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2 **Congruence of efficacy beliefs on the coach-athlete relationship and athlete anxiety: Athlete**
3 **self-efficacy and coach estimation of athlete self-efficacy**

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Abstract

This study's purpose was to assess the extent to which congruence of athlete self-efficacy and Coach Estimation of Athlete Self-Efficacy (CEASE) is associated with coach-athlete relationship quality and athlete anxiety. Data were obtained from 71 British coach-athlete dyads from individual sports regarding athlete self-efficacy, CEASE, coach-athlete relationship quality, and athlete anxiety. Polynomial regression analyses were conducted to assess congruence, with significant interactions depicted in surface response graphs. Athlete self-efficacy was significant in predicting athlete perceptions of relationship quality and CEASE was significant in predicting coach perceptions of relationship quality, but neither directly predicted the other person's relationship perceptions. Congruence (of athlete self-efficacy and CEASE) was significant in predicting athlete, but not coach, perceptions of relationship quality. Athlete anxiety was not significantly predicted. Overall, results from the study suggest that the coach-athlete relationship is enhanced when coaches and athletes have congruent perceptions of efficacy, with more cooperative and effective interactions resulting from congruence at high and low efficacy.

Keywords: Congruence, Polynomial Regression, Closeness, Commitment, Complementarity

Congruence of Athlete Self-Efficacy and Coach Estimation of Athlete Self-Efficacy on the Coach-Athlete Relationship and Athlete Anxiety

In 2019, Eliud Kipchoge broke the world record by setting a new marathon time of 1 hour 59 minutes and 40 seconds (New York Times, 2019). The record-breaking run involved a team of coaches who had to make assessments of how likely potential athletes would be able to run a sub two-hour marathon. Given many of the athletes likely had similar physical capabilities, the team behind the run would have estimated potential athletes' self-efficacy to achieve the task. It is plausible to suggest that their selection of Kipchoge would have been based on these estimations. Kipchoge's coach, Patrick Sang, stated in an interview prior to the event that "[Kipchoge] possesses an unwavering belief in himself unlike anyone I have ever met…I believe he will become the first human to run a sub two-hour marathon" (INEOS, 2019). While Sang appears to have accurately estimated Kipchoge's self-efficacy leading to his success, coaches' assessments can vary in their accuracy. Mis-estimation of athletes' efficacy beliefs can have consequences that can undermine the coach-athlete relationship and impact athlete anxiety and performance (Jackson & Beauchamp, 2010a). Unfortunately, very little is known about the impact of congruence of relational efficacy beliefs (Habeeb, 2020). As such, the purpose of this study was to assess the extent to which congruence of athlete self-efficacy and Coach Estimation of Athlete Self-Efficacy (CEASE) is predictive of coach-athlete relationship quality and athlete anxiety.

Tripartite Framework of Relational Efficacy Beliefs

Lent and Lopez's (2002) original tripartite framework describes the importance of three types of efficacy beliefs that can emerge in the coach-athlete relationship. The first of these beliefs is *self-efficacy* or confidence beliefs about self-capabilities to perform actions needed to produce desired outcomes (Bandura, 1986). The second belief is *other-efficacy,* which is an individual's beliefs about a relational partner's abilities relative to desired outcomes (e.g., I am confident in my coach). The final belief is *relation inferred self-efficacy* (RISE), which is the individual's appraisal of how his or her own capabilities are regarded by the relational partner

(e.g., I think my coach is confident in me; Lent & Lopez, 2002). Lent and Lopez posited that these three efficacy beliefs about the self and the relational other have a substantial effect on both individual and relationship functioning such as personal reliance, effort, and commitment among partners. Researchers have shown an array of support for Lent and Lopez's (2002) theoretical contentions in sport (cf. Habeeb, 2020). Jackson et al. (2010b) found, for example, that high efficacy in one's coach or athlete (i.e., other-efficacy) predicts enhanced relationship perceptions for both coach and athlete. Similarly, athletes who report higher levels of self- and other-efficacy toward a teammate tend to experience higher levels of commitment and satisfaction with that relationship (Jackson et al., 2007). Relational efficacy beliefs can also impact the relational partner. For example, athletes' RISE negatively predicted coach commitment, while coach's RISE positively predicted athlete commitment in a youth athlete sample (Jackson & Beauchamp, 2010b). In addition to relationship perceptions, the relational efficacy beliefs are associated with athletes' individual and team performance outcomes (Beauchamp & Whinton, 2005; Habeeb et al., 2019), indicating the importance of relational efficacy beliefs to athlete success.

Estimation of Other's Self-Efficacy

Since Lent and Lopez (2002) proposed the tripartite framework, the possibility of extending the framework to include additional efficacy beliefs has been forwarded by sport researchers. This has been based on Lent and Lopez's referral to their tripartite framework as a "preliminary model" (p. 257) that could potentially be extended and refined. Of specific importance, Jackson and Beauchamp (2010a) argued that a person will likely assess a relational partner's self-efficacy, labelled *Estimation of the Other Person's Self-Efficacy* (*EOSE*). EOSE represents "the degree to which a person believes that his or her partner is confident in the partner's *own* abilities" (Jackson & Beauchamp, 2010a; p. 189). A coach may estimate, as an example, that "my athlete has no self-efficacy" and we use the term Coach Estimation of Athlete Self-Efficacy (CEASE) to refer to the coach-to-athlete direction of perception. An athlete may also estimate the coach's self-efficacy and we use the term Athlete Estimation of Coach Self-

Efficacy (AECSE) to refer to the athlete-to-coach direction. Interviews with both athlete-athlete and coach-athlete dyads have revealed that these beliefs (i.e., EOSE) arise from both perceptions of the partner and perceptions of the dyad through verbal/non-verbal communication, past performances, and affective states (Jackson & Beauchamp, 2010a). Consequences, both intrapersonal and interpersonal, were also described by these participants including changes in anxiety, self-efficacy, motivation, relationship commitment and relationship longevity. Jackson and Beauchamp's preliminary study highlights that EOSE is an important aspect within the larger network of efficacy beliefs for coaches and athletes. Unfortunately, researchers to date have yet to investigate EOSE further. In their recent reviews, Habeeb (2020) and Jackson et al. (2020) argued for a specific need to assess EOSE (and specifically its congruence with athlete self-efficacy) because such an investigation would inform coaches and athletes of how their beliefs about one another's can impact the others' successes.

Lent and Lopez (2002) acknowledged that relational efficacy beliefs across partners may or may not accurately reflect one another's actual beliefs or abilities. A difference between athlete self-efficacy and a coach's estimation of her athlete's self-efficacy (i.e., CEASE), as an example, can occur because CEASE depends on accurately interpreting social cues from the athlete (including explicit communication, such as verbal, and implicit communication, such as body language). It can be difficult for some coaches and athletes to effectively interpret the multifaceted information that exists within a relationship. This was supported by Jackson et al.'s (2011) findings indicating that about 20% of coach-athlete relationships are associated with discordance among athlete self-efficacy, other-efficacy and RISE. Based on Jackson and Beauchamp's (2010a) investigation, it seems that CEASE may also be susceptible to being discordant with the athlete's self-efficacy. Athletes specifically reported that when there was a discrepancy between their own self-efficacy and their coaches' estimation of their self-efficacy (CEASE) that they paid less attention to coach feedback, were less confident in their coach (low other-efficacy), experienced higher levels of anxiety and felt less committed to the relationship.

Similarly, Jackson et al. (2007) found that athletes' RISE beliefs were not aligned to the confidence their tennis partners actually had in them (i.e., the teammate's other-efficacy). Unfortunately, a closer focus on the interaction of efficacy beliefs has not been investigated and little is known about how differing levels of estimation (e.g., high athlete self-efficacy and low CEASE) may be associated with personal and relational outcomes.

The need to better understand congruence, or meta-accuracy, between athlete and coach efficacy perceptions was highlighted in two recent reviews regarding the tripartite network of efficacy beliefs (Habeeb, 2020; Jackson et al., 2020). Meta-accuracy refers to the ability for a partner to accurately assess another's actual beliefs (Kenny & DePaulo, 1993). Only two studies have been conducted investigating meta-accuracy of EOSE and self-efficacy within coach-athlete relationships. Both studies indicate mixed evidence for congruence of coach self-efficacy and their athletes' estimation of their self-efficacy (AECSE). Short and Short (2004) compared male coaches' self-efficacy with their male athletes' ratings of AECSE. They found that athletes estimated their coach's self-efficacy in a similar way as coaches rated their own self-efficacy. Conversely, Caron (2015) found that coaches and athletes did not rate coach efficacy similarly, with most athletes reporting lower AECSE compared to their coach's self-efficacy. In other words, athletes under-estimated their coach's self-efficacy. Under-estimation was most strongly present in female coach-athlete pairs compared to male or mixed gender coach-athlete pairs. To date, no study has investigated the congruence of athlete self-efficacy and CEASE, despite evidence that coaches' beliefs about athletes can have more impact on athletes, compared to athletes' beliefs about coaches, due to the coach-athlete hierarchy (Jackson et al., 2010; Mageau & Vallerand, 2003). As such, the current study is focused on the extent to which congruence between athlete self-efficacy and CEASE predicts two specific outcomes identified within previous literature: coach-athlete relationship quality and athlete anxiety.

Coach-Athlete Relationship Quality

Researchers have found that efficacy perceptions predict levels of closeness, commitment

and complementarity within the coach-athlete relationship (Jackson & Beauchamp, 2010b; Jackson et al., 2007) and for this reason the first outcome variable investigated in this study is coach-athlete relationship quality. The 3 + 1C's conceptual model of coach-athlete interactions (Jowett & Cockerill, 2003) is one model that suggests coaches and athletes are subject to interconnected feelings, thoughts and behaviors. According to Jowett and Cockerill, the first three constructs in this model capture key attributes of interconnectedness in the coach-athlete relationship. *Closeness* pertains to the emotional connection of the relationship and the experience of an affective bond between coach and athlete. Expressions such as trust, respect and gratitude can indicate a more positive relationship. *Commitment* reflects the intention of the coach or athlete to maintain their relationship over time. *Complementarity* refers to the interaction between coach and athlete that is cooperative and effective. Behaviors such as being responsive in training and being friendly and at ease indicate positive complementarity in the relationship.

The fourth construct in this model, *co-orientation*, contains two distinct perceptual levels from which coaches and athletes are likely to view, consider, and assess the quality of the relationship (Davis & Jowett, 2014; Jowett & Lavallee, 2007). These perceptual levels include the direct perspective and the meta-perspective. The direct perspective reflects a relationship member's personal thoughts and feelings for the other member (e.g., "I am committed to my coach/athlete"). The meta-perspective reflects a relationship member's effort to perceive the relationship from the other member's perspective (e.g., "My coach/athlete is committed [to me]"). Co-orientation has been found to be an important determinant of the longevity of a coach-athlete relationship (e.g., Jowett & Cockerill, 2003). Isoard-Gautheur et al. (2012) found, for example, that athletes who reported low co-orientation with their coach experienced higher levels of burnout which can lead to termination of both the relationship and the athlete's career in sport. As aforementioned, researchers have found that when efficacy perceptions differ between a coach and an athlete (i.e., low co-orientation) then athletes experience low other-efficacy in their coach, increased anxiety, and decreased relationship satisfaction (Jackson & Beauchamp, 2010a;

Jackson et al., 2007; Jackson et al., 2011). These studies highlight the importance of maintaining similar perceptions of both efficacy and relationship quality within the coach-athlete relationship.

Athlete Anxiety

The second outcome variable investigated in this study is anxiety. Findings from Jackson and Beauchamp (2010a) indicated that athletes who reported discrepancy between their own self-efficacy and CEASE reported feeling higher levels of anxiety. It has been well documented in the literature that excessive levels of anxiety can be detrimental to sporting performance (e.g., Kellmann, 2010). High levels of anxiety can give rise to several physiological symptoms that impact performance such as, palpitations, sweating and upset stomach (Smith et al., 2006). Anxiety can be separated into three separate dimensions, *cognitive anxiety (*i.e., mental element of anxiety), *somatic* (i.e., physiological element of anxiety; Jones et al., 1994) and *concentration disruption* (effect that anxiety has upon concentration; Smith et al., 2006). Within the literature, sources of anxiety have been attributed to the relationship that one has with a coach and the numerous interactions which occur during training and competition (Davis & Jowett, 2014). As aforementioned, Jackson and Beauchamp (2010a) indicted that discrepancies between CEASE and athlete self-efficacy can lead to heightened levels of anxiety. Alongside findings from Davis and Jowett, who found that athletes who reported poor relationships with their coaches experienced greater feelings of negative emotions and higher levels of anxiety, it is plausible to suggest that when a coach underestimates athlete self-efficacy, their athlete may experience higher levels of anxiety. As such, an investigation of congruence between efficacy perceptions and the association with athlete anxiety could contribute a greater understanding of how coaches contribute to athlete anxiety.

Measuring Congruence of Meta-Perceptions

The importance of assessing perceptions and behaviors in coaches and athletes and ensuring those perceptions are similar (i.e., congruent) has been an integral aspect of many relationship and leadership theories (e.g., Multidimensional Model of Leadership; Chelladurai,

2012). The contribution these theories can have to the literature, however, has been limited by the mechanisms used to measure congruence. Co-orientation, as an example, is measured using discrepancy scores of athlete responses and coach responses from the Coach-Athlete Relationship Questionnaire (Jowett & Ntoumanis, 2004). That is, the athlete's response is subtracted from the coach's response to represent the distance between the two responses. However, previous literature highlights problems arising from using discrepancy scores to measure congruence (e.g., Edwards & Cable, 2009; Riemer & Chelladurai, 1995). Discrepancy scores are typically considered *directionless* due to treating positive and negatives scores the same, which does not take into account if the coach score is higher or lower than the athlete score. The direction of discrepancy is important because of the hierarchy between coach and athlete (Jackson et al., 2010; Mageau & Vallerand, 2003). As such, interpretations of the data are limited because the complexity of the relationship between the two variables (i.e., interactive effects) is not represented.

Within organization literature, a key method used to evaluate congruence within relationships is the use of polynomial regression and surface level plotting (Edwards & Perry, 1993) which provides numerical and visual representation of the relationship between two variables. Arthur and Bastardoz (2021) have recently suggested that researchers should apply polynomial regression and associated surface modeling to test congruence in sport. Polynomial regression allows researchers to examine the extent to which combinations of two predictor variables (e.g., high athlete self-efficacy and low CEASE) relate to an outcome variable (e.g., relationship perceptions), particularly in the case when the discrepancy (difference) between the two predictor variables is a central consideration. This approach is beneficial for a number of reasons. First, direct effects of athlete self-efficacy and CEASE are still apparent without having to refer to different analyses. Second, results provide estimates for the relationship between athlete self-efficacy and CEASE as their own individual component and not as a product of the original component. Finally, the polynomial regression allows for interpretation of congruence at

different levels. That is, congruence at low levels (i.e., low CEASE and low athlete self-efficacy), congruence at high levels (i.e., high CEASE and high athlete self-efficacy) or incongruence (e.g., high CEASE and low athlete self-efficacy) are not necessarily equivalent and may be associated with relationship perceptions differently. For example, low self-efficacy and high CEASE may negatively predict relationship quality as a coach may think that an athlete is confident and, therefore, provides less instructional feedback and support. This in turn may diminish an athlete's perceived relationship quality. Polynomial regression allows for interpretation of how congruence at different levels of efficacy uniquely impacts relationship quality and athlete anxiety.

Unfortunately, polynomial regression has been limited in its use within sport psychology literature. One exception is Stein et al.'s (2012) study on the effect of congruence between perceived and preferred coach feedback on the motivational climate. This study, however, included only athlete perceptions. Outside of sport settings, Laird and De Los Reyes (2013) found that, between the use of interaction, difference scores, and polynomial regression, only polynomial regression analyses were able to determine that discrepancies between parent-adolescent dyads predicted adolescents' psychopathology. Polynomial regression provides a novel approach to determine how congruence of efficacy beliefs may impact the coach-athlete relationship and athlete anxiety.

Purpose and Hypotheses

Drawing from the literature on relational efficacy beliefs (Lent & Lopez, 2002) and meta-accuracy (Jowett & Lavallee, 2007), we hypothesized that congruence between athlete self-efficacy and CEASE would predict both athlete and coach relationship perceptions (closeness, commitment, complementarity), with congruence at higher levels of efficacy predicting greater relationship quality relative to congruence at lower levels. We also hypothesized that incongruence between athlete self-efficacy and CEASE would predict athlete anxiety. Specifically, we expected to see lower levels of CEASE and higher levels of athlete self-efficacy associated with increased athlete cognitive anxiety, somatic anxiety and concentration disruption.

Method

Participants

Seventy-one coach-athlete dyads, involved in their relationship for a minimum of one season, participated in the current study. The mean duration of the relationships for these participants was 4 years (*SD* = 1.68) and on average, these pairs spent 5.79 hours per week in face-to-face contact time. Athletes reported participating in the individual sports of triathlon (56.3%), gymnastics (12.7%), cycling (8.5%), swimming (7%), running (7%), tennis (4.2%), golf (2.8%) and athletics (1.4%). The athletes (31 males, 40 females) had a mean age of 26.59 years (*SD* = 10.18) and had been participating in their sport for a mean of 7.37 years (*SD* = 5.28). The self-reported highest competitive level of athlete involvement was international (40%), national (23.9%), university (2.8%), or age-group (2.4%; a category in cycling, swimming and triathlon comprised of athletes competing internationally against others of a similar age; e.g., 20–30 year old category). Coaches (43 males, 18 females) involved in the study prescribed the majority of the athletes' training activities and had been coaching in their sport for a mean of 16.80 years (*SD* = 11.19). The sample of 71 dyads included two coaches who provided responses for three athletes and six coaches who provided responses for two athletes. Coaches who reported for more than one athlete did not coach athletes at the same training sessions. Previous literature containing effect sizes specific to CEASE do not exist (e.g., Fefer et al., 2018; Gjesdal et al., 2019; Harman & Doherty, 2017; Human et al., 2016; Kaplan et al., 2020; Rodrigues et al., 2020; Stein et al., 2012). This does not allow for conducting a power analysis to estimate a required sample size. Instead, we aimed for 70 dyads because previous research utilizing dyad samples to examine relational efficacy beliefs (i.e., self-efficacy, other-efficacy, RISE) has included samples of 60–74 dyads (e.g., Jackson & Beauchamp, 2010b, Jackson et al., 2011, Habeeb et al., 2019).[1]

[1] While there is no clear consensus on how to conduct power analyses for polynomial regression, Chen et al. (2012) indicates you can conduct a traditional power analysis using the inputs from the polynomial regression.

252 **Measures**

253 ***Self-efficacy and CEASE.*** Athlete self-efficacy was measured using a 15-item
254 questionnaire developed by Jackson et al. (2011) for use with individual sport athletes. In this
255 unidimensional measure, athletes were asked to rate their confidence in their ability relative to
256 each item on a Likert-type scale ranging from 1 *(no confidence at all)* to 5 *(complete confidence)*.
257 Example items included, "to what extent are YOU confident to perform all technical tasks" and
258 "to what extent are YOU confident to stay mentally strong during competition." The coefficient
259 alpha for data obtained with this measure in the present study was .86.

260 CEASE data were obtained by asking the coaches to estimate their athletes' self-efficacy
261 by responding to the same 15 efficacy items used to obtain athlete self-efficacy data. In line with
262 previous studies assessing multiple types of efficacy beliefs simultaneously (e.g., Jackson et al.,
263 2011; Habeeb et al., 2017, 2019), CEASE measurement with the 15 items was afforded by
264 adjusting the stem statement. Specifically, coaches were asked to estimate the athlete's
265 confidence in their ability relative to each item on a Likert-type scale ranging from 1 *(no*
266 *confidence at all)* to 5 *(complete confidence)*. Example items included, "to what extent is YOUR
267 ATHLETE confident to perform all technical tasks" and "to what extent is YOUR ATHLETE
268 confident to stay mentally strong during competition." The coefficient alpha for data obtained
269 with this measure in the present study was .90.

270 ***Relationship perceptions.*** Athletes' and coaches' perceptions of relational
271 interconnectedness were measured using The Coach-Athlete Relationship Questionnaire (CART-
272 Q; Jowett & Ntoumanis, 2004). Coaches and athletes were asked to respond to statements about
273 their thoughts "during training and competition" on an 11-item scale which assessed three
274 dimensions of interconnectedness. CART-Q items include statements that assess the dimensions
275 of closeness (3 items; e.g., "I like my coach/athlete"), commitment (4 items; e.g., "I feel

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Following Chen et al., our power estimations (conducted post hoc) using this method returned effect sizes ranging from .34 to .58 resulting in an observed power of .95. Post-hoc power analyses for anxiety indicted effect sizes ranging from .17 to .18, resulting in an observed power of .82.

committed to my coach/athlete") and complementarity (4 items; e.g., "When I am coached by my coach/When I coach my athlete, I am ready to do my best"). Responses were provided on Likert-type response scales ranging from 1 (*strongly disagree)* to 5 (*strongly agree).* The coefficient alphas for data obtained on the subscales in the present study ranged from .77–.79 for the athletes and .77–.78 for the coaches.

Athlete Anxiety. Athlete trait anxiety was measured using the Sport Anxiety Scale-2 (SAS-2; Smith et al., 2006). Athlete participants recorded their responses on a 15-item scale which assessed the three dimensions of anxiety. SAS-2 items include statements that assess dimensions of cognitive anxiety (5 items; e.g., "I worry that I will let others down"), somatic anxiety (5 items; e.g., "my muscles feel shaky"), and concentration disruption (5 items; e.g., "I lose focus"). Participants recorded their responses to items on a 5-point Likert-type scale anchored by 1 (*not at all*) to 5 (*very much*). The coefficient alphas for data obtained on the subscales in Smith et al. (2006) ranged from .84–.89 and in the present study from .87–.89.

Procedures

After receipt of Institutional Review Board (IRB) clearance, invitations to participate in this study were extended to coaches and athletes via email or in person at training sessions. Dyads volunteering to participate in the study underwent informed consent procedures and, when appropriate, parental consent for athletes under 18 years of age (n = 3). Questionnaire packs were distributed to athletes and coaches via two delivery methods. Paper copies were distributed and completed at training sessions (n = 94) and electronic copies were distributed and completed via email (n = 48). Both methods involved the questionnaire pack being returned directly to the researcher upon completion. Coaches who responded to multiple athletes in the study completed a separate questionnaire for each individual athlete.

Analyses

Data were prepared using IBM SPSS 26 statistics and occurred in five phases. The first stage involved checking the data for homoscedasticity and normality of residuals assumptions.

The second phase involved preliminary analyses generating coefficient alpha statistics for the measures, and calculation of univariate descriptive statistics and bivariate intercorrelations (with interpretation of correlations as .10 for small, .30 for moderate, .50 for large; Taylor, 1990). The third phase involved inferential comparisons of means of coach and athlete scores on relationship closeness, commitment and complementarity using three independent samples t-tests (with interpretation of Cohen's d values as 0.20 for small, 0.50 for moderate, 0.80 for large; Fritz et al., 2012). Bonferroni correction procedures were employed to manage risk of type-1 error inflation in the family of comparisons ($\alpha_{\text{altered}} = .02$). Calculations for any similarities within the data also occurred in the third phase, using suggestions from Grawitch and Munz (2004), for determining significant levels of similarity in the data.

Polynomial Regression Analyses

The fourth and fifth phase of analyses involved, respectively, polynomial regression analyses and the plotting of response surface depictions of interactions as described subsequently. Nine polynomial regression analyses were conducted to examine the main effects of athlete self-efficacy and CEASE and the presence of congruence between athlete self-efficacy and CEASE (i.e., the interaction) on the three coach relationship perceptions (i.e., closeness, commitment and complementarity), the three athlete relationship perceptions (i.e., closeness, commitment and complementarity), and three dimensions of athlete anxiety (i.e., somatic, cognitive and concentration disruption). The polynomial regression equation used in our analyses was $Y = b_0 + b_1SE + b_2CEASE + b_3SE^2 + b_4(SE*CEASE) + b_5CEASE^2 + e$ where Y represents relationship constructs (e.g., the 3C's) and SE and CEASE represent athlete self-efficacy and CEASE, respectively. These analyses were conducted on scale-centered scores of athlete self-efficacy and CEASE (Edwards & Cable, 2009).

Finally, response surface plots were created to depict significant interactions between athlete self-efficacy and CEASE in the prediction of each of the nine dependent variables. These three-dimensional response surface plots were obtained using unstandardized coefficients

obtained in the polynomial regressions as recommended by Edwards and Cable (2009). Athlete self-efficacy and CEASE were plotted relative to the two horizontal axes while the dependent variable was plotted relative to the vertical axis. In these plots, the horizontal plane of the graph comprises of two diagonal lines used for reference in determining the shape and direction of congruence and incongruence on a dependent variable. The congruence (i.e., solid) line signifies at what points on the graph that athlete self-efficacy and CEASE perceptions are equal. The incongruence (i.e., dashed) line signifies at what points on the graph athlete self-efficacy and CEASE perceptions differ. Within the graphical plots three conditions specify the presence (Condition 1) and shape (Conditions 2 and 3) of the graph, which indicates the relationship between the independent variables. When all conditions are fully satisfied (i.e., perfect congruence) the graphical depiction of the relationship will show a perfect inverted U-shaped 3D graph.

Condition 1 is derived from beta values obtained in the regression analyses and use the following equations: incongruence curvature line = (b_3 - b_4 + b_5), slope = (b_1 – b_2), while the congruence line is derived from curvature = (b_3 + b_4 + b_5), slope = (b_1 + b_2). In this condition, the value of the incongruence line will be negative. This negative curve indicates a decrease in the dependent variable scores when athlete self-efficacy and CEASE perceptions are significantly different. Condition 1 must be satisfied to show support for congruence. Failure to support this first condition indicates there is no support for the congruence hypothesis. In Condition 2, the peak of the graph along the congruence (i.e., solid) line will be maximized at all points when athlete self-efficacy and CEASE perceptions are equal (Edwards & Cable, 2009). When this condition is satisfied, the graphical plot illustrates that when efficacy perceptions are congruent, relationship quality will be at the highest. This condition does not have to be satisfied to support congruence but illustrates the shape of the curve. In Condition 3, the surface along the congruence (i.e., solid) line should be flat meaning that the level of the dependent variable is the same regardless of efficacy perceptions scores. Condition 3 also describes the shape of the

relationship and does not have to be satisfied to infer congruence. When plotted on a graph, each corner of the figure reflects a different combination of athlete self-efficacy and CEASE. As Shanock et al. (2010) explained, the right corner illustrates when CEASE ratings are low and athlete self-efficacy ratings are high, and the left corner illustrates when CEASE ratings are high, and athlete self-efficacy ratings are low. The front corner of the graph illustrates low athlete self-efficacy and low CEASE while the back corner illustrates high athlete self-efficacy and high CEASE (i.e., congruence). When interpreting results from the figures, we used the lower third of the scale to describe low efficacy ratings (ratings from -3 to -5) and the upper third of the scale to describe high efficacy ratings (ratings from 3 to 5).

Results

No violations of the homoscedasticity and normality of residuals assumptions were observed. Correlations and descriptive statistics among study variables are displayed in Table 1. Inspection of this table reveals that the correlation between athlete self-efficacy and CEASE was positive and moderate (r =.46, p = .004). As expected, correlations between athlete self-efficacy and all dependent variables were positive (r = .26 –.67), with the exception of athlete anxiety dimensions ($r_{somatic}$ = -.21, $r_{cognitive}$ = -.37, $r_{concentration\ disruption}$ = -.40). The correlations between CEASE and all dependent variables were positive (r = .02–.71).

Inferential comparisons of efficacy perceptions between coach and athlete responses revealed that athletes reported significantly higher levels of self-efficacy (M = 4.21) compared to their coaches' estimation of their self-efficacy (M = 4.01; t(140) = 2.46, p = .015, d =*0*.04). Inferential comparisons of responses on relationship quality variables revealed that athletes perceived significantly higher levels of relational closeness (M = 4.39) compared to their coaches (M = 4.07; t(140) = 2.71, p = .008, d = 0.04). Non-significant differences were observed across athletes' and coaches' levels of commitment (t(140) = 0.35, p = .725, d = 0.006), and complementarity (t(140) = 1.57, p = .119, d = 0.03).

Athlete Relationship Perceptions. Assessment of the similarity among coach

relationship perceptions among the sample of coaches with multiple athletes indicated there was not a significant amount of within-coach variance in the sample of 18 coaches for the athlete relationship perceptions (F = 0.68 – 1.14, p = .342 - .685; Grawitch & Munz, 2004). Polynomial regression results and incongruence effects for athlete relationship perceptions are displayed in Table 2. The main effects of athlete self-efficacy in the prediction of athlete relational perceptions were all significant ($B_{closeness}$ = 3.60, $B_{commitment}$ = 3.30, $B_{complementarity}$ = 2.90; p < .001). The main effects of CEASE in the prediction of athlete relational perceptions were all non-significant ($B_{closeness}$ = -0.47, $B_{commitment}$ = -0.30, $B_{complementarity}$ = -0.43; p = .46–.57). This indicates athlete perceptions of closeness, commitment, and complementarity were predicted by athlete self-efficacy, but not CEASE. Inspection of Table 2 reveals congruence of athlete self-efficacy and CEASE predicted athletes' relationship perceptions. Specifically, the curvature along the incongruence line between athlete self-efficacy and CEASE was negative and significant for athlete perceptions of closeness (incongruence curvature = -0.21., p = .045) and athlete perceptions of commitment (incongruence curvature = -0.44., p = .009), providing support for Condition 1 of the congruence analyses. Conditions 2 and 3 were not satisfied for athlete perceptions of closeness and commitment, indicating *perfect* congruence was not present. The incongruence line between athlete self-efficacy and CEASE was negative trending towards significance for athlete perceptions of complementarity (incongruence curvature = -0.04, p =.052).

Figure 1 presents the 3D depiction of the congruence between athlete self-efficacy and CEASE in the prediction of athlete perceptions of closeness (Panel A), commitment (Panel B), and complementarity (Panel C). As depicted in Panel A and Panel B, athlete perceptions of closeness and commitment were strongest when athlete self-efficacy and CEASE were both at the highest point on the graph (i.e., there is congruence at higher levels of efficacy). Athlete perceptions of closeness and commitment were weakest when athlete self-efficacy and CEASE are both at the lowest point on the graph (i.e., congruence at lower levels of efficacy). As

depicted in Panel C, athlete perceptions of complementarity were strongest when athlete self-efficacy and CEASE are congruent regardless of the level of efficacy. Weaker athlete perceptions of complementarity arise when incongruence is present, with the weakest perceptions of complementarity occurring when athlete self-efficacy is low, and CEASE is high.

Coach Relationship Perceptions. Assessment of the similarity among coach relationship perceptions among the sample of coaches with multiple athletes indicated there was a significant amount of within-coach variance in the sample of 18 coaches. Given Kenny et al. (2002) suggests using a more liberal p-value to determine significance (e.g., $p = .20$), caution is warranted when interpreting the results for coach closeness ($F = 1.64$, $p = .130$), coach commitment ($F = 1.91$, $p = .130$), and coach complementarity ($F = 4.85$, $p < .001$; Grawitch & Munz, 2004). Polynomial regression results and incongruence effects for coach relationship perceptions are displayed in Table 2. Main effects for athlete self-efficacy in the prediction of coach relational perceptions in each of the regression analyses were all non-significant ($B_{closeness} = 0.66$, $B_{commitment} = -0.87$, $B_{complementarity} = 0.32$; $p = .17$-$.64$). Main effects for CEASE in the prediction of coaches' relational perceptions in each of the regression analyses were significant for commitment ($B = 0.88$, $p = .004$) and complementarity ($B = 1.20$, $p = .001$), but not closeness ($B = 0.98$, $p = .079$). This indicates perceptions of commitment and complementarity were predicted by CEASE but not athlete self-efficacy. Inspection of Table 2 reveals congruence of athlete self-efficacy and CEASE did not predict coaches' relationship perceptions. Specifically, the curvature along the incongruence line between athlete self-efficacy and CEASE was positive and non-significant for coach perceptions of commitment (incongruence curvature = .20, $p = .613$), complementarity (incongruence curvature = -.28, $p = .409$) and athlete perceptions of closeness (incongruence curvature = .75, $p = .593$). Because all congruence lines were non-significant (i.e., Condition 1 was not satisfied), no support for congruence of efficacy beliefs in predicting coach relationship perceptions was found. Graphical depictions of these non-significant interactions are not presented.

Athlete Anxiety. Polynomial regression results and incongruence effects for athlete anxiety are displayed in Table 2. Main effects for athlete self-efficacy in the prediction of athlete trait anxiety in each of the regression analyses were all non-significant ($B_{\text{cognitive}}$ = 1.27, B_{somatic} = 1.89, $B_{\text{concentration disruption}}$ = -.46; p = .11-.17). Main effects for CEASE in the prediction of athlete trait anxiety in each of the regression analyses were all non-significant ($B_{\text{cognitive}}$ = -.60, B_{somatic} = .90, B_{worry} = -.60, $B_{\text{concentration disruption}}$ = .79; p = .12-.16). This indicates that athlete anxiety subscales were not predicted by athlete self-efficacy or CEASE. Inspection of Table 2 reveals for all anxiety subscales the curvature along the incongruence line between efficacy perceptions is negative and non-significant (somatic incongruence curvature = -.15, p = .302; cognitive incongruence curvature = -2.31, p = .630). The curvature along the incongruence line between efficacy perceptions and concentration disruption was positive and non-significant (incongruence curvature = .01, p = .854). Because all congruence lines were non-significant (i.e., Condition 1 was not satisfied), no support for congruence of efficacy beliefs in the prediction of athlete anxiety was found. Graphical depictions of these non-significant interactions are not presented.

Discussion

The purpose of this study was to assess the extent to which congruence of athlete self-efficacy and Coach Estimation of Athlete Self-Efficacy (CEASE) is predictive of coach-athlete relationship quality and athlete anxiety. Main effects revealed that CEASE significantly predicted coach perceptions of relationship quality while athlete self-efficacy predicted athlete perceptions of relationship quality. Congruence between athlete self-efficacy and CEASE positively predicted athletes' perceptions of relationship quality, partially supporting the first hypothesis. None of the efficacy beliefs, or their congruence, predicted athlete anxiety, in contrast to the second hypothesis. These findings, in line with Lent and Lopez (2002) and Jackson and Beauchamp (2010a), support the extension of the tripartite network of efficacy beliefs and that athlete perceptions of the coach-athlete relationship are associated with congruence of efficacy beliefs between coach and athlete. The theoretical and applied implications of these findings are

discussed subsequently.

In relation to our first hypothesis, results provide partial support for congruence between athlete self-efficacy and CEASE in the prediction of athletes' perceptions of closeness, commitment and complementarity. Congruence of efficacy perceptions was most prominent in the prediction of an athlete's perception of complementarity. The strongest perception of athlete complementarity occurred when athlete self-efficacy and CEASE were the same, regardless of if the level of efficacy perceptions were high or low. Suggesting that when coaches' CEASE perceptions are more congruent with an athlete's efficacy perception, cooperative and effective interactions can occur, leading to enhanced interpersonal and intrapersonal consequences for the athlete (Jowett & Cockerill, 2003). Further, Jackson et al. (2010) found that personal self-efficacy and other-efficacy, and partner's other-efficacy and RISE predicted complementarity within coach-athlete dyads. Taken together, it seems that complementarity within the coach-athlete relationship depends upon the interaction (e.g., high self-efficacy and low CEASE) of one's own and another's efficacy perceptions.

Results also provided an understanding of how CEASE perceptions that are not the same as athlete self-efficacy are associated with relationship perceptions. Athlete perceptions of closeness and commitment were stronger at high levels of congruence compared to low levels. This was somewhat unsurprising as previous literature has demonstrated that higher efficacy perceptions can enhance perceptions of the coach-athlete relationship (e.g., Jackson & Beauchamp, 2010b; Jackson et al., 2007; Jackson et al., 2009). Of further importance is that the lowest level of relationship perceptions occurred when CEASE is lower than athlete self-efficacy. However, these results are somewhat contradictory with results from Jackson et al. (2007) and Jackson and Beauchamp (2010b) who found that when athletes felt their coach was confident in their ability (i.e., high RISE), this was related to lowered commitment on the part of both dyad members. Our results indicate that when coaches believe an athlete has lower levels of self-efficacy than an athlete reports, relationship commitment is at its lowest. Accordingly, it is

possible that when an athlete detects a lower CEASE appraisal, this in turn diminishes athlete self-efficacy leading to diminished perceptions of the relationship.

Results also showed that CEASE was the only significant predictor of coaches' relationship perceptions providing evidence to support CEASE may influence interactions between coach and athlete through coach perceptions. Interestingly, Jackson et al. (2009) found that some coaches reported that RISE had no effect on their personal functioning but did influence their communication towards athletes. CEASE may be particularly revelant in explaining why coaches communicate differently with their various athletes. A coach may base her communication on her estimation of the athlete's self-efficacy (i.e., CEASE), rather than her belief of how her athlete views her own self-efficacy (i.e., RISE). Because the current framework of efficacy beliefs does not presently incorporate EOSE, the framework may not capture relational processes to the full extent (Troyer & Younts, 1997). This gap is important based on the knowledge provided from the current study indicating that CEASE is associated with coach perceptions of the relationship.

In relation to Hypothesis 2, incongruence between athlete self-efficacy and CEASE did not predict athlete anxiety. Given that current literature has highlighted that negative rapport between coach and athlete can significantly increase athlete anxiety (Baker et al., 2000), it was surprising that incongruence between athlete self-efficacy and CEASE perceptions did not predict athlete anxiety. Kenow and Williams (1999) found that within coach-athlete dyads, athletes who felt more compatible with their coach experienced lower negative cognitive/attentional and somatic effects from their coach's behavior during game situations. Baker et al. (2000) also noted that behaviors that the coach demonstrates relative to competition can be influential in reducing athlete anxiety. As such, the effect of incongruence between athlete self-efficacy and CEASE may be more apparent during competition. However, as data collection for the current study took place during training, anxiety may be lower in training sessions and therefore the lack of variability in anxiety in the current sample may have been difficult to predict.

Of particular importance, the results from polynomial regression analyses allowed for the relationship between athlete self-efficacy and CEASE to be examined in a novel way, not typically used within the sport psychology literature. Previous research regarding coach-athlete relationship meta-accuracy has typically utilized discrepancy scores (e.g., Jowett & Lavallee, 2007). Discrepancy scores have been criticized for not being able to accurately represent the complexity of interactions between independent variables. By using a curvilinear regression model, results from this study provide a way to view different combinations of efficacy score levels (i.e., high athlete self-efficacy and low CEASE compared to low athlete self-efficacy and high CEASE) and the subsequent result that this may have upon dependent variables (i.e., relationship perceptions) that interaction terms and discrepancy scores do not provide. Because our results do not show *perfect congruence,* the use of an interaction would not have precisely depicted the relationship between athlete self-efficacy and CEASE. Considering previous literature has reported that athletes and coaches do not rate each other's efficacy perceptions similarly (e.g., Jackson et al., 2011), we would not expect our results to show perfect congruence. Our results highlight how different levels of discrepancies between efficacy beliefs are associated with an athlete's perception of the relationship, with high CEASE appraisal enhancing an athlete's relationship perception over a low CEASE appraisal. As such, the study provides initial evidence to support how polynomial regression analyses can be used within sport psychology between dyadic relationships to capture the complex interaction between efficacy perceptions.

Our study highlights several practical implications for coaches and athletes. Coach-athlete relationships can be improved by getting coaches and athletes concordant regarding athlete self-efficacy. The more a coach's CEASE belief aligns to an athlete's self-efficacy, the better the coach-athlete relationship will be. Given that the results from this study indicated that, on average, coaches tend to underestimate athletes' self-efficacy beliefs and that the lowest level of relationship perceptions occur when CEASE is lower than athlete self-efficacy, it is important

that coaches are more aware of and aligned to an athlete's self-efficacy beliefs. Strategies to align coach-athlete perceptions include increasing coach-athlete communication about athletes' psychological states. This may help provide a way in which athletes can communicate self-efficacy perceptions and concerns they have regarding their competency (Jackson et al., 2009). Better communications should, in turn, improve coaches' abilities to better estimate their athletes' self-efficacy. Furthermore, in a practical setting, it can be difficult for some coaches and athletes to effectively perceive the multifaceted information that exists within a relationship (Lent & Lopez, 2002). In such instances, coaches may also wish to implement efficacy enhancing strategies such as verbal persuasion and vicarious experiences aimed at increasing athlete self-efficacy (Bandura, 1986). Through actively supporting athlete self-efficacy, CEASE appraisals may increase due to the coach believing that the athlete will be experiencing higher self-efficacy beliefs. By increasing congruence between athlete self-efficacy and CEASE, and improving athlete self-efficacy, athletes may experience greater levels of satisfaction, commitment to the relationship and performance as a result (Jowett & Cockerill, 2003).

Despite the empirical contributions highlighted, it is important to consider the study's limitations. Participants selected the coach or athlete partner they wanted to complete the study with and therefore an element of positive bias may have been present in this selection of participants because athletes and/or coaches are more likely to approach a partner they feel more comfortable with. As such, the current sample may not have accurately represented the full spectrum of coach-athlete dyads because there was a lack of dyads reporting lower relationship quality and/or low efficacy perceptions. However, coaches' CEASE perceptions were significantly lower than athlete self-efficacy indicating that the sample did include coach-athlete dyads who were not perfectly congruent with one another on all aspects. One further limitation was the use of two coaches who provided responses for three athletes and six coaches who provided responses for two athletes. This could potentially introduce non-independence in the data, as coaches with multiple athletes may have rated their athletes very similarly. We

ensured that coaches who reported for more than one athlete did not coach those athletes at the same training sessions to reduce the potential impact in the results. Finally, given the study's design it is not possible to make causal claims. Although our research was guided by theory, it is plausible to suggest that when an individual feels close to their partner (i.e., reports high levels of coach-athlete relationship perceptions), they may experience heightened levels of self-efficacy and therefore the observed relationships may work in the opposite direction (Bandura, 1986; Jackson et al., 2010).

This study provides the foundation for future research to investigate the congruence between efficacy perceptions within dyadic settings, despite study limitations. Given that congruence of athlete self-efficacy and CEASE predicted athletes' perceptions of the coach-athlete relationship, it would be important to determine factors that can affect congruence within both team and individual sports. Specifically, the effect that leadership identity has on aligning efficacy perceptions within both dyadic relationships and team sports would be interesting to determine. Evidence suggests that identity leadership behaviors are important antecedents of team/collective confidence and have indicated that this was primarily achieved by building athletes' identification with their team (Fransen et al., 2016). This is important considering that Lent and Lopez (2002) suggested the possibility that collective efficacy is the sum of self-efficacy and other-efficacy. As such, it would be interesting to determine if certain leadership behaviors are associated with improved congruence of efficacy perceptions.

This study generally supports the importance of CEASE as a meta-perception to be included within relational efficacy beliefs. Results indicated that coaches consistently rated CEASE lower than actual athlete self-efficacy and that CEASE is an important predictor of coach relationship perceptions. Results also provide support for congruence between athlete self-efficacy and CEASE to be a predictor of athlete feelings of closeness, commitment and, most prominently, complementarity. The takeaway message is that effective interactions arise when coaches and athletes are concordant regarding perceptions of athlete self-efficacy.

References

Arthur, C. A., & Bastardoz, N. (2021). Leadership in Sport. *Handbook of Sport Psychology*, 344-371.

Baker, J., Côté, J., & Hawes, R. (2000). The relationship between coaching behaviours and sport anxiety in athletes. *Journal of Science and Medicine in Sport*, *3*(2), 110–119. https://doi.org/10.1016/S1440-2440(00)80073-0

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of Social and Clinical Psychology*, *4*(3), 359–373. https://doi.org/10.1521/jscp.1986.4.3.359

Beauchamp, M. R., & Whinton, L. C. (2005). Self-efficacy and other-efficacy in dyadic performance: Riding as one in equestrian eventing. *Journal of Sport and Exercise Psychology*, *27*(2), 245–252. https://doi.org/10.1123/jsep.27.2.245

Caron, J. (2015). Comparing coaches' and athletes' perceptions of coaching efficacy. (Unpublished thesis). California State University, Long Beach, CA, USA. https://search.proquest.com/docview/1674335257?accountid=10639

Chelladurai, P. (2012). Leadership in sports. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (pp. 111–135). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118270011.ch5

Chen, D. G., Chen, X., Lin, F., Tang, W., Lio, Y., & Guo, Y. (2014). Cusp catastrophe polynomial model: Power and sample size estimation. *Open Journal of Statistics*, 4, 803–813. 10.4236/ojs.2014.410076.

Davis, L., & Jowett, S. (2014). Coach–athlete attachment and the quality of the coach–athlete relationship: Implications for athlete's well-being. *Journal of Sports Sciences*, 1–11. https://doi.org/10.1080/02640414.2014.898183

Edwards, J. R., & Parry, M. E. (1993). On the use of polynomial regression equations as an alternative to difference scores in organizational research. *Academy of Management Journal*, *36*(6), 1577–1613. https://doi.org/10.2307/256822

614 Edwards, J. R., & Cable, D. M. (2009). The value of value congruence. *Journal of Applied*
615 *Psychology*, *94*(3), 654–677. https://doi.org/10.1037/a0014891
616 Evans, M. G., (1985). A Monte Carlo study of the effects of correlated method variance in
617 moderated multiple regression analysis. *Organizational Behavioral and Human Decision*
618 *Process*. 36, 305–323. 10.1016/0749-5978(85)90002-0
619 Fefer, S. A., Ogg, J. A., & Dedrick, R. F. (2018). Use of polynomial regression to investigate
620 biased self-perceptions and ADHD symptoms in young adolescents. *Journal of Attention*
621 *Disorders*, *22*(12), 1113-1122. 10.1177/1087054715573993
622 Fransen, K., Steffens, N. K., Haslam, S. A., Vanbeselaere, N., Vande Broek, G., & Boen, F.
623 (2016). We will be champions: Leaders' confidence in 'us' inspires team members' team
624 confidence and performance. *Scandinavian Journal of Medicine & Science in*
625 *Sports*, *26*(12), 1455–1469. https://doi.org/10.1111/sms.12603
626 Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: current use, calculations,
627 and interpretation. Journal of Experimental Psychology: General, 141(1), 2.
628 Gjesdal, S., Stenling, A., Solstad, B. E., & Ommundsen, Y. (2019). A study of coach-team
629 perceptual distance concerning the coach-created motivational climate in youth
630 sport. *Scandinavian journal of medicine & science in sports*, *29*(1), 132-143.
631 Grawitch, Matthew & Munz, David. (2004). Are Your Data Nonindependent? A Practical Guide
632 to Evaluating Nonindependence and Within-Group Agreement. Understanding Statistics.
633 3. 231-257. 10.1207/s15328031us0304_2
634 Habeeb, C. M. (2020). The tripartite model of relational efficacy beliefs in sport: A scoping
635 review. *International Review of Sport and Exercise Psychology*, 1–26.
636 https://doi.org/10.1080/1750984X.2020.1815233
637 Habeeb, C. M., Eklund, R. C., & Coffee, P. (2017). It depends on the partner: Person-related
638 sources of efficacy beliefs and performance for athlete pairs. *Journal of Sport and*
639 *Exercise Psychology*, *39*(3), 172–187. https://doi.org/10.1123/jsep.2016-0348

Habeeb, C. M., Eklund, R. C., & Coffee, P. (2019). Reciprocal relationships between efficacy and performance in athlete dyads: Self-, other-, and collective constructs. *Journal of Sport and Exercise Psychology*, *41*(3), 147–158. https://doi.org/10.1123/jsep.2018-0248

Harman, A., & Doherty, A. (2017). Psychological contract fulfilment for volunteer youth sport coaches. International Journal of Sport Management and Marketing, 17(1-2), 94-120. 10.1504/IJSMM.2017.083988

Human, L. J., Dirks, M. A., DeLongis, A., & Chen, E. (2016). Congruence and incongruence in adolescents' and parents' perceptions of the family: Using response surface analysis to examine links with adolescents' psychological adjustment. Journal of Youth and Adolescence, 45(10), 2022-2035. 10.1007/s10964-016-0517-z

Isoard-Gautheur, S., Guillet-Descas, E., & Lemyre, P. N. (2012). A prospective study of the influence of perceived coaching style on burnout propensity in high level young athletes: Using a self-determination theory perspective. *The Sport Psychologist*, 26, 282-298.

Jackson, B., & Beauchamp, M. R. (2010b). Efficacy beliefs in coach-athlete dyads: Prospective relationships using actor-partner interdependence models. *Applied Psychology*, *59*(2), 220–242. https://doi.org/10.1111/j.1464-0597.2009.00388.x

Jackson, B., & Beauchamp, M. R. (2010a). Self-efficacy as a metaperception within coach-athlete and athlete-athlete relationships. *Psychology of Sport and Exercise*, *11*(3), 188–196. https://doi.org/10.1016/j.psychsport.2009.12.005

Jackson, B., Beauchamp, M. R., & Dimmock, J. A. (2020). Efficacy beliefs in physical activity settings: Contemporary debate and unanswered questions. In G. Tenenbaum & R.C. Eklund, *Handbook of sport psychology* (4th ed., pp. 57-80). John Wiley & Sons.

Jackson, B., Beauchamp, M. R., & Knapp, P. (2007). Relational efficacy beliefs in athlete dyads: An investigation using actor–partner interdependence models. *Journal of Sport and Exercise Psychology*, *29*(2), 170–189. https://doi.org/10.1123/jsep.29.2.170

Jackson, B., Grove, J. R., & Beauchamp, M. R. (2010). Relational efficacy beliefs and

relationship quality within coach-athlete dyads. *Journal of Social and Personal Relationships*, *27*(8), 1035–1050. https://doi.org/10.1177/0265407510378123

Jackson, B., Gucciardi, D. F., & Dimmock, J. A. (2011). Tripartite efficacy profiles: A cluster analytic investigation of athletes' perceptions of their relationship with their coach. *Journal of Sport and Exercise Psychology*, *33*(3), 394–415. https://doi.org/10.1123/jsep.33.3.394

Jackson, B., Knapp, P., & Beauchamp, M. R. (2009). The coach-athlete relationship: A tripartite efficacy perspective. *The Sport Psychologist*, 23(2), 203–232. https://doi.org/10.1123/tsp.23.2.203

Jackson, B., Myers, N. D., Taylor, I. M., & Beauchamp, M. R. (2012). Relational efficacy beliefs in physical activity classes: A test of the tripartite model. *Journal of Sport and Exercise Psychology*, *34*(3), 285–304. https://doi.org/10.1123/jsep.34.3.285

Jones, G., Hanton, S., & Swain, A. (1994). Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers. *Personality and Individual Differences*, 17(5), 657–663. https://doi.org/10.1016/0191-8869(94)90138-4

Jowett, S, & Cockerill, I. M. (2003). Olympic medalists' perspective of the athlete–coach relationship. *Psychology of Sport and Exercise*, *4*(4), 313–331. https://doi.org/10.1016/S1469-0292(02)00011-0

Jowett, S. & Lavallee, D. (Eds.). (2007). *Social psychology in sport*. Human Kinetics. https://doi.org/10.5040/9781492595878

Jowett, S. & Ntoumanis, N. (2004). The coach-athlete relationship questionnaire (CART-Q): Development and initial validation. *Scandinavian Journal of Medicine and Science in Sports*, *14*(4), 245–257. https://doi.org/10.1111/j.1600-0838.2003.00338.x

Kaplan, S., Winslow, C., Craig, L., Lei, X., Wong, C., Bradley-Geist, J., & Ruark, G. (2020). "Worse than I anticipated" or "This isn't so bad"?: The impact of affective forecasting accuracy on self-reported task performance. Plos one, 15(7),

10.1371/journal.pone.0235973

Kellmann, M. (2010). Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. *Scandinavian Journal of Medicine & Science in Sports, 20,* 95–102. https://doi.org/10.1111/j.1600-0838.2010.01192.x

Kenny, D. A., & DePaulo, B. M. (1993). Do people know how others view them? An empirical and theoretical account. *Psychological Bulletin*, 114(1), 145–161. https://doi.org/10.1037/0033-2909.114.1.145

Kenny, D. A., Mannetti, L., Pierro, A., Livi, S., & Kashy, D. A. (2002). The statistical analysis of data from small groups. *Journal of Personality and Social Psychology, 83,* 126–137. https://doi.org/10.1037/0022-3514.83.1.126

Kenow, L., & Williams, J. M. (1999). Coach-athlete compatibility and athlete's perception of coaching behaviors. *Journal of Sport Behavior*, 22(2), 251-259.

Keh, A. (2019, October 12). Eliud Kipchoge breaks Two-hour Marathon Barrier. Retrieved April 06, 2021, from https://www.nytimes.com/2019/10/12/sports/eliud-kipchoge-marathon-record.html.

Laird, R. D., & De Los Reyes, A. (2013). Testing informant discrepancies as predictors of early adolescent psychopathology: Why difference scores cannot tell you what you want to know and how polynomial regression may. *Journal of Abnormal Child Psychology*, *41*(1), 1–14. https://doi.org/10.1007/s10802-012-9659-y

Lent, R. W., & Lopez, F. G. (2002). Cognitive ties that bind: A tripartite view of efficacy beliefs in growth-promoting relationships. *Journal of Social and Clinical Psychology*, *21*(3), 256–286. https://doi.org/10.1521/jscp.21.3.256.22535

Mageau, G. A., & Vallerand, R. J. (2003). The coach–athlete relationship: A motivational model. *Journal of Sports Sciences, 21*(11), 883–904. https://doi.org/10.1080/0264041031000140374

Patrick Sang on Eliud Kipchoge. (n.d.). INEOS 1:59 CHALLENGE. Retrieved June 8, 2021,

from https://www.ineos159challenge.com/news/patrick-sang-on-eliud-kipchoge/

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. Annual Review of Psychology, 63(1), 539-569. 10.1146/annurev-psych-120710-10045

Riemer, H. A., & Chelladurai, P. (1995). Leadership and satisfaction in athletics. *Journal of Sport and Exercise Psychology*, *17*(3), 276–293. https://doi.org/10.1123/jsep.17.3.276

Rodrigues, F., Macedo, R., Cid, L., Teixeira, D. S., Marinho, D. A., & Monteiro, D. (2020). Sex differences in relationships between perceived coach-induced motivational climates, basic psychological needs, and behavior regulation among young swimmers. Perceptual and Motor Skills, 127(5), 891-911. 10.1177/0031512520926805

Short, S. E., & Short, M. W. (2004). Coaches' assessment of their coaching efficacy compared to athletes' perceptions. *Perceptual and Motor Skills*, *99*(2), 729–736. https://doi.org/10.2466/pms.99.2.729-736

Siemsen E., Roth A., Oliveira P., (2010). Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational Research Methods* 13:456–76. 10.1177/1094428109351241

Smith, R. E., Smoll, F. L., Cumming, S. P., & Grossbard, J. R. (2006). Measurement of multidimensional sport performance anxiety in children and adults: The sport anxiety scale-2. *Journal of Sport and Exercise Psychology*, *28*(4), 479–501. https://doi.org/10.1123/jsep.28.4.479

Stein, J., Bloom, G. A., & Sabiston, C. M. (2012). Influence of perceived and preferred coach feedback on youth athletes' perceptions of team motivational climate. *Psychology of Sport and Exercise*, *13*(4), 484–490. https://doi.org/10.1016/j.psychsport.2012.02.004

Taylor, R. (1990). Interpretation of the correlation coefficient: a basic review. Journal of Diagnostic Medical Sonography, 6(1), 35-39.

Troyer, L., & Younts, C. W. (1997). Whose expectations matter? The relative power of first- and

744 second-order expectations in determining social influence. *American Journal of*

745 *Sociology*, *103*(3), 692–732. https://doi.org/10.1086/231253

Table 1. *Descriptive Statistics and Zero-order Correlations for All Variables*

	M	*SD*	Correlations									
			1	2	3	4	5	6	7	8	9	10
1. Athlete Self-Efficacy	4.21	.46										
2. Coaches Estimation of Athletes Self-efficacy	4.01	.55	.46**									
3. Athlete Closeness	4.39	.68	.67**	.38**								
4. Athlete Commitment	4.64	.55	.56**	.39**	.78**							
5. Athlete Complementarity	4.52	.57	.52**	.24*	.64**	.56**						
6. Coach Closeness	4.07	.77	.39**	.63**	.41**	.33**	.22*					
7. Coach Commitment	4.61	.46	.26*	.66**	.36**	.40**	.16	.56**				
8. Coach Complementarity	4.37	.57	.38**	.71**	.44**	.43**	.23*	.65**	.62**			
9. Anxiety Somatic	2.15	.94	-.21	.24*	-.04	-.02	-.18	.27*	.24*	.10		
10. Anxiety Worry	2.59	.99	-.37**	.10	-.08	-.16	-.21	-.04	.05	-.04	.62**	
11. Anxiety Concentration Disruption	1.64	.69	-.40**	.02	-.34**	-.24*	-.32**	.06	.05	.15	.66**	.46**

Note. N = 71; * indicates significance at $p < 0.05$; ** indicates significance at $p < 0.01$.

Table 2. *Polynomial Regression Results for Perceptions of the Coach-Athlete Relationship and Athlete Anxiety*

	Athlete Relationship Quality			Coach Relationship Quality			Athlete Anxiety		
	Closeness	Commit.	Complement.	Closeness	Commit.	Complement.	Somatic	Cognitive	Con. Disrupt.
Athlete SE	3.56***	3.30***	2.89***	0.66	-0.87	0.32	1.89	1.27	-0.46
CEASE	-0.47	-0.30	-0.43	0.98	0.88***	1.20***	0.90	-0.60	0.79
Athlete SE^2	-0.70**	-0.80***	-0.35	-0.05	0.11	0.03	-0.93	-1.17	-0.04
Athlete SE x CEASE	-0.18	0.04	0.64	-0.21	-0.32	-0.24	0.28	1.01	-0.16
$CEASE^2$	0.31***	0.12	0.55***	0.03	0.33	0.01	-0.29	-0.13	-0.10
Incongruence line									
slope ($b_1 – b_2$)	4.02	3.60	3.32	-0.32	-1.74	-0.78	0.99	1.87	-1.25
Curvature ($b_3 - b_4 + b_5$)	-0.21*	-0.73*	0.84	0.20	0.75	0.28	-1.50	-2.31	0.01
Congruence line									
slope ($b_1 + b_2$)	3.10	3.00	2.55	1.64	0.01	1.41	2.79	0.07	0.32
Curvature ($b_3 + b_4 + b_5$)	-0.56	-0.65	-0.44	-0.22	0.11	-0.20	-0.94	-0.29	-0.30

Note. *$p < .05$, **$p < .01$, ***$p < .001$; SE = Self-Efficacy; CEASE = Coach Estimation of Athlete Self-Efficacy; Commit; = Commitment. Complement. = Complementarity; Con. Disrupt. = Concentration Disruption.

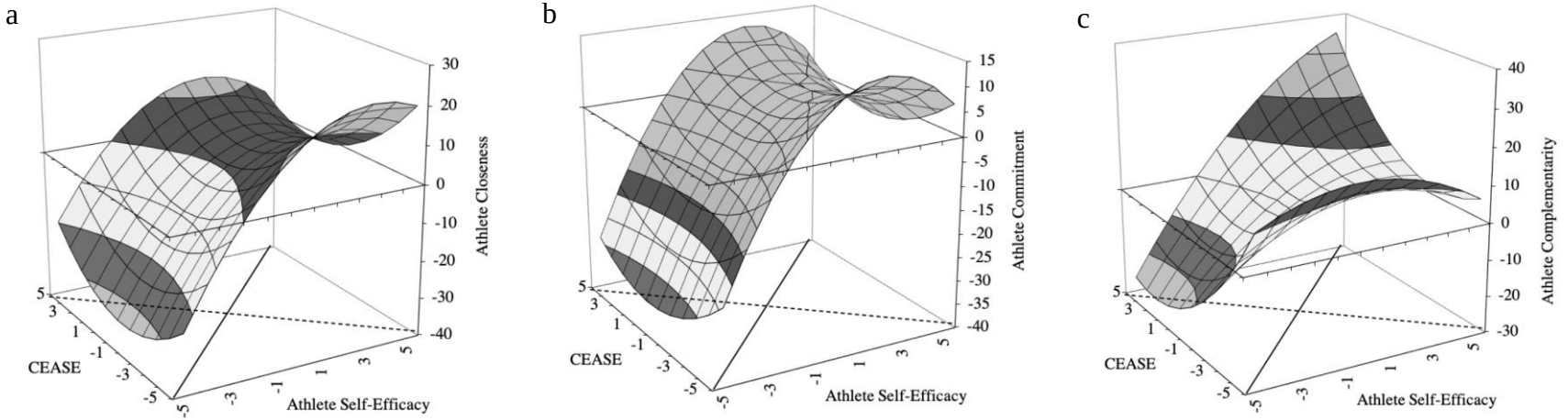

Figure 1. Surface Response Plot of Interaction between Athlete Self-Efficacy and CEASE on Athlete Relationship Perceptions. *Note.* Figure represents predicted values based upon unstandardized regression coefficients. CEASE represents coach estimation of athlete self-efficacy. Predictors are centered on the midpoint of the scale. The line of congruence (solid line) reflects cases where values of athlete self-efficacy and CEASE perfectly match, at all levels of the scale. The line of incongruence (dashed line) represents cases where values of athlete self-efficacy are the opposites of values of CEASE.