-1136.310				-1135.510		
Pseudo R^2		0,4451				0,5160				0,5169				0,5176		

Table S6. Unstandardized estimates for linear mixed models predicting engagement (continued)

	Model 3a				Model 3b				Model 4a			
Coeffcient	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	78.67	8.72	61.57 – 95.76	**<0.001**	77.94	8.74	60.81 – 95.06	**<0.001**	78.73	6.42	66.13 – 91.32	**<0.001**
Time	0.98	0.87	-0.72 – 2.68	0.260	1.05	0.87	-0.65 – 2.75	0.226	0.71	0.73	-0.72 – 2.13	0.332
Sex	-10.40	3.26	-16.80 – -4.00	**0.001**	-10.50	3.26	-16.88 – -4.11	**0.001**	-2.00	2.64	-7.17 – 3.17	0.449
Age	0.76	0.86	-0.93 – 2.46	0.376	0.84	0.86	-0.86 – 2.53	**0.333**	0.20	0.67	-1.11 – 1.50	0.768
Indivual Sport	0.97	3.55	-5.99 – 7.94	0.784	1.20	3.55	-5.76 – 8.16	0.735	-5.23	2.52	-10.16 – -0.29	**0.038**
Task PMC - Between									-0.02	0.07	-0.16 – 0.13	0.816
Task PMC - Within									0.02	0.06	-0.10 – 0.14	0.688
Task PMC x Time - Betw.												
Task PMC x Time - With.												
Ego PMC - Between	0.05	0.11	-0.17 – 0.28	0.638	0.13	0.16	-0.17 – 0.44	0.394				
Ego PMC - Within	-0.09	0.06	-0.22 – 0.04	0.170	-0.29	0.21	-0.70 – 0.12	0.165				
Ego PMC x Time - Betw.					-0.05	0.05	-0.15 – 0.06	0.403				
Ego PMC x Time - With.					0.08	0.08	-0.07 – 0.23	0.297				
Autonomous Mot. - Betw.									0.80	0.10	0.59 – 1.00	**<0.001**
Autonomous Mot. - With.									0.46	0.07	0.33 – 0.60	**<0.001**
Controlled Mot. - Betw.												
Controlled Mot. - With.												
Random Effects												
Level 1 intercept variance	175.64				174.38				139.85			
Level 2 intercept variance	110.15				108.83				77.70			
Level 2 slope variance	13.27				13.00				6.46			
AIC	2300.854				2302.875				2212.169			
log-Likelihood	-1139.427				-1138.438				-1093.084			
Pseudo R^2	0,5245				0,5264				0,6110			

Table S6. Unstandardized estimates for linear mixed models predicting engagement (continued)

	Model 4b				Model 4c				Model 4d			
Coeffcient	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estimates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	81.59	8.26	65.41 – 97.77	**<0.001**	76.76	6.65	63.72 – 89.80	**<0.001**	79.76	8.67	62.77 – 96.75	**<0.001**
Time	0.78	0.83	-0.85 – 2.42	0.347	0.73	0.73	-0.71 – 2.17	0.318	0.87	0.88	-0.86 – 2.60	0.323
Sex	-9.65	3.20	-15.93 – -3.37	**0.003**	-1.69	2.65	-6.88 – 3.50	0.523	-10.51	3.23	-16.85 – -4.17	**0.001**
Age	0.84	0.84	-0.80 – 2.48	0.316	0.08	0.67	-1.22 – 1.39	0.899	0.81	0.85	-0.86 – 2.47	0.344
Indivual Sport	-1.44	3.22	-7.74 – 4.86	0.654	-4.01	2.72	-9.35 – 1.33	0.141	0.41	3.53	-6.51 – 7.32	0.909
Task PMC - Between	0.15	0.09	-0.03 – 0.33	0.107								
Task PMC - Within	0.19	0.06	0.06 – 0.31	**0.003**								
Task PMC x Time - Betw.												
Task PMC x Time - With.												
Ego PMC - Between					0.09	0.09	-0.08 – 0.26	0.308	0.08	0.11	-0.15 – 0.30	0.503
Ego PMC - Within					-0.03	0.06	-0.14 – 0.08	0.591	-0.06	0.06	-0.19 – 0.06	0.310
Ego PMC x Time - Betw.												
Ego PMC x Time - With.												
Autonomous Mot. - Betw.					0.79	0.10	0.60 – 0.99	**<0.001**				
Autonomous Mot. - With.					0.47	0.06	0.34 – 0.59	**<0.001**				
Controlled Mot. - Betw.	-0.10	0.06	-0.21 – 0.02	0.098					-0.09	0.06	-0.21 – 0.03	0.141
Controlled Mot. - With.	-0.17	0.05	-0.26 – -0.08	**<0.001**					-0.16	0.05	-0.25 – -0.06	**0.001**
Random Effects												
Level 1 intercept variance	158.64				139.69				159.57			
Level 2 intercept variance	141.31				70.38				140.56			
Level 2 slope variance	13.40				6.79				18.30			
AIC	2283.327				2211.116				2292.604			
log-Likelihood	-1128.664				-1092.558				-1133.302			
Pseudo R^2	0,5589				0,6115				0,5660			

Table S7. Unstandardized estimates for linear mixed models predicting autonomous and controlled motivation for mediation analyses

	Autonomous Motivation - Within-Person Level								**Autonomous Motivation - Between-Person Level**							
	Model 5a				Model 5b				Model 5c				Model 5d			
Coeffcient	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	-0.64	3.76	-8.02 – 6.73	0.864	-1.15	3.98	-8.96 – 6.65	0.772	6.33	2.96	0.51 – 12.14	**0.033**	8.79	3.42	2.09 – 15.49	**0.010**
Time	0.32	0.60	-0.85 – 1.50	0.590	0.48	0.68	-0.85 – 1.81	0.480	0.00	0.00	-0.00 – 0.00	1.000	0.00	0.00	-0.00 – 0.00	1.000
Sex	-0.04	1.38	-2.74 – 2.66	0.977	-0.04	1.44	-2.87 – 2.78	0.975	-10.22	1.46	-13.08 – -7.37	**<0.001**	-11.48	1.50	-14.42 – -8.54	**<0.001**
Age	-0.02	0.37	-0.76 – 0.71	0.953	-0.01	0.39	-0.78 – 0.76	0.984	0.00	0.00	-0.00 – 0.00	1.000	0.00	0.00	-0.00 – 0.00	1.000
Indivual Sport	-0.00	1.36	-2.67 – 2.66	0.998	0.05	1.42	-2.73 – 2.83	0.974	5.69	1.44	2.87 – 8.52	**<0.001**	5.07	1.67	1.79 – 8.34	**0.002**
Task PMC - Within	0.32	0.05	0.23 – 0.42	**<0.001**												
Ego PMC - Within					-0.13	0.05	-0.24 – -0.02	**0.016**								
Task PMC - Between									0.15	0.04	0.08 – 0.23	**<0.001**				
Ego PMC - Between													-0.05	0.05	-0.16 – 0.05	0.334
Random Effects																
Level 1 intercept variance	116.69				126.83				0.00				0.00			
Level 2 intercept variance	4.55				31.60				38.88				40.97			
Level 2 slope variance	0.77				5.41				0.00				0.00			
AIC	2073.462				2106.776				-2030.075				-2277.880			
log-Likelihood	-1026.731				-1043.388				1025.037				1148.940			
Pseudo R^2	0.1455494[a]				0.07102458[a]				0.5250559[b]				0.4674571[b]			

Table S7. Unstandardized estimates for linear mixed models predicting autonomous and controlled motivation for mediation analyses (continued)

	Controlled Motivation - Within-Person Level								**Controlled Motivation - Between-Person Level**							
	Model 5a				Model 5b				Model 5c				Model 5d			
Coeffcient	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*	*Estim-ates*	*Std. Deviation*	*Conf. Int (95%)*	*P-Value*
(Intercept)	1.81	5.81	-9.57 – 13.19	0.755	2.10	5.78	-9.24 – 13.43	0.717	25.19	6.47	12.52 – 37.87	**<0.001**	16.56	7.26	2.33 – 30.79	**0.023**
Time	-0.71	1.11	-2.89 – 1.47	0.525	-0.84	1.14	-3.07 – 1.40	0.462	-0.00	0.00	-0.00 – 0.00	0.973	0.00	0.00	-0.00 – 0.00	1.000
Sex	-0.12	2.04	-4.12 – 3.89	0.953	-0.12	2.02	-4.08 – 3.83	0.952	-5.17	3.18	-11.40 – 1.06	0.104	-4.95	3.18	-11.19 – 1.29	0.120
Age	0.01	0.56	-1.08 – 1.10	0.983	0.01	0.55	-1.06 – 1.09	0.980	-0.00	0.00	-0.00 – 0.00	0.996	0.00	0.00	-0.00 – 0.00	1.000
Indivual Sport	0.06	2.01	-3.88 – 4.01	0.974	0.09	1.99	-3.81 – 3.98	0.966	-11.89	3.14	-18.05 – -5.73	**<0.001**	-6.72	3.54	-13.67 – 0.22	0.058
Task PMC - Within	0.11	0.08	-0.05 – 0.27	0.166												
Ego PMC - Within					0.16	0.08	0.00 – 0.31	**0.049**								
Task PMC - Between									0.25	0.09	0.08 – 0.42	**0.003**				
Ego PMC - Between													0.35	0.11	0.12 – 0.57	**0.002**
Random Effects																
Level 1 intercept variance	252.93				246.08				0.00				0.00			
Level 2 intercept variance	203.68				239.34				185.41				184.61			
Level 2 slope variance	34.33				40.23				0.00				0.00			
AIC	2315.304				2313.373				-648.119				-1918.696			
log-Likelihood	-1147.652				-1146.687				334.060				969.348			
Pseudo R^2	0.1517107[a]				0.1810328[a]				0.2498408[b]				0.2816234[b]			