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A daily diary study of interpersonal emotion regulation, the social environment, and team performance among university athletes

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A B S T R A C T

Interpersonal emotion regulation (IER) refers to social interactions that are intended to improve or worsen the emotions of others (Niven et al., 2011), and IER has been associated with emotional and motivational outcomes for athletes (Tamminen et al., 2016). Qualitative findings suggest IER among teammates is associated with performance, and that it is also important to consider IER interactions within the context of athletes' social environment (Campo et al., 2017; Palmateer & Tamminen, 2018). The purpose of this research was to quantitatively examine these proposed associations among a sample of 59 university team sport athletes over a 10-day period. Athletes completed measures of perceived esteem support (Freeman & Rees, 2009) and social cohesion (Eys et al., 2009), and they rated the extent to which they provided and received affect-improving or affect-worsening IER with teammates in the days prior to and following a competition. Piecewise multilevel models were used to model changes in IER before and after competition. Overall, athletes' engagement in affect-worsening IER decreased in the days before competition, while providing and receiving affect-improving IER decreased in the days following competition. Esteem support moderated some of these trajectories of IER, and there were interactions between esteem support and competition outcome on the trajectories of IER: more supported athletes reported providing and receiving more affect-worsening IER before a loss. Esteem support and affect-worsening IER also interacted to predict the team's competition outcome: among athletes who perceived more esteem support, decreases in the receipt of affect-worsening IER in the days before competition was predictive of the team winning their competition. Social cohesion did not moderate any of the associations between IER, time, and performance outcome. These results suggest that athletes' daily IER exchanges among teammates and their perceptions of esteem support have implications for team performance.

1. Introduction

It is well-established that athletes' experiences and performances in sport are influenced by emotions (Nicholls, Perry, & Calmeiro, 2014; Robazza, Pellizzari, Bertollo, & Hanin, 2008), and how emotions are regulated (e.g., Balk, Adriaanse, De Ridder, & Evers, 2013; Martinent, Ledos, Ferrand, Campo, & Nicolas, 2015; Robazza, Pellizzari, & Hanin, 2004). Historically, researchers in sport psychology have adopted intrapersonal perspectives to understand athletes' emotional experiences and how emotion regulation impacts their own preparation and performance in sport (Friesen, Lane, et al., 2013; Tamminen & Gaudreau, 2014). However, there has recently been an emergence of studies documenting the social or interpersonal aspects of emotion and emotion regulation; for example, researchers have documented the ways that athletes perceive their emotions are influenced by others (e.g., Friesen, Devonport, Sellars, & Lane, 2015; Tamminen, Palmateer, et al., 2016; Wolf, Harenberg, Tamminen, & Schmitz, 2018) and the ways that athletes attempt to regulate the emotions of their teammates (e.g., Friesen, Devonport, Sellars, & Lane, 2013; Palmateer & Tamminen, 2018; Tamminen & Crocker, 2013). Several important questions remain to be answered in this research area regarding the associations between IER and team performance, the patterns of interpersonal emotion regulation among athletes over time, and the influence of the social environment on IER among athletes. The present study was designed to address these gaps in the literature.

The recent 'interpersonal turn' in the study of emotions in sport has produced a flourishing body of research examining athletes' emotional expressions and their impacts in groups and teams (Friesen, Devonport, et al., 2013; Moll, Jordet, & Pepping, 2010; van Kleef, Cheshin, Koning, & Wolf, 2019), the social norms surrounding emotion expressions in sport (Gallmeier, 1987; Tamminen & Crocker, 2013; Tamminen, Palmateer, et al., 2016; Wong, Steinfeldt, LaFollette, & Tsao, 2011), and

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experiences of collective and group-based emotions as a function of athletes' social identity and connection to their team (Campo et al., 2019; Tamminen, Palmateer, et al., 2016). For example, team sport athletes have indicated that, prior to competing, they perceive interactions with teammates to influence their own cognitions, emotions, and motivation for competition (Wolf et al., 2018). Additional qualitative research among individual and team sport athletes suggests that emotions serve multiple functions in sport contexts, including impacting team functioning and performance, communicating team values and commitment, promoting communal coping to deal with stressors collectively, and signalling affiliation or distancing among teammates (Tamminen, Palmateer, et al., 2016). Furthermore, athletes have reported that they use their teammates' emotional expressions as signals to inform decisions about how and when to regulate their teammates' emotions (Friesen, Devonport, et al., 2013). Thus, there is a growing body of research supporting the idea that emotions serve social functions in sport and that emotions act as cues to guide interactions between athletes, including the regulation of one another's emotions.

Concurrently, researchers have examined the ways that athletes attempt to regulate the emotions of their teammates (Campo et al., 2017; Friesen et al., 2015; Palmateer & Tamminen, 2018; Tamminen & Crocker, 2013; Tamminen, Gaudreau, McEwen, & Crocker, 2016; Tamminen, Palmateer, et al., 2016). Interpersonal emotion regulation (IER) refers to deliberate attempts to influence the emotions of another person (Friesen, Lane, et al., 2013; Niven, 2017). To date, qualitative findings suggest that athletes use a variety of strategies to try and regulate the emotions of their teammates. For example, findings from two case studies among high-performance curlers (Tamminen & Crocker, 2013), and volleyball players (Palmateer & Tamminen, 2018) indicated that the athletes attempted to regulate their teammates' emotions by providing verbal and positive feedback to teammates, using humour, cueing teammates about their emotions, using non-verbal strategies (e.g., high-fives, hugging a teammate), and by engaging in indirect actions to protect teammates from potential stressors and resultant negative emotions. Another study consisting of interviews with 16 professional ice hockey players classified athletes' and coaches' IER strategies according to verbal and behavioural dimensions that included the use of humour, distraction, goal setting, and positive appraisals (Friesen et al., 2015). Athletes in this study also described several examples of IER strategies intended to worsen a teammate's emotions, such as ignoring teammates (e.g., 'silent treatment'), using threats or punishments, and pointing out performance problems to embarrass them (e.g., 'calling out athletes')(Friesen et al., 2015). A further perspective offered by Campo et al. (2017) adopted Gross' process model of emotion regulation (Butler & Gross, 2009; Gross, 1998) to examine IER among 22 male rugby players. The athletes reported regulating their teammates' emotions by engaging in extrinsic situation selection (e.g., relieving pressure on a teammate), situation modification (e.g., providing instructions to teammates), attentional deployment (e.g., joking with teammates to distract them), cognitive change (e.g., listening to teammates' explanations about a situation; reappraisal), and extrinsic response modulation (e.g., teammates telling one another to suppress their emotions). Collectively, these studies represent an accumulating body of research and various theoretical perspectives that describe a number of strategies athletes use to try and regulate the emotions of their teammates.

There is further evidence from quantitative research among adolescent athletes that IER is associated with enjoyment and commitment in sport (Tamminen, Gaudreau, et al., 2016). To assess athletes' reports of IER with their teammates, researchers have relied on Niven et al. (2011) framework that distinguishes between strategies that are intended to improve or worsen one's own affect and actions to influence the affect of others (e.g, self-improving or other-improving IER and self-worsening or other-worsening IER). Using this approach, Tamminen, Gaudreau, et al. (2016) surveyed 451 competitive adolescent athletes across a range of team sports and found that, at the individual level, athletes' affect-worsening IER toward their teammates was negatively associated with their own sport enjoyment, while greater affect-improving IER was positively associated with greater sport enjoyment and commitment. However, despite this initial research exploring associations between athletes' IER use and their own sport enjoyment and commitment, there is limited research evidence regarding the association between athletes' IER and team performance. Although there are qualitative studies suggesting that athletes perceive IER is important for influencing teammates' precompetitive states and competitive outcomes (e.g., Tamminen & Crocker, 2013; Wolf et al., 2018), it is not known whether the efforts of athletes to regulate their teammates' emotions are actually associated with performance outcomes. Thus, one important objective for advancing the literature is to examine whether IER is associated with team performance in sport.

Findings from previous qualitative studies of IER in sport have also outlined several factors pertaining to the social environment that may moderate the relationship between IER and performance. Across several qualitative studies, athletes have reported that their IER interactions with teammates are influenced by the quality of their relationships with teammates and the social environment within the sport context (e.g., Friesen et al., 2015; Palmateer & Tamminen, 2018; Tamminen & Crocker, 2013; Wolf et al., 2018). For example, athletes perceived team cohesion and the feeling of being unified and harmonious as an important factor influencing their precompetitive state (Wolf et al., 2018), and athletes have indicated that team dynamics and cohesion are associated with interpersonal emotion regulation interactions between teammates (Tamminen & Crocker, 2013). Tamminen, Gaudreau, et al. (2016) also provided support for this idea, as adolescent athletes' perceptions of the team climate were associated with their use of affect-improving and affect-worsening IER strategies toward teammates. Based on the growing body of evidence suggesting that athletes' perceptions of the social environment may influence IER strategy use, we sought to test this association by examining whether athletes' perceptions of their social environment moderated the association between IER and performance.

To examine athletes' perceptions of their social environment within their teams, we chose to use measures of perceived esteem support (Freeman, Coffee, & Rees, 2011) and perceived social cohesion (Carron, Widmeyer, & Brawley, 1985) as potential moderators of the relationship between IER and performance. Social support is considered to have some conceptual overlap with IER although they are distinct constructs (Dixon-Gordon, Bernecker, & Christensen, 2015). A key distinguishing feature is that IER is specifically aimed at influencing another person's emotions, whereas social support may or may not be directly targeted at influencing the emotions of another person; additionally, IER efforts may be aimed at improving or worsening the emotions of another person (Dixon-Gordon et al., 2015). Perceived esteem support is operationalized as positive support offered as encouragement and praise, and refers to perceptions that another person would enhance one's self esteem, provide a boost of confidence, or instill confidence to deal with pressure (Freeman et al., 2011). Esteem support has been associated with a number of positive outcomes for athletes, including improved performance, self-confidence, and lower levels of burnout (Freeman et al., 2011; Freeman & Rees, 2009; Rees & Freeman, 2007), and this form of support has been suggested to be "the key perceived available support dimension predicting performance" (Freeman & Rees, 2009, p. 436).

Team cohesion is commonly broken down into two main components, task cohesion and social cohesion, which have been associated with a variety of positive outcomes among athletes, including competition appraisals, sport satisfaction, motivation, and performance outcomes (Carron, Brawley, & Widmeyer, 1998; Martin, Paradis, Eys, & Evans, 2013). Social cohesion reflects the degree to which athletes perceive their team is integrated as a social unit (i.e., group integration – social) and their perceptions regarding their ties with team members (i.e., individual attraction to the group – social)(Carron et al., 1985).

We focused on social cohesion as we were seeking indicators of the social environment and the quality of social relationships with teammates, as these opportunities for social support and social engagement can subsequently influence individual and group outcomes (Berkman, Glass, Brissette, & Seeman, 2000). Therefore, it may be expected that esteem support and social cohesion would moderate the association between IER with their teammates and performance outcomes.

Another important topic for advancing research on IER in sport is to examine the provision and receipt of IER among athletes. While there are no studies to date that have explicitly examined this issue, there is some qualitative evidence indicating that athletes are aware of their teammates' efforts to regulate their emotions. For example, findings from a case study among a team of volleyball athletes indicated that athletes were aware of their teammates providing encouragement and positive feedback to regulate their emotions, and athletes also described situations where their teammates cued or reminded them about their emotional state during competition (Palmateer & Tamminen, 2018). Wolf et al. (2018) also reported that athletes perceived their pre-competitive states were influenced by the communication, social support, and practice or warm-up performances of their teammates. There is additional evidence of athletes reporting their emotions being influenced by the IER efforts of their coaches (Braun & Tamminen, 2019). Despite these qualitative findings, there are no quantitative studies to date that have examined athletes' perceptions of having their emotions regulated by their teammates. Asking athletes about the receipt of IER from their teammates is important, as efforts to regulate someone's emotions may not be interpreted or received as such by the recipient, and individuals may have negative reactions to supportive interactions (Barrera & Baca, 1990). For example, Palmateer and Tamminen (2018) reported that some athletes preferred not to have teammates draw attention to their emotions and that they preferred to manage their emotions on their own. Thus, we sought to examine the extent to which athletes reported they were the recipient of IER efforts from their teammates, in addition to their reports of regulating others' emotions.

A final issue we aimed to address in order to advance research on IER in sport was to examine patterns of IER among teammates over time. Previous quantitative research has adopted a cross-sectional approach to examine associations between IER with athlete enjoyment and commitment (e.g., Tamminen, Gaudreau, et al., 2016), and only two qualitative studies to date have adopted longitudinal designs to investigate IER (Braun & Tamminen, 2019; Tamminen & Crocker, 2013). There is limited research that has examined IER over time and across different contexts (e.g., practices and competition); thus, in the present study we sought to explore the trajectories of athletes' provided and received IER over a 10-day period before and after competition.

Overall, there is compelling research evidence that athletes engage in various strategies to regulate their own emotions and the emotions of their teammates, and athletes perceive that these interpersonal interactions have consequences for performance outcomes. Given that emotions and emotion regulation have been shown to influence performance in sport from an intrapersonal perspective, we sought to extend this research by examining the association between IER and team performance. We also sought to determine whether trajectories of IER prior to competition predicted the team's eventual success or failure (win/loss), and whether trajectories of IER were moderated by the team's success in competition. Furthermore, to address the question of whether athletes' perceptions of the social environment influence these associations, we examined whether trajectories of providing or receiving IER were moderated by the athletes' perceptions of esteem support and social cohesion. Those participants who reported higher levels of social cohesion and esteem social support were expected to report more affect-improving and less affect-worsening IER from teammates than participants who reported lower levels of social cohesion and esteem social support.

2. Method

2.1. Participants and procedure

Participants were 59 athletes (52.54% female, 45.70% male, 1.7% transgender; M_{age} = 20.15 years, SD = 1.91) from 6 teams representing various university team sports: men's hockey (n = 10), women's hockey (n = 9), women's field hockey (n = 15), men's volleyball (n = 7), men's basketball (n = 6), and women's basketball (n = 12). Athletes had an average of 10.24 years (SD = 4.86) of sport experience and had competed on their current team for an average of 2.24 years (SD = 1.26). Following approval by a University Research Ethics Board, coaches were contacted approximately one month into their respective competitive seasons to inform them about the study and to arrange a time to meet with the team to provide athletes with information about the study. Athletes who agreed to participate in the study provided informed consent and completed a baseline measure including demographic information (age, ethnicity, position on team, length of sport experience and length of time on current team, as well as starting status on the team), perceived esteem support, and team cohesion. Approximately one month later (mid-way through their competitive seasons), athletes subsequently completed daily diary measures of interpersonal emotion regulation and performance for a period of 10 days (the data collection schedule included five practice days prior to a competition, a competition day, and four days of data collection following a competition). The daily diary entries were managed using Experience Sampler (Thai & Page-Gould, 2018) which was programmed to alert the athlete to complete the entry each day at 8pm. In total, this mixed design yielded 346 observations for our primary analyses.

2.2. Measures

Perceived Esteem Support. Athletes were asked to rate the extent to which they felt their teammates would provide them with support using the esteem support subscale of the Perceived Available Social Support Questionnaire (PASS-Q; Freeman et al., 2011). The items (e.g., *"If needed, to what extent would someone on your team reinforce the positives"*) are rated on a scale of 0 (*not at all*) to 5 (*extremely so*). Athletes' mean scores for the four items measuring esteem support were calculated (α = 0.89). Prior to inclusion in the analyses, perceived esteem support was centered around the sample mean.

Social Cohesion. Athletes completed a measure of social cohesion (Eys, Loughead, Bray, & Carron, 2009) by indicating the extent to which they agreed with statements regarding their perceptions about their team (e.g., *"Some of my best friends are on this team"* and *"We hang out with one another whenever possible"*). The eight social cohesion items are rated on a scale of 1 (*strongly disagree*) to 9 (*strongly agree*) and athletes' mean scores were calculated (α = 0.95). Team cohesion was centered around the sample mean for analysis.

Interpersonal Emotion Regulation. Athletes completed a short form of the Interpersonal Emotion Regulation Scale (Niven et al., 2011; c.f., Tamminen, Gaudreau, et al., 2016) each night. Athletes were asked to rate the extent to which they attempted to improve (4 items; α = 0.93) or worsen (3 items; α = 0.72) their teammates' emotions (e.g., *"I listened to a teammate's problems to improve how they felt"* and *"I acted annoyed towards a teammate to try to make them feel worse"*), and the extent to which they had been the target of teammate's efforts to improve (4 items; α = 0.92) or worsen (3 items; α = 0.72) their emotions (e.g., *"A teammate gave me helpful advice to try to improve how I felt"* and *"A teammate acted annoyed towards me to try to make me feel worse"*). Items were rated on a scale of 1 (*not at all*) to 5 (*very much*). Prior to analysis, each type of IER was centered within each participant, such that higher values represent greater IER relative to each participant's average perceptions.

Team Performance. On the day of competition, the team's success in that competition (win/loss) was used as an indicator of team

performance.

2.3. Data analysis plan

Correlations were calculated between all measures (baseline measures and daily measures averaged across daily entries); these are reported in Table 1.

To properly model our mixed design, four piecewise multilevel models were used to model changes in giving and receiving affect-worsening and affect-improving IER before and after competition. We used 3-level multilevel models to account for the fact that daily reports of giving and receiving each type of IER (lowest level) were nested within participants (Level 2) who were in turn nested in teams (Level 3). The intraclass correlation coefficients for all models are reported in supplementary Table S1. We used a piecewise model to allow for different trajectories for IER leading up to competition (pre-competition) and following competition (post-competition). In addition, since participants reported their IER on multiple days pre- and post-competition, we allowed the pre- and post-competition trajectories to have both linear and curvilinear (i.e., quadratic) effects. The multilevel equations that define these models are provided in the supplementary materials. All analyses were conducted using R 2.5.5 (R Core Team, 2018) and plots were created with the ggplot2 package (Wickham, 2016). The multilevel models were conducted with the lme4 package (Bates, Mäechler, Bolker, & Walker, 2015), and the lmerTest package (Kuznetsova, Brockhoff, & Christensen, 2017) was used to obtain Satterthwaite degrees of freedom and *p*-value estimates.

In preparation for analysis, the dataset was organized so that each daily report was on its own row, resulting in multiple rows per participant. The piecewise model was implemented by including a pre-competition time predictor that was coded as a countdown of days to the competition and a post-competition time predictor coded as the number of days post-competition with the day of competition coded as zero for both predictors. The squared values of each of these linear predictors were used to capture curvilinear effects. We modeled random intercepts for each person nested in each team, allowing for different average amounts of IER between teams and between athletes within each team. We also included random slopes for the linear pre- and post-competition time predictors to account for different trajectories between teams and between athletes within each team.

We then tested whether esteem support or team cohesion moderated these trajectories by running the set of models again by adding interaction terms with the time variables and either esteem support or team cohesion. A summary of the main findings regarding the trajectories of interpersonal emotion regulation and moderation by social cohesion and esteem support and interactions with competition outcome (win/loss) is provided in Table 2.

3. Results

3.1. Interpersonal emotion regulation prior to and following competition[1]

Regulating Teammates' Emotions to Improve Affect. There was no change in efforts to improve teammates' affect in the days leading up to competitions (linear: $b = -0.03$, $SE = 0.2$, $t(25) = -0.17$, $p = 0.87$, quadratic: $b = -0.02$, $SE = 0.05$, $t(195) = -0.33$, $p = 0.74$). However, improving teammates' affect dropped sharply in the days after competitions, $b = -0.34$, $SE = 0.12$, $t(54) = -2.78$, $p < .01$, but this decrease soon leveled off, $b = 0.06$, $SE = 0.02$, $t(163) = 2.81$, $p < .01$.

Regulating Teammates' Emotions to Worsen Affect. Efforts to worsen teammates' affect steadily decreased in the days leading up to competitions (linear: $b = -0.19$, $SE = 0.07$, $t(199) = -2.77$, $p < .01$) and dropped sharply right before a competition (quadratic: $b = -0.04$, $SE = 0.02$, $t(187) = -2.09$, $p = 0.04$). Worsening teammates' affect stayed steady in the days after a competition (linear: $b = 0.08$, $SE = 0.05$, $t(29) = 1.63$, $p = 0.11$, quadratic: $b = -0.01$, $SE = 0.01$, $t(57) = -1.62$, $p = 0.11$).

Receiving Affect-Improving IER from Teammates. There was no change in how much affect-improving regulation participants received from teammates in the days leading up to competitions (linear: $b = 0.07$, $SE = 0.14$, $t(145) = 0.51$, $p = 0.61$, quadratic: $b = 0.06$, $SE = 0.04$, $t(178) = 1.46$, $p = 0.15$). However, receiving affect-improving regulation from teammates decreased in the days after competitions, $b = -0.2$, $SE = 0.1$, $t(73) = -2.08$, $p = 0.04$, although this decrease leveled off, $b = 0.04$, $SE = 0.02$, $t(121) = 2.06$, $p = 0.04$.

Receiving Affect-Worsening Regulation from Teammates. There was no change in how much affect-worsening regulation participants received from teammates during either the days leading up to competitions (linear: $b = -0.07$, $SE = 0.07$, $t(204) = -0.93$, $p = 0.35$, quadratic: $b = -0.01$, $SE = 0.02$, $t(193) = -0.55$, $p = 0.58$) or the days after competition (linear: $b = -0.02$, $SE = 0.05$, $t(192) = -0.5$, $p = 0.62$, quadratic: $b = 0$, $SE = 0.01$, $t(181) = 0.33$, $p = 0.74$).

3.2. Moderators of these patterns

For all types of emotion regulation, the same piecewise model as above was run, except that a higher-level interaction was added between the pre- and post-competition time predictors, competition, outcome, and a moderator. The two moderators were social cohesion or esteem social support. We report model fit statistics in the form of BIC to facilitate comparisons between the moderators.[2]

3.2.1. Social cohesion

Regulating Teammates' Emotions to Improve Affect. Social cohesion did not moderate how much participants improved their teammates' affect in either the days leading up to competitions (linear: $b = -0.04$, $SE = 0.09$, $t(179) = -0.46$, $p = 0.65$, quadratic: $b = 0.01$, $SE = 0.03$, $t(197) = 0.39$, $p = 0.7$) or the days after competitions, $b = -0.05$, $SE = 0.05$, $t(134) = -0.93$, $p = 0.36$, but this decrease soon leveled off, $b = 0.02$, $SE = 0.01$, $t(183) = 1.47$, $p = 0.14$. The model BIC was 850.68.

Regulating Teammates' Emotions to Worsen Affect. Social cohesion did not moderate how much participants worsened their teammates' affect in either the days leading up to competitions (linear: $b = -0.06$, $SE = 0.04$, $t(159) = -1.54$, $p = 0.13$, quadratic: $b = -0.01$, $SE = 0.01$, $t(200) = -0.94$, $p = 0.35$) or the days after competitions, $b = 0.01$, $SE = 0.02$, $t(111) = 0.25$, $p = 0.8$, but this decrease soon leveled off, $b = 0$, $SE = 0$, $t(74) = -0.75$, $p = 0.45$. The model BIC was 427.51.

Receiving Affect-Improving Regulation From Teammates. Social cohesion did not moderate how much affect-improving regulation participants received from their teammates in either the days leading up to competitions (linear: $b = -0.21$, $SE = 0.08$, $t(194) = -2.57$, $p = 0.01$, quadratic: $b = -0.05$, $SE = 0.03$, $t(200) = -1.78$, $p = 0.08$) or the days after competitions, $b = -0.03$, $SE = 0.05$, $t(149) = -0.63$, $p = 0.53$, but this decrease soon leveled off, $b = 0.02$, $SE = 0.01$, $t(208) = 1.82$, $p = 0.07$. The model BIC was 770.94.

Receiving Affect-Worsening Regulation From Teammates. Social cohesion did not moderate how much affect-worsening regulation participants received from their teammates in either the days leading up to competitions (linear: $b = 0.04$, $SE = 0.04$, $t(159) = 0.88$, $p = 0.38$, quadratic: $b = 0.01$, $SE = 0.01$, $t(170) = 0.96$, $p = 0.34$) or the days after competitions (linear: $b = 0.02$, $SE = 0.02$, $t(123) = 0.68$,

[1] The outcome of the competition did not moderate the overall pre-competitive or post-competitive IER patterns.

[2] Unless otherwise noted, the effects reported in these analyses were not moderated by competition outcome.

Table 1
Bivariate correlations between all measures.

	Mean (SD)	1.	2.	3.	4.	5.	6.
1. Giving Affect-Improving IER	2.17 (1.05)	–					
2. Giving Affect-Worsening IER	1.17 (.42)	0.29***	–				
3. Receiving Affect-Improving IER	1.87 (.94)	0.77***	0.30***	–			
4. Receiving Affect-Worsening IER	1.18 (.43)	0.22***	0.61***	0.20***	–		
5. Esteem Social Support	3.83 (1.00)	0.13*	0.17**	0.35***	0.12*	–	
6. Social Cohesion	7.09 (1.61)	−0.005	0.07	0.24***	−0.002	0.67***	–
7. Competition Outcome (Loss = −1, Win = 1)	0.44 (.90)	−0.13**	−0.02	−0.21	−0.21**	0.06	0.23***

$p = 0.5$, quadratic: $b = 0$, $SE = 0$, $t(148) = -0.92$, $p = 0.36$). The model BIC was 471.05.

3.2.2. Esteem support

Regulating Teammates' Emotions to Improve Affect. Esteem support did not moderate how much participants improved their teammates' affect in either the days leading up to competitions (linear: $b = -0.18$, $SE = 0.17$, $t(188) = -1.09$, $p = 0.28$, quadratic: $b = 0$, $SE = 0.06$, $t(199) = -0.03$, $p = 0.98$) or the days after competitions, $b = 0.07$, $SE = 0.09$, $t(142) = 0.75$, $p = 0.45$, but this decrease soon leveled off, $b = 0$, $SE = 0.02$, $t(193) = -0.08$, $p = 0.93$. The model BIC was 844.44.

Regulating Teammates' Emotions to Worsen Affect. There was a marginal trend for athletes with more esteem support to have an even greater decrease in affect-worsening in the days leading up to a competition than athletes who did not perceive as much esteem support (linear: $b = -0.11$, $SE = 0.06$, $t(182) = -1.73$, $p = 0.09$, quadratic: $b = -0.02$, $SE = 0.02$, $t(190) = -0.96$, $p = 0.34$) and a marginal trend for athletes with greater esteem support to give relatively more affect-worsening emotion regulation to their teammates after competitions (linear: $b = 0.06$, $SE = 0.03$, $t(117) = 1.82$, $p = 0.07$, quadratic: $b = -0.01$, $SE = 0.01$, $t(163) = -1.5$, $p = 0.13$). Although competition outcome did not differentiate between the emotion regulation trajectories of athletes who felt they had a more supportive team before the competition (linear: $b = -0.23$, $SE = 0.06$, $t(179) = -0.58$, $p = 0.56$, quadratic: $b = -0.01$, $SE = 0.02$, $t(190) = -0.41$, $p = 0.68$), there were marginal linear ($b = -0.06$, $SE = 0.03$, $t(117) = -1.8$, $p = 0.08$) and significant quadratic interactions between time, competition outcome, and esteem support ($b = 0.02$, $SE = 0.01$, $t(155) = 2.31$, $p = 0.02$).

We probed this interaction for when teams won and when they lost (Aiken & West, 1991). When the team won, giving affect-worsening emotion regulation to teammates after the competition was not moderated by perceived esteem support (linear: $b = 0$, $SE = 0.05$, $t(134) = 0.03$, $p = 0.98$, quadratic: $b = 0.01$, $SE = 0.01$, $t(147) = 0.54$, $p = 0.59$). However, when they lost, athletes who perceived a more supportive team reported giving relatively more affect-worsening regulation to their teammates after competition (linear: $b = 0.13$, $SE = 0.05$, $t(103) = 2.46$, $p = 0.02$), but this increase tapered off more dramatically than it did among athletes who perceived less esteem support (quadratic: $b = -0.03$, $SE = 0.01$, $t(161) = -2.8$, $p < .01$) (see Fig. 1).

Receiving Affect-Improving Regulation From Teammates. Athletes who perceived their teams as more supportive reported receiving less affect-improving regulation from teammates as competition approached (linear: $b = -0.28$, $SE = 0.14$, $t(192) = -1.99$, $p = 0.05$, quadratic: $b = -0.04$, $SE = 0.05$, $t(197) = -0.9$, $p = 0.37$). Esteem support did not moderate patterns of receiving affect-improving regulation in the days after competitions (linear: $b = 0.1$, $SE = 0.07$, $t(150) = 1.3$, $p = 0.2$, quadratic: $b = 0$, $SE = 0.01$, $t(147) = -0.13$, $p = 0.89$), and whether they won or lost the competition did not differentiate between the regulation patterns of athletes who felt more or less supported before the competition (linear: $b = 0.12$, $SE = 0.14$, $t(192) = 0.87$, $p = 0.39$, quadratic: $b = 0.02$, $SE = 0.05$, $t(197) = 0.42$, $p = 0.68$) or after the competition (linear: $b = -0.09$, $SE = 0.07$, $t(150) = -1.27$, $p = 0.21$, quadratic: $b = 0.02$, $SE = 0.01$, $t(146) = 1.33$, $p = 0.18$). The model BIC was 765.69.

Receiving Affect-Worsening Regulation From Teammates. Esteem support did not moderate the patterns of receiving affect-worsening regulation in the days leading up to competition (linear: $b = 0.08$, $SE = 0.07$, $t(170) = 1.27$, $p = 0.21$, quadratic: $b = 0.03$, $SE = 0.02$, $t(189) = 1.32$, $p = 0.19$), and there was a marginal post-competition trend for athletes with greater esteem support to have a brief increase in receiving affect-worsening regulation that leveled off (linear: $b = 0.06$, $SE = 0.04$, $t(107) = 1.73$, $p = 0.09$, quadratic: $b = -0.01$, $SE = 0.01$, $t(177) = -1.94$, $p = 0.05$). However, there was a three-way interaction between the linear effect of time leading up to the competition, esteem support, and competition outcome (linear: $b = -0.09$, $SE = 0.07$, $t(165) = -2.13$, $p = 0.03$, quadratic: $b = -0.04$, $SE = 0.02$, $t(187) = -1.69$, $p = 0.09$), which was only marginal after the competition (linear: $b = -0.06$, $SE = 0.04$, $t(106) = -1.67$, $p = 0.1$, quadratic: $b = 0.01$, $SE = 0.01$, $t(175) = 1.8$, $p = 0.07$). The model BIC was 453.42.

We probed the interaction between esteem support and pre-competition patterns of emotion regulation for when teams won or lost by using specially coded dummy variables (Aiken & West, 1991). Esteem support was unrelated to receiving affect-worsening regulation prior to the competition if the team won (linear: $b = -0.06$, $SE = 0.05$, $t(128) = -1.06$, $p = 0.29$, quadratic: $b = -0.01$, $SE = 0.01$, $t(158) = -0.68$, $p = 0.5$). However, before competitions that they ultimately lost, there was a marginal trend for athletes who perceived more support to report an increase in receiving affect-worsening regulation from others (linear: $b = 0.23$, $SE = 0.12$, $t(174) = 1.86$, $p = 0.06$, quadratic: $b = 0.07$, $SE = 0.05$, $t(189) = 1.56$, $p = 0.12$) (see Fig. 2).

3.3. How do these patterns relate to performance?

We tested whether individual differences in the different types of emotion regulation preceding a competition would predict winning or losing the competition. Only one competition was observed per participant, so this binary outcome is at the highest level. Therefore, we extracted the random slopes for each of the emotion regulation types from the initial (unmoderated) models to reflect how much each person varied from the overall patterns reported in the first section of the results. Athletes' individual slopes for giving and receiving the same type of emotion regulation (i.e., affect-improving or affect-worsening) in the days leading up to competition were strongly correlated with each other (see Table 3).

We also regressed competition outcome on each participant's estimated trajectories for all types of emotion regulation in a logistic regression. There were no reliable effects of athletes' emotion regulation trajectories: individual differences in giving affect-improving ($b = -390.58$, $SE = 525.31$, $z = -0.74$, $p = 0.46$), giving affect-worsening ($b = -17.16$, $SE = 44.06$, $z = -0.39$, $p = 0.7$), receiving affect-improving ($b = -13.26$, $SE = 19.21$, $z = -0.69$, $p = 0.49$), and receiving affect-worsening ($b = 7.74$, $SE = 34.11$, $z = 0.23$, $p = 0.82$) regulation prior to a competition did not predict the outcome of the

Table 2
Summary of main findings regarding the trajectories of interpersonal emotion regulation, moderation by social cohesion and esteem support, and interactions with competition outcome (Win/Loss).

Trajectories of Interpersonal Emotion Regulation			Moderators of Trajectories of Interpersonal Emotion Regulation				Interactions between Moderators and Competition Outcome (Win/Loss)
			Social Cohesion		Esteem Support		
	Before Competition	After Competition	Before Competition	After Competition	Before Competition	After Competition	
Giving Affect-Improving IER	No change	Decreased	None	None	None	None	None
Giving Affect-Worsening IER	Decreased	Remained low	None	None	More supported athletes had greater decrease in affect worsening toward teammates	More supported athletes reported increase in providing affect worsening toward teammates	Win: No interaction Loss: More supported athletes gave more affect worsening toward teammates before a loss
Receiving Affect-Improving IER	No change	Decreased	None	None	More supported athletes received less affect improving	None	None
Receiving Affect-Worsening IER	No change	No change	None	None	None	More supported athletes reported increase in receiving affect worsening from teammates	Win: No interaction Loss: More supported athletes received more affect worsening before a loss

competition.

Social Cohesion. We added social cohesion as a moderator of the estimated pre-competition trajectories for the emotion regulation types in a logistic regression predicting competition outcome. There were no two-way interactions between social cohesion and individual differences in giving affect-improving ($b = 1563.24$, $SE = 1450.14$, $z = 1.08$, $p = 0.28$), giving affect-worsening ($b = -40.91$, $SE = 95.39$, $z = -0.43$, $p = 0.67$), receiving affect-improving ($b = 19$, $SE = 30$, $z = 0.63$, $p = 0.53$), or receiving affect-worsening ($b = -42.17$, $SE = 35.42$, $z = -1.19$, $p = 0.23$) regulation prior to a competition in predicting the outcome of the competition.

Esteem Support. We added esteem support as a moderator of the estimated pre-competition trajectories for the emotion regulation types in a logistic regression predicting competition outcome in the same way as we did for the social cohesion model. Esteem support moderated pre-competition trajectories of receiving affect-worsening regulation in predicting the outcome of the competition ($b = -373.92$, $SE = 164.76$, $z = -2.27$, $p = 0.02$). We probed this interaction at one standard deviation above and below the mean of esteem support (West, Aiken, & Krull, 1996). For athletes who perceived relatively more esteem support, receiving less affect-worsening regulation from their teammates before a competition was predictive of winning, $b = -791.63$, $SE = 349$, $z = -2.27$, $p = 0.02$. For athletes who perceived relatively little esteem support, however, receiving affect-worsening regulation from their teammates was unrelated to whether the team won or lost, $b = -83.37$, $SE = 166.18$, $z = -0.5$, $p = 0.62$.

Esteem support did not reliably moderate the trajectories of giving affect-improving ($b = 1766.08$, $SE = 1728.45$, $z = 1.02$, $p = 0.31$), giving affect-worsening ($b = -355.25$, $SE = 199.32$, $z = -1.78$, $p = 0.07$), or receiving affect-improving ($b = -48.41$, $SE = 60.39$, $z = -0.8$, $p = 0.42$) regulation in predicting the outcome of the competition.

4. Discussion

The purpose of this study was to examine trajectories of providing and receiving IER among varsity athletes prior to and following a competition and associations with performance, which is a novel contribution to the literature in this area and builds on previous quantitative work which has examined the effects of providing IER on individual outcomes such as sport enjoyment and commitment (Tamminen, Gaudreau, et al., 2016). By adopting a longitudinal approach, we found that there were differences in the trajectories of athletes' provided and received IER prior to and following competitions. The overall pattern of findings regarding affect-improving IER indicated there were no significant changes prior to competition, although there was a significant decrease following competition. Athletes generally reported decreases in affect-worsening IER toward teammates in the days leading up to and after competition; however, they did not perceive any changes in the receipt of affect-worsening behaviours from teammates following competition. These patterns were moderated by perceived esteem support as well as by the interaction between esteem support and competition outcome, highlighting the importance of considering perceptions of social support when examining IER interactions, although social cohesion did not moderate any of the associations between IER, time, and team performance. Furthermore, it appears that changes in teammates' affect-worsening in particular may have consequences for predicting team performance.

The different trajectories of providing versus receiving IER suggest that these are distinct processes, which supports previous qualitative research indicating that athletes report trying to influence others' emotions, and they also report being the target of teammates' IER efforts (Friesen et al., 2015; Palmateer & Tamminen, 2018; Tamminen, Palmateer, et al., 2016; Wolf et al., 2018). Moreover, the evidence distinguishing between trajectories of provided and received IER also supports previous qualitative findings indicating that athletes report

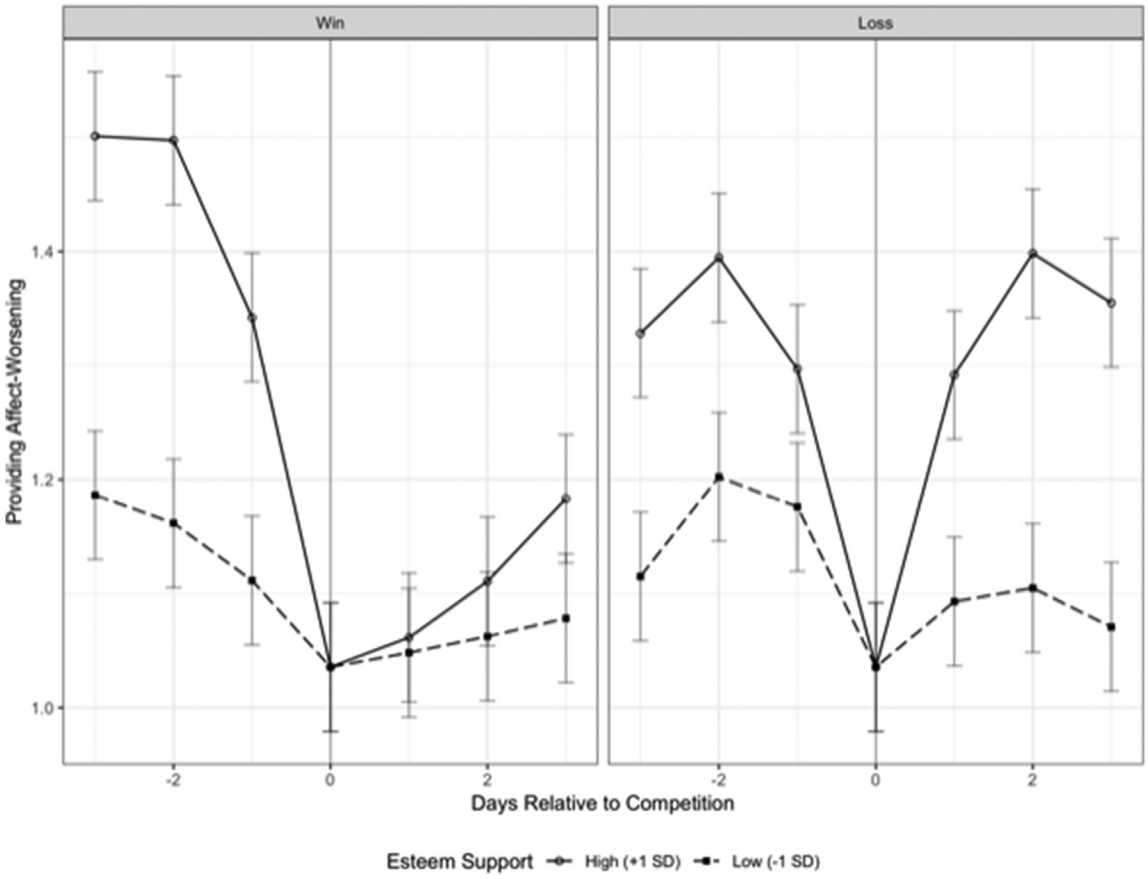

Fig. 1. Trajectories of providing affect-worsening prior to and after competition, moderated by esteem social support.

engaging in 'indirect actions' to protect teammates from potential stressors (Tamminen & Crocker, 2013) and that athletes engage in some extrinsic situation selection actions to take pressure off their teammates (Campo et al., 2017). Such invisible support actions (Bolger, Zuckerman, & Kessler, 2000) may be necessary in cases where detectable emotion regulation actions could draw attention to the recipient's emotions (Palmateer & Tamminen, 2018) and cause harm to his or her self-esteem by signalling that they are not capable of dealing with the situation on their own. Interpersonal emotion regulation that is provided but not detected by the recipient may also serve as strategies to regulate one's own emotions regardless of their impact on the receiver (i.e., response-independent IER; Doré, Morris, Burr, Picard, & Ochsner, 2017; Zaki & Williams, 2013). Further research examining athletes' ability to perceive the extent of teammates' IER efforts as well as the value of interpersonal emotion regulation actions for the provider and the recipient would be worthwhile avenues of investigation.

The overall pattern of results indicates that changes in the receipt of affect-worsening interactions were predictive of the team's performance in competition, whereas affect-improving IER was not associated with the team's performance success. These results align with previous research suggesting that generally negative and antisocial teammate behaviours have consequences for team performance (e.g., Al-Yaaribi, Kavussanu, & Ring, 2018; Cope, Eys, Schinke, & Bosselut, 2010), and the results indicate that changes in interactions specifically concerning the interpersonal regulation of teammates' emotions are an important consideration for team performance. The findings also support research by Niven et al. (2011) indicating that individuals' engagement in affect-worsening scores were lower compared to affect-improving scores, yet these more negative forms of social interactions were associated with poorer health and wellbeing outcomes. Thus, our results lend support to Niven et al. (2011) assertion that "although strategies used to worsen affect are not used very often they do have important consequences, and more broadly fits with the theory that bad is stronger than good" (p.70; see also Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

It is important to note that the association between lower than usual affect-worsening and the team's eventual success in competition only emerged as a significant finding among those athletes who perceived high levels of esteem support among their teammates. The findings also indicated that athletes higher in esteem support provided and received more affect-worsening in interactions with teammates prior to a loss, but when these athletes experienced less affect-worsening from teammates in the days leading up to competition, their team was more likely to win. It is possible that athletes who typically feel greater esteem support from teammates may feel a degree of 'security' to engage in greater affect-worsening toward other teammates, supporting previous suggestions that some athletes (e.g., leaders or more skilled athletes) are more likely to engage in particular forms of IER with teammates (Friesen et al., 2015; Palmateer & Tamminen, 2018; Tamminen, Palmateer, et al., 2016). Additionally, more-supported athletes within the team may be more sensitive to changes in affect-worsening interactions among teammates, as these interactions may signal changes in available support in times of need. Thus, when supported athletes perceive less affect-worsening from teammates, they may subsequently perform better in competition and contribute to the team's success. Furthermore, athletes who perceive higher esteem support from teammates may also be more important contributors to the team's performance (Moran & Weiss, 2006), and thus receiving less affect-worsening from teammates may be particularly beneficial for the entire team's success.

Given that decreases in affect-worsening were associated with the team's competitive success, additional research is needed to examine the causes of affect-worsening IER among teammates to optimize

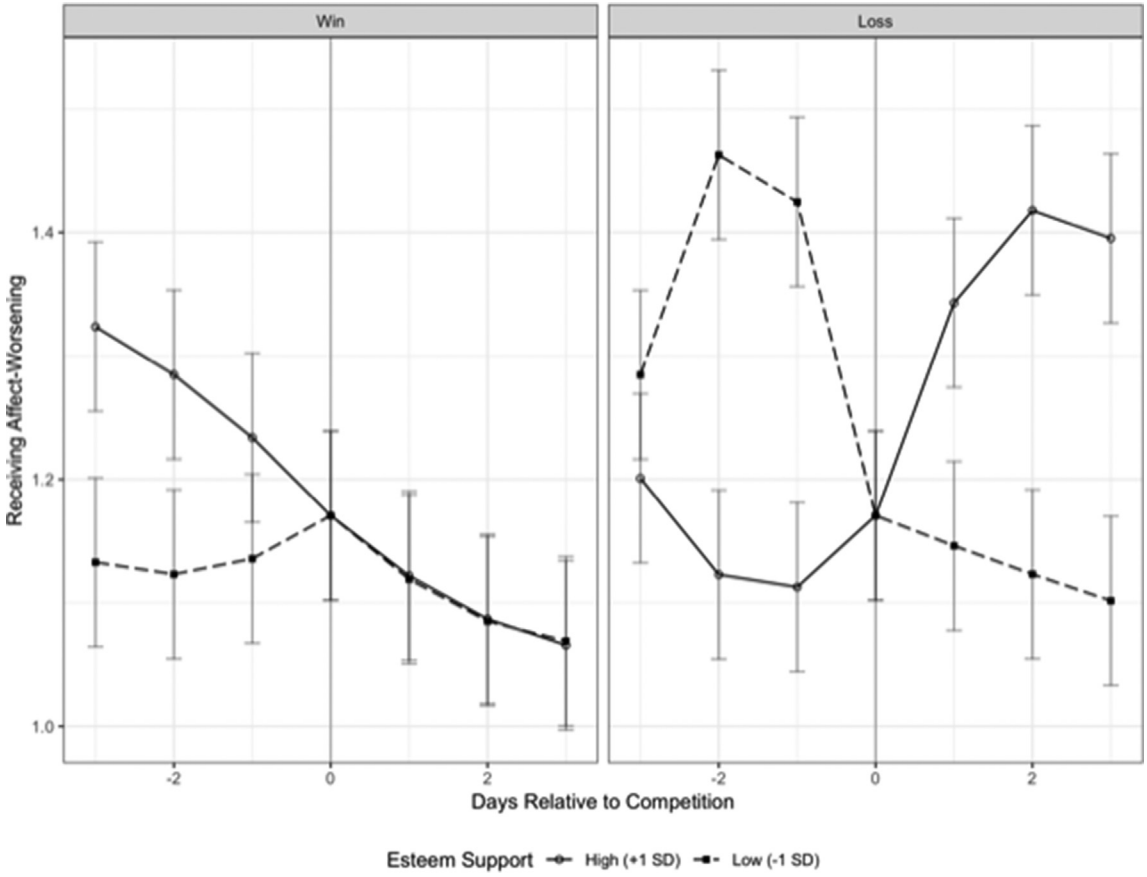

Fig. 2. Trajectories of receiving affect-worsening prior to and after competition, moderated by esteem social support.

conditions for team success. Possible causes for affect-worsening IER interactions could include intra-team conflict (Paradis, Carron, & Martin, 2014) or positional competition between teammates (Harenberg, Reimer, Karreman, & Dorsch, 2016). These examples of intra-team conflict are associated with negative emotions and conflict-related behaviours such as sarcasm, silent treatment, and trash talking teammates (Paradis et al., 2014). However, affect-worsening may also occur if athletes believe that such actions serve instrumental purposes and that making teammates feel worse about poor performance may serve to improve their performance in subsequent competitions (Friesen et al., 2015; Palmateer & Tamminen, 2018). Thus, not all instances of affect-worsening would necessarily have a negative impact on team outcomes (cf. Knight & Eisenkraft, 2015). Determining the causes of affect-worsening IER among teammates (e.g., as an indicator of team functioning or as an instrumental strategy to try and improve the effort and performance of others) is an important area for future research in explaining its impact on team success.

One limitation of the current study is that we did not ask athletes about their perceptions of motives underlying IER interactions. Athletes have reported that they believe affect-worsening can be useful for improving teammates' performance, and that affect-worsening interactions may signal athletes' commitment to the team and desire for future success (Campo et al., 2017; Palmateer & Tamminen, 2018). However, it is not known whether athletes interpret such instrumental motives when they are the target of affect-worsening IER from teammates. Specifically, athletes may feel that worsening others' emotions is useful for instrumental purposes - that is, they may try to make teammates feel bad because they believe it will motivate teammates to perform better. Yet when athletes are the target of teammates' affect-worsening actions, they may not perceive such instrumental motives. Indeed, recent lab-based experimental research suggests that perceptions of others' motives for emotion expression and emotion regulation are important for interpersonal appraisals, trust, and interpersonal behaviours (Shore & Parkinson, 2018). Therefore, affect-worsening behaviours may be enacted for instrumental purposes, and they may have value in signifying commitment or dedication to the team's long-term performance, although these behaviours having short-term costs (e.g., making teammates feel worse and potentially performing poorly in the short term). Future research examining athletes' perceptions of the instrumental purposes of affect-worsening and negative emotions (Netzer,

Table 3
Correlations between pre-competition emotion regulation trajectories, the moderators of esteem social support and social cohesion, and competition outcome.

	1.	2.	3.	4.	5.	6.
1. Giving Affect-Improving IER	–					
2. Giving Affect-Worsening IER	0.24***	–				
3. Receiving Affect-Improving IER	0.76***	0.29***	–			
4. Receiving Affect-Worsening IER	0.23***	0.51***	0.22***	–		
5. Esteem Social Support	0.15*	0.21**	0.39***	0.14*	–	
6. Social Cohesion	−0.04	0.09	0.22***	−0.02	0.72***	–
7. Competition Outcome (Loss = −1, Win = 1)	−0.18**	−0.06	−0.04	−0.19**	0.06	0.24***

van Kleef, & Tamir, 2015; Tamir, 2016) and the factors that influence effective intrateam communication behaviours would be valuable to advance this area of research.

To advance the literature on IER and performance in sport, it is necessary to further investigate the specific mechanisms explaining these associations. A clear avenue for further research is to examine the impact of IER efforts on athletes' emotions and appraisals in competitions (cf. Wolf, Eys, Sadler, & Kleinert, 2015) and the subsequent impact on individual and team performance. Moreover, qualitative research indicates that athletes report regulating their own emotions at the same time as they seek to regulate their teammates' emotions (Tamminen & Crocker, 2013), and that some emotion regulation strategies serve to influence both their own and others' emotions (e.g., co-regulation; Campo et al., 2017). Athletes are not passive targets of their teammates' actions, and some athletes may be not be influenced as strongly by the IER efforts of others; further research is needed to examine the interactive or buffering effects of athletes' own emotion regulation strategies in conjunction with IER efforts of teammates.

In addition to research examining the mechanisms linking IER and performance outcomes, it would be important to examine the impact of individual characteristics of athletes on IER processes. Based on suggestions from previous studies, we examined the effect of athletes' perceptions of their social environment (using esteem support and social cohesion) as moderators of the relationship between IER and performance (e.g., Friesen et al., 2015; Tamminen, Gaudreau, et al., 2016; Tamminen, Palmateer, et al., 2016). One limitation of this focus is that we did not examine individual characteristics that may influence the nature and frequency of IER interactions with teammates, such as emotional intelligence (Laborde, Dosseville, & Allen, 2016) or social identity (Rees, Haslam, Coffee, & Lavallee, 2015). Some related research on this topic has linked social identity with group-based emotions in sport: for example, Tamminen, Palmateer, et al. (2016) reported that athletes' experiences of group-based and collective emotions were linked to athletes' social identity. These findings were supported by subsequent research examining social identity, group-based emotions, and performance by Campo et al. (2019). While social identity has been linked to group-based and collective emotions, to our knowledge there is no research to date explicitly linking social identity with IER strategy use in sport, which would be a valuable area for future research. Furthermore, given that emotional intelligence concerns the ability to perceive, express, assimilate, understand, and regulate one's own or others' emotions (Laborde et al., 2016; Meyer & Fletcher, 2007), this would also be an important individual characteristic to examine in relation to athletes' IER.

4.1. Strengths and limitations

In the current study we examined the associations between IER and team performance, the patterns of interpersonal emotion regulation among athletes over time, and the influence of the social environment on IER among athletes. While this is one of the first studies to explore associations between esteem support, cohesion, IER, and performance in sport, the sample size was small; as such, the results should be interpreted with caution and these findings should be replicated in a larger sample (Sakaluk, 2016). As noted previously, we did not ask athletes about their motives for engaging in IER or their perceptions of teammates' IER motives. Thus, future research should also ask athletes why they engage in IER and why they think teammates engage in IER. Furthermore, given that athletes' perceptions of esteem support moderated some of the effects within this study, it would be important to examine IER within the context of athletes' relationships with specific teammates (Overall & McNulty, 2017). We did not ask athletes which teammates they specifically interacted with and therefore could not examine patterns of affect-improving and affect-worsening IER between particular teammates. Qualitative research suggests that particular roles and social norms on the team may influence who engages in affect-improving and affect-worsening behaviours (Friesen, et al., 2015; Palmateer & Tamminen, 2018; Tamminen, Palmateer, et al., 2016). Future research using social network analysis could be valuable for examining patterns of IER between teammates.

Another limitation of the current study was the use of team success (win/loss) as an indicator of performance without accounting for the difficulty of the competition or the opponent. It may be that the teams who lost their competitions faced difficult opponents, while the winning teams may have been favoured to win. Thus, future research examining the association between IER and performance could examine both objective and subjective assessments of performance, relative to the opponent's skill or level of difficulty. Furthermore, while team success can be conceived as a result of the individual performances of the team members, we did not ask athletes about their individual performance in competition, which would be an important avenue for future research examining the impact of IER in sport.

A strength of this study was its longitudinal design to examine IER and performance outcomes, which advances the literature by providing information about patterns of IER before and after competition. However, the 10-day period of data collection offers only a snapshot of athletes' IER. Given that we observed changes in IER after competitions, it would be valuable to explore these trajectories over a longer period of time. This information could indicate whether such changes in IER have consequences for subsequent competitions and whether there are reciprocal effects between athletes' IER and performance over time. Another limitation is that we did not ask athletes about the specific positively- or negatively-valenced emotions they experienced prior to or during practices or competition. In adopting a prospective design and asking athletes about their emotions as well as IER interactions, researchers could further examine the impact and occurrence of IER on positively- or negatively-toned emotions.

In conclusion, this study advances research on interpersonal processes of emotion regulation in sport by adopting a longitudinal approach to examine IER over a 10-day period including practices and competitions. We found associations between teammates' IER, esteem support, and team performance in competition. The findings suggest that decreases in affect-worsening IER from teammates an important factor in predicting the team's success in competition, particularly among athletes who typically perceive higher levels of support from their teammates. Overall, the findings of this study build on a growing body of research examining IER in sport and provide direction for future research in this area. Key areas for future research pertain to the instrumental nature of emotions and emotion regulation, the distinction between the receipt and provision of IER between teammates, and the social context within which these interactions take place.

Conflicts of interest

The authors declare no potential conflict of interest for this study.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.psychsport.2019.101566.

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