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Reciprocal Relationships between Efficacy and Performance in Athlete Dyads: Self, Other, and Collective Constructs

Christine M. Habeeb
College of Health and Human Performance
East Carolina University, Greenville, NC, USA

Robert C. Eklund
College of Education
Florida State University, Tallahassee, FL, USA

Pete Coffee
Faculty of Health Sciences and Sport
University of Stirling, Stirling, UK

Correspondence:
Christine Habeeb, PhD
College of Health and Human Performance
East Carolina University
160 Minges Coliseum, NC, USA 27858
Tel: 1 (252) 737 - 2395
Email: habeebc18@ecu.edu

Abstract

This study's purpose was to evaluate the unique contributions of self-, other-, and collective constructs in the efficacy-performance reciprocal relationship for athlete dyads involving low- and high-dependence roles. Data were obtained from 74 intact cheerleading pairs on self-, other-, and collective efficacy and subjective performance evaluations for each of five successive trials. Objective assessments of dyad performances were obtained from digital recordings. Across path-models involving a single efficacy construct, similar reciprocal relationships between objective dyad performance and self-, other-, or collective efficacy were observed. In path-models comprised of multiple efficacy or performance constructs, unique efficacy contributions were observed in the prediction of objective dyad performance, and unique subjective performance contributions were observed in the prediction of efficacy beliefs. Partner effects were observed more often for athletes in the high-dependence role than for those in the low-dependence role. Findings support how self-, other-, and collective beliefs are processed by team athletes.

Keywords: self-efficacy, other-efficacy, collective efficacy, dyad, asymmetric dependence, objective performance

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In theory, the best performances occur when athletes have strongly positive efficacy beliefs. For athletes performing in a team, however, evaluations of personal capabilities (i.e., self-efficacy; Bandura, 1977) can have weaker relationships to performance because personal success is partially dependent on factors such as how a teammate performs (Bandura, 1997). As such, self-efficacy theory has been extended to include beliefs about a specific teammate's capabilities (i.e., other-efficacy; Lent & Lopez, 2002) and beliefs about a team's conjoint capabilities (i.e., collective efficacy; Bandura, 1997). All three types of efficacy beliefs share commonality in their positive, moderate relationship to sport performance (Moritz, Feltz, Fahrbach, & Mack, 2000; Stajkovic, Lee, & Nyberg, 2009; Stonecypher, Blom, Johnson, Bolin, & Hilliard, 2018). Self-efficacy, other-efficacy, and collective efficacy are each a moderate predictor of performance; and, in turn, self-performance, other-performance, and collective performance are each a moderate predictor of the respective efficacy beliefs. Despite these advances from research focused on testing the efficacy and performance constructs independently, it is emphasized in efficacy theory that self-, other-, and collective constructs operate simultaneously (Bandura, 1997; Lent & Lopez, 2002). Simultaneous evaluations of the efficacy and performance constructs, as argued by Myers (2014), are a better reflection of a team athlete's actual thought processes and performance behaviors. Moreover, efficacy beliefs are subject, in part, to an athlete's level of dependence on others while performing in his or her role and should be examined in respect to the variability of dependence (Bray, Brawley, & Carron, 2002). The purpose of this study was to evaluate the unique contributions of self-, other-, and collective constructs in the efficacy-performance reciprocal relationship for athlete dyads comprised of a low- and high-dependence role.

Self-efficacy, other-efficacy, and collective efficacy have similar definitions that refer to a belief in a capability to produce a given level of performance on a specific task (Bandura, 1977, 1997; Lent & Lopez, 2002). The efficacy constructs differ only by whom the belief is targeted towards; self-efficacy is about personal capabilities; other-efficacy is about a specific teammate's capabilities; and collective efficacy is about a team's collective capabilities. The characterizations of the efficacy beliefs also include parallel cyclical relationships involving similar antecedents (i.e., prior performance, verbal persuasion, vicarious experience, and physiological and emotional states) and consequences (i.e., motivation, enjoyment, and performance). Several studies, perhaps unsurprisingly, show correlations among athletes' self-, other-, and collective efficacy beliefs that are positive and moderately strong in magnitude (e.g., *r*'s = .63 - .76; Beauchamp & Whinton, 2005; Magyar, Feltz, & Simpson, 2004). Beyond these associations, Bandura (1997) and Lent and Lopez (2002) theorize that the efficacy constructs simultaneously influence one another. Athletes may have self-efficacy beliefs because of other- and collective beliefs; other-efficacy beliefs because of self- and collective beliefs; and collective efficacy beliefs because of self- and other-beliefs (Damato, Grove, Eklund, & Cresswell, 2008; Dunlop, Beatty, & Beauchamp, 2011; Jackson, Beauchamp, & Knapp, 2007; Magyar et al., 2004). As a result of these interactions, it may be difficult for athletes performing conjointly with a teammate to isolate their self-, other-, and collective beliefs from one another. The constructs' independently established relationships with performance may potentially be redundancies of one another when they are examined simultaneously.

Research utilizing samples of dyad athletes have provided some evidence for unique contributions of self-, other-, and collective constructs in the efficacy-performance reciprocal relationship. Elite athlete dyad members identify the most common source of self-efficacy to be past individual achievements, but also acknowledge that other and collective abilities inform their evaluations of self-efficacy (Jackson, Knapp, & Beauchamp, 2008). Similarly, these athletes report other-efficacy beliefs are mostly evaluated based on their partner's past performances, but past experiences and performances as a dyad are also considered. When other-efficacy is examined alongside self-efficacy in the prediction of dyad performance, personal and collective achievements are uniquely influenced by other-efficacy, above and beyond the unique contributions of self-efficacy (Beauchamp & Whinton, 2005; Dunlop et al., 2011). While overlap exists among the three constructs, concordant efficacy and performance measures are expected to have the strongest associations (Moritz et al., 2000).

One feature that is defining of an athlete dyad, yet has been mostly overlooked in previous research, can be found in how the implicated performance roles are related to one another (Bray, et al., 2002; Gaudreau, Fecteau, & Perreault, 2010). For some pairs, classified as dyads with *exchangeable roles*, the athletes perform in very similar roles that are equal in personal dependence on the partner (e.g., doubles tennis; Kenny, Kashy, & Cook, 2006). In contrast, dyads with *distinguishable roles* (e.g., pair skating) are comprised of two athletes performing in very distinct performance roles, with each of the roles being associated with a different level of dependence on the partner. One member of the dyad is more dependent on their partner (i.e., performs in a *high-dependence role*) than the other member (i.e., performs in a *low-dependence role*). In the current study we focused on athlete dyads with distinguishable roles because the asymmetrical dependence in these types of partnerships implicates differences in each athletes' psychological functioning, including the formation of efficacy beliefs (Katz-Navon & Erez, 2005; Snyder & Stukas, 1999).

Efficacy beliefs, as argued by Snyder and Stukas (1999), emerge in respect to athletes' performance roles because of the varying attentional foci implicated in the different performance roles. More specifically, athletes' performance roles are linked to interdependent functions that effectively regulate their attention during performance, and hence the person-related information available in the formation of efficacy beliefs (Bray et al., 2002). For example, performing in a low-dependence role requires, relatively speaking, a minimal degree of reaction to a teammate and, as a consequence, provides an opportunity to focus attention on personal performance quality. Reacting to and/or coordinating with a teammate while performing in a high-dependence role, however, requires close attention to that teammate’s behavioral cues during performance (Fiske, 1993). Habeeb, Eklund, and Coffee's (2017) examination of cheerleaders performing in their low- or high-dependence role in two-person stunt-tasks has helped clarify these links. They found that bases performing in a low-dependence role, tended to report self-, other-, and collective efficacy beliefs at a consistent level regardless of whom their partner was, while flyers, performing in a high-dependence role, tended to report self-, other-, and collective efficacy beliefs at a certain level based on their partner’s abilities. This was interpreted to indicate that athletes performing in a low-dependence role (i.e., bases) and a high-dependence role (i.e., flyers) had attentional foci that were, respectively, more *self-oriented* and *other-oriented*. The self- and other-orientations of attention, each linked to a performance role, may potentially impact on the extent to which self, other, and collective constructs uniquely contribute to the efficacy-performance reciprocal relationship, but this has yet to be examined.

Reciprocity in the efficacy-performance relationship has often been tested using repeated-measures study designs (Heggestad & Kanfer, 2005). Feltz (1982), for example, conducted a study requiring participants to report their self-efficacy prior to each of four successive trials of a back-diving task to analyze the unique contribution of self-efficacy in the prediction of performance, and the unique contribution of performance in the prediction of self-efficacy. Researchers (Bandura, 1997; Bandura & Locke, 2003; Heggestad & Kanfer, 2005; Vancouver, Thompson, & Williams, 2001), however, have strongly urged cautious interpretation of reciprocity in the efficacy-performance relationship in these types of studies because common variance explaining self-efficacy and performance will bias prediction estimates (for review see Feltz, Chow, & Hepler, 2008; Heggestad & Kanfer, 2005). In response to these assertions, Feltz et al. (2008) reanalyzed data from Feltz' (1982) back-diving study to compare several statistical approaches that descriptively test for unique contributions of past performance and efficacy in the prediction of performance. Their results suggest it is most appropriate to minimize common variance amongst predictors by residualizing the efficacy and performance predictor variables. This approach, Residualized Past Performance-Residualized Self-Efficacy Modeling (RPPRSEM; Feltz et al., 2008), was then later adopted by LaForge-MacKenzie and Sullivan (2014) to examine the efficacy-to-performance and performance-to-efficacy predictive directions. The aim to minimize common variance in RPPRSEM provides a framework for examining the extent to which (a) self-, other-, and collective efficacy uniquely contribute to the prediction of performance and (b) self-, other-, and collective performance uniquely contribute to the prediction of efficacy.

To date, an investigation requiring both athletes in a pair to report their self-, other-, and collective efficacy beliefs and subjective performance evaluations during repeated trials of a two-person task (that is also objectively assessed) has not, to the best of our knowledge, been conducted. Such an investigation would extend previous findings involving measures from only one member of a dyad (e.g., Beauchamp & Whinton, 2005), and quantitatively substantiate extant qualitative and case-study evidence (e.g., Jackson et al., 2008; Stonecypher et al., 2018). When predicting dyad athletes' outcomes, RPPRSEM requires modification because personal outcomes are mutually influenced by oneself (i.e., *actor effects*) and the other member of the dyad (i.e., *partner effects*; Kenny et al., 2006). A common statistical approach used to capture actor and partner effects is termed Actor-Partner Interdependence Modelling (APIM; Kashy & Kenny, 2000; Kenny, 1996). APIM offers advantages to examining dyads because the actor and partner effects predicting both partners' outcome variables are simultaneously estimated. When employed with distinguishable dyads, the size of actor and partner effects can be compared across members to determine directions of influence in the dyad (Kenny & Cook, 1999). The presence of larger partner effects for one member of the dyad is a numerical indicator of asymmetrical dependence (Kenny et al., 2006). In coach-athlete dyads, for example, larger partner effects tend to be observed for athletes' outcomes (e.g., Jackson, Grove, & Beauchamp, 2010; Stebbings, Taylor, & Spray, 2016). APIM would also be useful to investigate the proposed role differences in athlete dyads with distinguishable roles by examining the magnitude of partner effects across an efficacy-performance reciprocal chain (Gaudreau et al., 2010). To afford this end, an approach grounded in Feltz' (1982) original path analysis and Feltz et al.'s (2008) re-analysis using RPPRSEM was adapted for distinguishable athlete dyads using APIM.

In the current study, athletes' reports of efficacy and performance were obtained across five trials of a two-person cheerleading stunt-task. To examine the reciprocal effects of the self-, other-, and collective constructs independently and simultaneously, we estimated two sets of path models. The first set of path models each utilized a single efficacy construct and objective performance; that is, three separate path models were estimated to evaluate reciprocal relationships between, respectively, self-efficacy, other-efficacy, and collective efficacy and performance. In line with previous assertions (Bandura, 1997; Lent & Lopez, 2002), we hypothesized that similarities in direction, and magnitude of the predictive pathways would be observed across the three separate models (H1). The second set of path models utilized multiple efficacy (self-, other-, and collective) or performance (objective, subjective) constructs simultaneously to examine potential unique effects in the efficacy-to-performance and performance-to-efficacy predictive directions. In the efficacy-to-performance models we hypothesized that, when controlling for past objective dyad performance, self-, other-, and collective efficacy would contribute uniquely to the prediction of objective dyad performance (H2). In the performance-to-efficacy models, we utilized a measure of subjective performance to obtain evaluations from each dyad member's assessment of his/her performance suitable for examining potential partner effects (n.b., objective dyad performance assessment affords only a single value for a pair's performance). In the performance-to-efficacy models, we expected the subjective assessments of self-, other-, and collective performance to contribute uniquely to the prediction of, respectively, self-, other-, and collective efficacy. Beyond these expectations, we hypothesized that, when controlling for both partners' past efficacy beliefs, subjective assessments of (a) other- and collective performance, (b) self- and collective performance, and (c) self- and other-performance would contribute uniquely to the prediction of, respectively, self-efficacy, other-efficacy, and collective efficacy (H3). Finally, in the models comprised of multiple performance constructs, we hypothesized that partner effects would contribute uniquely to the prediction of self-, other-, and collective efficacy beliefs, above and beyond any actor effects, for athletes performing in the high-dependence role (H4).

Method

Participants

Seventy-four male-female pairs from National Collegiate Athletic Association Division I (n = 6) or II (n = 1) cheerleading teams participated in the study. Teams were located within the northeast (n = 2), southeast (n = 4), and midwest (n = 1) regions of the United States. Participants were from 18 – 27 years of age (M_{males} = 21.0, SD = 2.14; M_{females} = 19.3, SD = 1.65). In accordance with the American Association of Cheerleading Coaches and Administrators (AACCA, 2015), two-person stunt-tasks require one *base* (i.e., the partner in direct contact with the performing surface while supporting the other dyad member's weight overhead) and one *flyer* (i.e., the partner being supported and/or tossed into the air by the other dyad member). In this study, males always performed in the base role (i.e., the low-dependence role) and females always performed in the flyer role (i.e., the high-dependence role). Flyers in this study averaged more general cheerleading experience than bases (M_{flyers} = 8.8 years, *SD* = 4.13; M_{bases} = 5.2 years, *SD* = 3.59), but experience in co-ed cheerleading was comparable across roles (M_{flyers} = 2.9 years, *SD* = 1.82; M_{bases} = 3.6 years, *SD* = 2.27). Participants were starting their first (*n* = 63; 43.8%), second (*n* = 31; 21.5%), third (*n* = 33; 22.6%), fourth (*n* = 14; 9.7%), or fifth (*n* = 3; 2.1%) year with their respective teams. Dyad members, on average, had been assigned together for two and a half months (SD = 2.91) and trained together for six hours per week (*SD* = 4.53). Flyers trained 4.5 hours (*SD* = 4.77) and bases trained 2.5 hours (*SD* = 4.64) per week with others.

Procedures

After obtaining approval from the Human Subjects Committee at [redacted], information sheets were emailed to university coaches at addresses gathered from respective team websites. Ten coaches responded to the invitation, and seven agreed to their athletes being involved in data acquisition during a regularly scheduled practice at the beginning of the sport season. After participants completed informed consent, each pair selected a moderately challenging stunt-task to perform for five trials in front of a video camera. The participants received a questionnaire packet on: (a) efficacy beliefs to be completed immediately before each stunt-task performance, and (b) subjective performance to be completed immediately after each stunt-task performance. Participants were asked to refrain from any verbal and nonverbal communication except for during communication periods allocated between each performance trial. Communication periods were necessary for partners to discuss a safe strategy for the next performance and to avoid unnecessary risk of injury. Efficacy measures obtained after the communication periods were employed within analyses.[1] Finally, participants provided their age, experience, and a post-performance subjective assessment of the stunt-task challenge level. Objective dyad performance, using video images of a front-view angle of each team of dyads, was assessed post-data collection.

Stunt-Task

The two-person cheerleading stunt-tasks employed in this study required one base and one flyer, and involved the base lifting and supporting the flyer's weight in an overhead position. The stunt-tasks were standardized in difficulty across each dyads' level of ability at the time the study was conducted. Variations in difficulty of the overhead position, entrance, and dismount were self-selected by each dyad to make the stunt-task moderately challenging. "Moderately challenging" was defined for the participants as being "any skill successfully performed about 50% of the time, at this moment in time." Successful performance in this sport is regarded as a faultless execution of the stunt-task and not simply an effortful attempt (Habeeb & Eklund, 2016). The selected stunt-tasks ranged across four levels of objective skill difficulty in line with the National Cheerleading Association's (2013) scoring guidelines. Lower range intermediate stunt-tasks, (n = 23 dyads; 31%) included any non-spinning or non-flipping skill, and the upper range intermediate stunt-tasks (n = 26 dyads; 35%) included any skill requiring a 360-degree vertical spin. Advanced stunt-tasks (n = 16 dyads; 22%) included an inverted position at any point in the skill including 360-degree flips. Elite stunt-tasks (n = 9 dyads; 12%), the most difficult category, included either a 720-degree spin or simultaneous spin-inversion combination. The selected stunt-tasks were rated, on average, as moderately challenging (M_{flyers} = 5.1, SD = 2.85; M_{bases} = 5.2, SD = 2.42) after completion of the five trials on a scale ranging from 0 (*not a challenge at all*) to 10 (*a complete challenge*).

Measures

Participants reported their self-, other-, and collective efficacy beliefs and subjective performance evaluations for each performance trial. Single-item measures were implemented in line with previous research (e.g., Bruton, Mellalieu, & Shearer, 2016; Habeeb et al., 2017; LaForge-MacKenzie & Sullivan, 2014). Data derived from single-item efficacy measures have demonstrated evidence for validity and reliability in measuring athletes' efficacy beliefs

(Bruton et al., 2016). The presentation order of the items within each questionnaire was randomized across participants and performance trials to manage potential order effects in participant responses.

Efficacy beliefs. Participants' self-, other-, and collective efficacy beliefs were assessed using three target-specific, single-item measures. Participants were asked to respond to the questions, "To what extent are you confident in [YOUR/ your PARTNER's / YOU AND YOUR PARTNER's collective] ability to perform the skill?" Each item was anchored at 0 (*not at all confident*), 5 (*moderately confident*), and 10 (*completely confident*).

Subjective performance. Participants subjectively rated self, other, and collective performances in a similar format to the efficacy items. Participants were asked to respond to the questions, "To what extent was [YOUR/ your PARTNER's / YOU AND YOUR PARTNER's collective] performance of the skill successful?" Each item was anchored at 0 (*not at all successful*), 5 (*moderately successful*), and 10 (*completely successful*).

Objective dyad performance. Standardized behavioral assessments to obtain objective assessments of dyad performances were employed as described by Habeeb and Eklund (2016). The protocol involves assessing a dyad's quality of performance in accordance to gradations of errors as defined by the National Cheerleading Association (2013). The five-point Likert-type scale represents performance qualities with *no errors* (0), *minor errors* (-.5), *major errors* (-1), *complete errors* (-1.5), and *multiple errors* (-2). Accordingly, the lowest possible score (i.e., -2) indicated poor execution and the highest possible score (i.e., 0) indicated a faultless execution of the stunt-task. All stunt-task performances (n = 296) were assessed by the first author and these scores were used in subsequent analyses. A second independent rater, trained on the evaluation protocol, assessed a sample of 100 stunt-task performances (i.e., 34% of the total number of performances) to evaluate performance assessment objectivity.[2] A high level of objectivity across raters was observed in the independently rated sample of performance evaluations as indicated by the absolute agreement intraclass correlation coefficient of .91.

Analyses

Mean and standard deviation values were calculated for all variables across Trials 1 through 5. Preliminary analyses were subsequently conducted within SPSS version 21.0 to determine if the data met statistical criteria indicating a dyadic, or nonindependent, data structure (Kenny et al., 2006). Dyad modelling approaches were deemed appropriate because Pearson product-moment correlations between partners' self-, other-, and collective efficacy beliefs (r = .34 – .68, p < .001) and subjective performances (r = .32 – .74, p < .001) indicated the existence of nonindependence within the data (Kenny et al., 2006).

Models comprised of a single efficacy construct. Three models (i.e., self-efficacy, other-efficacy, and collective efficacy) were estimated to examine the efficacy-performance reciprocal relationship across the five performance trials. Predictive pathways between each partners' efficacy beliefs and objective dyad performances were modelled starting with efficacy on Trial 1 and ending with performance on Trial 5. The five trials rendered four performance waves (e.g., Performance 1 to Performance 2 is one wave) and four efficacy waves (e.g., Efficacy 1 to Efficacy 2 is one wave). In line with APIM modelling, the first pair of variables (i.e., Flyer Efficacy 1 and Base Efficacy 1), and the errors for subsequent pairs of efficacy variables were allowed to correlate to control for nonindependence in the partners' scores (Kenny et al., 2006; Ledermann, Macho, & Kenny, 2011). All variables were standardized using the sample grand mean and standard deviation values so that standardized pathway coefficients were interpretable across the base and flyer performance roles (Kenny et al., 2006). Some kurtosis was present in the distributions of the efficacy and performance values (range -1.25 – 5.94), so these path models were estimated using the robust maximum likelihood method within Mplus version 7.0. Evaluation of fit of the model to the data was assessed using Chi-square (χ^2), comparative fit index (CFI; a relative measure of fit), and standardized root mean square residual (SRMR; an absolute measure of fit). A two-presentation index strategy (Hu & Bentler, 1999) was selected based on previous sport research utilizing distinguishable dyads (e.g., Stebbings et al., 2016). CFI values between .95 and 1.0 indicate an excellent model fit and values below .90 indicate poor fit, while SRMR values of .08 or less indicate good model fit (Hu & Bentler, 1999; Kenny et al., 2006).

Models comprised of multiple efficacy or performance constructs. We adopted a multi-construct RPPRSEM approach (Feltz et al., 2008) in conjunction with APIM (Kenny et al., 2006) for distinguishable dyads to examine unique contributions of: (a) self-, other-, and collective efficacy to the prediction of objective dyad performance and (b) subjective self-, other-, and collective performance to the prediction of self-efficacy, other-efficacy, and collective efficacy. The series of steps (within SPSS version 21.0) to attain residual scores used in these models slightly differed for each direction of prediction being examined. Details of the calculations are described subsequently. As before, the robust maximum likelihood estimator within Mplus version 7.0 was employed in estimating these models. These models were fully saturated so their fits to the data could not be evaluated (Kenny et al., 2006).

Efficacy-to-performance. A series of models were estimated to examine the unique contribution of self-efficacy (SE), other-efficacy (OE), and collective efficacy (CE) from both partners to the prediction of objective dyad performance, while controlling for past objective dyad performance. To attain residual scores employed in these models, first, Objective Dyad Performance 1 was regressed on the preceding measures of Self-, Other-, and Collective Efficacy 1 from both partners (i.e., Flyer SE 1, Base SE 1, Flyer OE 1, Base OE 1, Flyer CE 1, and Base CE 1) and the residual was saved. Second, the saved residual (i.e., Residual Objective Dyad Performance 1) was used to calculate residuals associated with the subsequently measured efficacy beliefs. Each efficacy belief was separately regressed on

Residual Performance 1, to remove the effect of Performance 1 from each efficacy in Trial 2. The residuals (i.e., Residual Flyer SE 2, Residual Base SE 2, Residual Flyer OE 2, Residual Base OE 2, Residual Flyer CE 2, and Residual Base CE 2) were then saved. To estimate the model, the seven residual variables were entered as predictors of Performance 2 (a non-residualized score). This process was repeated for the remaining trials rendering four separate models representing four performance waves.

Performance-to-efficacy. Three series of models were estimated to examine the unique contribution of subjective assessments of self-, other-, and collective performance from both partners on (self-, other-, or collective) efficacy, while controlling for past (self-, other-, or collective) efficacy. Performance variables in these analyses were subjective so that each partner's perceptions could be modelled, and partner effects could be examined (i.e., objective dyad performance has only a single value for both members and does not allow for partner effects to be evaluated). To attain residual scores, first, Flyer and Base (Self-, Other-, or Collective) Efficacy 3 were regressed on Flyer and Base Self-, Other-, and Collective Performance 2, and the Residual Flyer and Base Efficacy 3 scores were saved. Second, Flyer and Base Self-, Other-, and Collective Performance 3 scores were regressed on the Residual Efficacy 3 scores. To estimate the model, the eight residual variables were then entered as predictors of Efficacy 3 (a non-residualized score). This process was repeated for the remaining trials rendering nine separate models representing three efficacy waves (i.e., Efficacy 2 to 3, Efficacy 3 to 4, and Efficacy 4 to 5) for each of the three efficacy constructs.

Results

A trivial percent (.002%) of data was recorded as missing. Descriptive statistics for all variables are presented in Table 1. Participants provided responses that were across the possible scale range, with average responses to efficacy (M_{flyers} = 7.15 – 8.23, SD_{flyers} = 1.82 – 2.58; M_{bases} = 7.55 – 8.76, SD_{bases} = 1.72 – 2.43) and subjective performance (M_{flyers} = 6.41

– 7.74, SD_{flyers} = 2.47 – 3.42; M_{bases} = 6.53 – 8.20, SD_{bases} = 2.35 – 3.51) being in the upper end of the scale. The skewness of efficacy and performance scores (range -1.91 – 0.71) was insufficient to warrant any transformations (Kline, 2011). The stunt-tasks were, on average, moderately challenging to participants as indicated by the average objective dyad performance score in each trial remaining consistently near the middle of the possible scale range. Visual inspection of these performance scores across trials did not indicate an upward or downward performance trend across the five successive trials.[3]

Models Comprised of a Single Efficacy Construct

Three single-efficacy construct (i.e., self-efficacy, other-efficacy, and collective efficacy) models were estimated to examine efficacy-performance reciprocal effects across the five performance trials. The observed fit of data to the self-efficacy model was $\chi^2(62)$ = 96.57, p = .003; CFI = .96; SRMR = .08, to the other-efficacy model was $\chi^2(62)$ = 166.13, p < .001; CFI = .86; SRMR = .08, and to the collective efficacy model was $\chi^2(62)$ = 121.25, p < .001; CFI = .92; SRMR = .08. The observed pathways of interest are reported in Figure 1.[4] We note that the CFI for the other-efficacy model did not meet the provided cut-off value indicating good model fit, so caution is warranted in interpreting those pathway coefficients.

As hypothesized (H1), similarities can be observed across the three path models. First, past efficacy beliefs tended to have a moderate-to-large effect on efficacy beliefs, regardless of role or efficacy type (β = .42 – .87, p < .001). Second, past objective dyad performance tended to have a small-to-moderate effect on objective dyad performance (β = .23 – .45, $p \leq$ .001 – .070), except for the effect of Performance 3 on Performance 4 in the other- and collective efficacy models. Finally, objective dyad performance tended to have a small-to-moderate effect on efficacy beliefs for flyers (β = .24 – .46, p < .001) and bases (β = .15 – .34, $p \leq$ .001 – .037).

The similarities in magnitude and direction of the efficacy-to-performance effects across the three path models differed by athlete role. These effects within the other- and collective efficacy models were similar for the flyers, whereas these effects within the self- and collective efficacy models were similar for the bases. It can be observed in the effects of Efficacy 3 on Performance 3, for example, that the effects of flyers' other-efficacy (β = .00) and collective efficacy beliefs (β = .08) were more similar compared to flyers' self-efficacy beliefs (β = .26). In contrast, the effects of bases' self-efficacy (β = -.10) and collective efficacy beliefs (β = -.02) were more similar compared to bases' other-efficacy beliefs (β = .20). The expected theoretical relationships emerged most clearly when past performance was the poorest predictor of performance, as in the instance of Performance 3 to Performance 4. In this performance wave, flyers' other-efficacy beliefs (β = .27) and bases' self-efficacy beliefs (β = .29) were positive, small predictors of performance. Both partners' collective efficacy beliefs (β_{base} = .21; β_{flyer} = .15) were positive, small predictors of performance, although only bases' collective efficacy reached statistical significance.

Upon inspection of the path models, it is evident that self-efficacy, other-efficacy, and collective efficacy explain a similar amount of variance in objective dyad performance across the models. The variance explained in Performance 2, for example, is 19%, 24%, and 24% for, respectively, self-, other-, and collective efficacy. Although differences in the magnitude of the pathway coefficients occur in some places, it is impossible to know in these analyses whether or not the explained variance in performance is unique to each efficacy belief.

Models Comprised of Multiple Efficacy or Performance Constructs

Efficacy-to-performance. Across all waves, a significant proportion of variance in objective dyad performance was accounted for by past objective dyad performance and both partners' self-, other-, and collective efficacy beliefs (R^2 = .20 – .38). Pathway coefficients are reported in Figure 2. As expected, past objective dyad performance contributed uniquely to the prediction of objective dyad performance in all four waves (β = .27 – .58, $p \leq .001$ –

.033). For the hypothesized pathways (H2), a different pattern of unique contribution from self-, other-, and collective efficacy to the prediction of objective dyad performance resulted across the four waves. In Wave 1, only flyer self-efficacy (β = -.31, p = .011) contributed uniquely to the prediction of objective dyad performance, and it was in the unexpected direction. In Wave 2, both base other-efficacy (β = .43, p = .005) and flyer self-efficacy (β = .26, p = .048) contributed uniquely to the prediction of objective dyad performance. In Wave 3, only base collective efficacy (β = .39, p = .030) contributed uniquely to the prediction of objective dyad performance, while in Wave 4, only flyer collective efficacy (β = .56, p = .020) contributed uniquely to the prediction of objective dyad performance.

Subjective performance-to-self-efficacy. Across all waves, a significant proportion of variance in flyers' and bases' self-efficacy was accounted for by both partners' past self-efficacy and self-, other-, and collective subjective performances (R^2 = .63 – .78). Pathway coefficients are reported in Table 2. Past self-performance contributed uniquely to the prediction of one's own self-efficacy in two of the three waves for the flyers (β = .52 – .67, p ≤ .001 – .009) and bases (β = .46 – .78, p < .001). For the hypothesized pathways (H3), a general trend involved athletes' perceptions of other- and collective performance contributing uniquely to the prediction of self-efficacy. Hypothesized role differences (H4) were observed in predicting Efficacy 3 (see upper-left panel of Table 2). Only partner effects contributed uniquely to the prediction of flyers' self-efficacy beliefs; bases' other-performance (β = .21, p = .009) and bases' collective performance (β = -.41, p = .049). In contrast, a mixture of actor and partner effects contributed uniquely to the prediction of bases' self-efficacy beliefs; bases' other-performance (β = .39, p = .004), bases' collective performance (β = -.76, p < .001), and flyers' other-performance (β = .66, p = .004).

Subjective performance-to-other-efficacy. Across all waves, a significant proportion of variance in flyers' and bases' other-efficacy was accounted for by both partners' past other-efficacy and self-, other-, and collective subjective performances (R^2 = .67 – .73). Pathway coefficients are reported in Table 2. Past other-performance contributed uniquely to the prediction of one's own other-efficacy in two waves for the flyers (β = .74 – .84, p < .001) and all three waves for the bases (β = .53 – .63, p < .001). For the hypothesized pathways (H3), a general trend involved athletes' perceptions of self- and collective performance contributing uniquely to the prediction of other-efficacy. Hypothesized role differences (H4) were observed in predicting Efficacy 3 (see upper-middle panel of Table 2). Only partner effects contributed uniquely to the prediction of flyers' other-efficacy beliefs; bases' other-efficacy (β = .15, p = .043), bases' other-performance (β = .28, p = .006), and bases' collective performance (β = -.56, p = .007). In contrast, only an actor effect contributed uniquely to the prediction of bases' other-efficacy beliefs; bases' collective performance (β = -.48, p = .025).

Subjective performance-to-collective efficacy. Across all waves, a significant proportion of variance in flyers' and bases' collective efficacy was accounted for by both partners' past collective efficacy and self-, other-, and collective subjective performances (R^2 = .63 – .76). Pathway coefficients are reported in Table 2. Past collective performance contributed uniquely to the prediction of one's own collective efficacy in one wave for the flyers (β = .36, p = .032) and three waves for the bases (β = -.53 – 1.14, p = .008 – .034). For the hypothesized pathways (H3), a general trend involved athletes' perceptions of self- and other-performance contributing uniquely to the prediction of collective efficacy. Hypothesized role differences (H4) were observed in predicting Efficacy 3 (see upper-right panel of Table 2). A mixture of actor and partner effects contributed uniquely to the prediction of flyers' collective efficacy beliefs; flyers' other-performance (β = .73, p < .001), bases' other-performance (β = .36, p = .001), and bases' collective performance (β = -.56, p = .013). In contrast, only actor effects contributed uniquely to the prediction of bases' collective efficacy beliefs; bases' self-performance (β = .72, p = .001) and bases' other-performance (β = .48, p < .001).

Discussion

The purpose of this study was to evaluate the unique contributions of self-, other-, and collective constructs in the efficacy-performance reciprocal relationship for athlete dyads involving low- and high-dependence roles. Reciprocal relationships between objective dyad performance and self-, other-, or collective efficacy were observed in the models comprised of a single efficacy construct demonstrating some similarities across the three efficacy constructs. When the efficacy or performance constructs were examined together, the findings were generally supportive of the hypotheses. First, unique efficacy contributions were observed in the prediction of objective dyad performance, beyond the common variance among the efficacy constructs. Second, unique subjective performance contributions were observed in the prediction of efficacy beliefs. Third, the presence of partner effects differed by athlete role. Overall, the findings support the presence of shared and unique predictive contributions of self-, other-, and collective constructs in the efficacy-performance reciprocal relationship.

Bandura (1997) and Lent and Lopez (2002) have emphasized in their theorizing that the many forms of efficacy operate simultaneously. In the current study, a different efficacy belief contributed uniquely to the prediction of objective dyad performance across each of the four waves in the multi-efficacy construct models. While the results do not support that one efficacy belief is consistently the strongest predictor of performance, this study demonstrates paired performance is improved when members have positive beliefs about self, other, and collective abilities because, at any given point, each belief may play a unique role in predicting how the pair will perform. In these dyads, for example, a previously poor performance by the flyer may have implications for beliefs about the flyer (i.e., base other-efficacy) and perhaps strengthen its uniqueness as a predictor of the pair's future performance together. The findings, in conjunction with previous evidence (Damato et al., 2008; Magyar et al., 2004), helps support that beliefs about personal and specific teammates' abilities are important beliefs that uniquely predict group performance.

Contrary to Bandura's (1977, 1997) theorizing, negative efficacy-performance and performance-efficacy relationships have been previously observed in repeated-measures designs like the one employed in the current study (e.g., Vancouver et al., 2001). Bandura and Locke (2003) argue that negative or nonsignificant relationships emerge in these studies because performance stabilizes, vitiating the need for performers to reevaluate their efficacy beliefs. In the current study, however, performance did not stabilize, nor increase or decrease linearly across trials either. An alternative explanation, from Vancouver and colleagues (2001), suggests that negative efficacy-performance relationships arise when personal performance approaches a desired level of achievement and effort is diminished, even while performance-efficacy relationships remain, nonetheless, positive. Feelings of complacency that result in diminished effort, may help explain why negative relationships were observed in the current study. However, negative relationships were only observed when the self-, other-, and collective constructs were examined simultaneously. Moreover, in contrast to Bandura's (1977, 1997) and Vancouver et al.'s (2001) assertions, negative relationships were observed in both efficacy-to-performance and performance-to-efficacy predictive directions. It seems plausible that the observed negative relationships may be statistical artifacts resulting from the similarities amongst the constructs examined in this study. This is corroborated by all the bivariate correlations being positive. Extant literature focused on unique effects between either self- and collective-efficacy (e.g., Katz-Navon & Erez, 2005) or self- and other-efficacy (e.g., Beauchamp & Whinton, 2005) demonstrates efficacy beliefs remain a positive, unique predictor of performance as argued in theory. Taken together, a stronger examination of the varying explanations (e.g., Vancouver et al., 2001; Bandura & Locke, 2003) of negative efficacy-performance relationships is clearly warranted in dyadic instances of performance.

The main rationale for this study was the need to evaluate *partner* influences within efficacy-performance relationships for athlete dyads (Kenny & Cook, 1999). In line with Lent and Lopez' (2002) dependence hypothesis, the direction of dependence proposed in the current study's sample of cheerleading dyads was supported by the increased presence of partner effects for the high-dependence role (i.e., flyer) compared to the low-dependence role (i.e., base). The observation of partner effects support Jackson et al.'s (2008) qualitative evidence for factors related to the partner being perceived by athletes as a source of information to evaluate self- and other-efficacy. This provides evidence, in line with Jackson et al. (2010) that asymmetric dependence predisposes those in a low-dependence role to be more self-oriented and those in a high-dependence role to be more other-oriented. The current study extends Habeeb et al. (2017) by providing evidence that role moderates predictive relationships between efficacy and performance. Overall, it seems clear that partner effects are important to investigate, even when only interested in actor effects within group contexts. The findings have an important implication in the pursuit of a more integrated theory of efficacy beliefs for team athletes; athlete role, at least in part, is a determinant of the efficacy-performance relationship.

Findings from this study can be applied in sport and performance group contexts in which self-efficacy is not easily malleable. First, when factors beyond personal control are partially responsible for successful performance, beliefs about others have important implications for personal and interpersonal outcomes (Bandura, 1997; Damato et al., 2008). Therefore, in instances that insufficient time or resources limit the opportunity to foster personal mastery experiences, a focus on improving beliefs about a specific teammate or the team overall may be useful for practitioners. The findings from previous research and the current study suggest this approach is likely to be most useful for athletes highly dependent on others (Habeeb et al., 2017; Jackson et al., 2010). Based on Lent and Lopez' (2002) tripartite efficacy model, practitioners may also consider the wider network of efficacy beliefs. More specifically, the members of these cheerleading dyads will likely estimate what their partner thinks about their own abilities. This estimated belief, also known as relation-inferred self-efficacy, has been found to support self-efficacy beliefs regardless of what a partner may actually think about oneself (Jackson et al., 2010). Second, while ignoring certain teammates' abilities altogether is likely to cause other team-related issues, coach performance feedback tailored to athletes' orientations of attention may enhance the other sources of efficacy beliefs including verbal persuasion and third-party feedback (Bandura, 1997; Lent & Lopez, 2002).

There are some limitations to the current study. First, the performance roles inherently implicated athlete gender which was not controlled for in this investigation. Support for a gender explanation for differences in athletes' cognitive-performance relationships, however, has not been previously observed in both athlete-athlete and coach-athlete dyads (e.g., Jackson, et al., 2010). Further, no differences in confidence were observed by Clifton and Gill (1994) between females and males in the performance of partner-stunts such as those employed in this study. Second, the selection of a more novel performance task, as occurred in Feltz (1982) original path-analytic investigation, might have minimized the extent to which sources of efficacy information from mastery experiences prior to the study had an impact on athletes' efficacy beliefs while participating in the current study. Future studies involving less previous knowledge of the task among participants may provide clearer partitioning of unique information relative to self, other and collective abilities. Nonetheless, the stunt-tasks were purposefully selected to avoid floor and ceiling effects while also reducing the likelihood of participant injury. Despite limitations related to experience with the task, this study included a sample of intact dyads performing several trials of a task requiring dependence on a teammate, providing both measurement and theoretical extensions of previous dyad studies.

Future research focused on a more explicit test of the proposed relationship between athlete role, orientation of attention, and the formation of efficacy beliefs would be a valuable contribution to this area of research. Although attention provides a useful framework to explain why role differences may occur, our knowledge of the extent athlete role contributes to efficacy theory is limited until we directly monitor attention in these types of studies. Additionally, the manipulations of the athletes' level of dependence on one another through use of exchangeable dyads for comparison would provide stronger evidence for the tenability of the dependence hypothesis to explain functioning in all dyad types (Lent & Lopez, 2002). Finally, this study's focus on two-person teams provides a basis for examining efficacy beliefs in larger-sized teams. Future studies focused on the interactive network of efficacy beliefs and role-related orientations of attention of athletes in larger-sized teams can utilize analyses such as the group APIM (Kenny & Garcia, 2012) and the Social Relations Model (Kenny & La Voie, 1984).

In conclusion, although there is shared variance among the constructs, self-, other-, and collective efficacy and subjective performance provide unique contribution in the efficacy-performance reciprocal relationship. Further, some athletes' beliefs are influenced by a partner/teammate more than others, indicating the importance of including individual differences in the integration of self, other, and collective efficacy theory for team athletes.

Endnotes

[1] Extant literature suggests that communication is an antecedent and consequence of the efficacy beliefs (e.g., Jackson et al., 2008). Although, in the current study, we could not control for communication across dyads, participants' self-reported efficacy beliefs were obtained prior to and subsequently after each communication period to allow for descriptive analyses of any potential changes in efficacy related to communication. Reported self-, other-, and collective efficacy during pre- and post-communication were examined using three 2 x 2 x 4 mixed model RM-ANOVAs to examine role (flyer, base) by communication (pre-, post-) by trial (Trials 2-5) interactions. Regardless of one's role, both self- and collective efficacy increased from pre- to post-communication (η_p^2 = .14 – .20, p < .001), with the absolute levels of efficacy for both roles slightly varying across trials (η_p^2 = .03 – .05, $p \leq$ .001 – .02). In contrast, bases' other-efficacy was significantly higher than flyers' other-efficacy across all trials as indicated by the moderately-small main effect for role (η_p^2 = .05, p < .01). Further, a significant two-way interaction effect indicated that other-efficacy increased from pre- to post-communication, but the change in other-efficacy slightly varied across trials (η_p^2 = .02, p < .05). Given the evidence for efficacy to increase after communication, self-, other-, and collective efficacy measures obtained after the communication periods (i.e., closest in time to the next performance) were used within subsequent analyses.

[2] The second rater's training occurred over two sessions using videos of similar stunt-task performances from an earlier study (i.e., [redacted]). The first training session involved performance assessments of 36 dyads with concurrent feedback and discussion with the first author. The second training session involved assessment of 72 dyads for independent practice regarding the evaluation protocol. Based on the ICC from training session 2 (i.e., .90), the second rater assessed the sample of 100 dyads within the current study.

[3] Reported self-, other-, and collective efficacy and performance were examined using six 2 x 4 x 4 mixed model RM-ANOVAs to examine role (base, flyer) by trial (Trials 2–5) by stunt-task difficulty (Levels 1–4) interactions. Results revealed that none of the main or interactive effects involving task-difficulty were significant for the efficacy beliefs (p = .175 – .995) or performance (p = .069 – .880). A 2 x 4 mixed model RM-ANOVAs conducted to examine trial (Trials 2–5) by task-difficulty (Levels 1–4) interactions was also not significant (p = .349 – .737), providing additional support to examine all cases together.

[4] Error covariances between partner's self-efficacy variables were r = .06 – .14, p = .027 – .054, other-efficacy variables were r = -.03 – .09, p = .127 – .359, and collective efficacy variables were r = .000 – .116, p = .004 – .998. The correlation between the Flyer and Base Self-Efficacy 1 was r = .07, p =.555, Other-Efficacy 1 was r = -.03, p= .775, and Collective Efficacy 1 was r = .27, p = .033.

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Table 1. Means and Standard Deviations for Efficacy and Performance Data for the Flyer, Base, and Dyads across Performance Trials 1-5.

		Performance 1		Performance 2		Performance 3		Performance 4		Performance 5	
	Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Flyers	Self-efficacy (pre-com.)	7.45	1.87	7.70	1.98	7.78	1.96	7.69	2.44	8.00	2.20
	Other-efficacy (pre-com.)	7.12	2.13	7.23	2.06	7.58	2.15	7.54	2.58	7.80	2.39
	Collective Efficacy (pre-com.)	6.76	1.91	7.15	2.04	7.51	2.16	7.47	2.44	7.64	2.48
	Self-efficacy (post-com.)	-	-	7.80	2.05	8.01	1.82	7.97	2.10	8.23	1.98
	Other-efficacy (post-com.)	-	-	7.61	2.09	7.78	2.20	7.81	2.32	8.01	2.23
	Collective Efficacy (post-com.)	-	-	7.39	2.00	7.82	1.97	7.71	2.26	7.93	2.17
	Subjective Self-performance	6.50	2.66	7.34	2.47	6.73	3.30	7.74	2.68	7.43	2.66
	Subjective Other-performance	6.26	2.82	7.03	2.99	6.63	3.22	7.22	3.12	7.25	2.76
	Subjective Collective Performance	5.66	3.15	6.69	3.24	6.41	3.42	7.12	3.11	6.84	3.24
Bases	Self-efficacy (pre-com.)	7.35	2.11	7.57	2.04	7.97	1.79	7.87	2.08	7.96	2.43
	Other-efficacy (pre-com.)	7.71	2.44	8.10	2.07	8.58	1.84	8.39	2.17	8.47	2.17
	Collective Efficacy (pre-com.)	7.21	2.02	7.55	2.01	8.10	1.91	8.04	2.10	8.15	2.31
	Self-efficacy (post-com.)	-	-	7.78	1.90	8.11	1.83	8.07	2.07	8.07	2.37
	Other-efficacy (post-com.)	-	-	8.55	1.73	8.76	1.72	8.68	1.90	8.73	2.10
	Collective Efficacy (post-com.)	-	-	8.00	1.89	8.43	1.72	8.26	2.14	8.19	2.36
	Subjective Self-performance	5.70	3.11	7.00	2.72	6.58	3.14	7.05	3.10	7.01	3.10
	Subjective Other-performance	6.97	3.07	8.20	2.35	7.51	3.11	8.16	2.64	8.05	2.70
	Subjective Collective Performance	5.76	3.39	6.97	3.07	6.53	3.51	7.05	3.21	6.77	3.29
Dyads	Objective Dyad Performance	-0.93	0.55	-0.89	0.58	-0.93	0.57	-0.85	0.54	-0.89	0.55

Note. Pre-com = pre-communication between partners. Post-com = post-communication between partners.

Table 2. The Actor and Partner Effects (β) and Total Explained Variances (R^2) within the Performance-to-Self-, Other-, and Collective Efficacy Models.

		Self-efficacy			Other-efficacy			Collective efficacy		
Outcome	Predictor	Actor effects (β)	Partner effects (β)	Total R^2	Actor effects (β)	Partner effects (β)	Total R^2	Actor effects (β)	Partner effects (β)	Total R^2
Flyer Efficacy 3				*.78****			*.73****			*.76****
	Efficacy 2	.54***	.04		.51***	.15*		.51***	.05	
	Self-performance 2	.67***	.27		.16	.32		.16	.30	
	Other-performance 2	.26	.21**		.84***	.28**		.73***	.36***	
	Collective performance 2	-.25	-.41*		-.15	-.56**		-.07	-.56*	
Base Efficacy 3				*.66****			*.68****			.64***
	Efficacy 2	.65***	-.11		.59***	.01		.47***	.09	
	Self-performance 2	.78***	-.09		.44	-.03		.72***	-.05	
	Other-performance 2	.39**	.66**		.53***	.02		.48***	.12	
	Collective performance 2	-.76***	-.38		-.48*	-.01		-.53*	-.09	
Flyer Efficacy 4				*.64****			*.73****			*.68****
	Efficacy 3	.40***	-.13		.44***	.05		.45***	-.06	
	Self-performance 3	.52**	.26		-.28	.29		.12	.26	
	Other-performance 3	.02	.22		.74***	.06		.53**	.15	
	Collective performance 3	-.10	-.09		.09	.01		-.12	-.09	
Base Efficacy 4				*.78****			*.70****			*.71****
	Efficacy 3	.55***	.01		.40***	.01		.51***	-.03	
	Self-performance 3	.46***	-.08		-.26†	-.16		-.28	-.31*	
	Other-performance 3	-.27†	.40*		.64***	.43		.14	.73**	
	Collective performance 3	.34*	-.18		.21	-.20		.70**	-.27	
Flyer Efficacy 5				*.63****			*.70****			*.63****
	Efficacy 4	.51***	.04		.59***	-.06		.43***	.13	
	Self-performance 4	.29	.02		-.05	.27		-.04	.19	
	Other-performance 4	-.30*	.06		.12	-.05		.09	.04	
	Collective performance 4	.36	.13		.37*	.06		.36*	.05	
Base Efficacy 5				*.74****			*.67****			*.68****
	Efficacy 4	.64***	.10		.28*	-.02		.34**	.13	
	Self-performance 4	.44	.34*		-.67*	.07		-.42	.09	
	Other-performance 4	-.29†	.04		.63***	-.44		.13	-.28	
	Collective performance 4	.17	-.04		.83*	.22		1.14**	.09	

Note. Predictor variables are residualized scores in line with Feltz et al. (2008). $^{\dagger}p = .05$. $*p < .05$. $**p < .01$. $***p < .001$.

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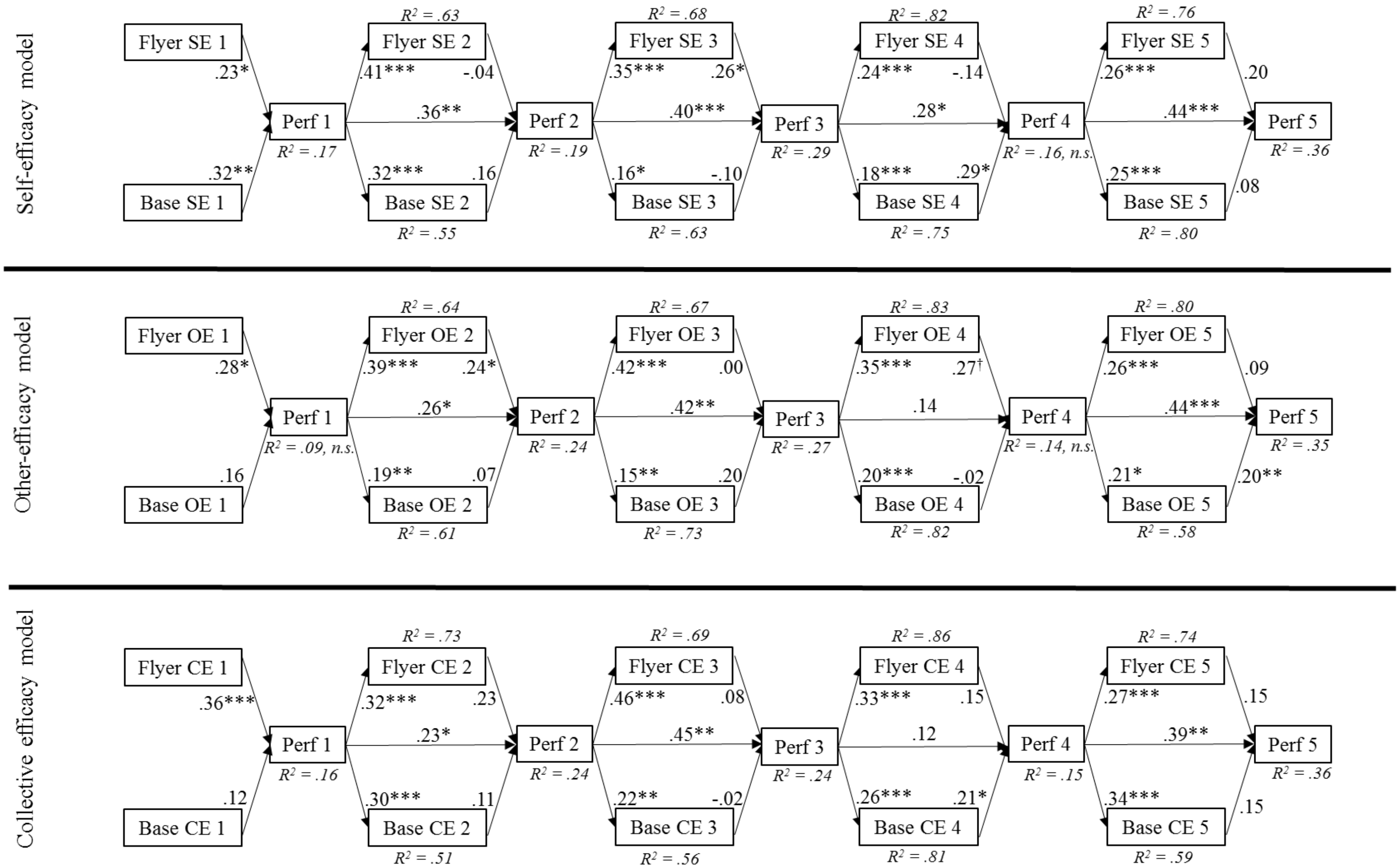

Figure 1. Efficacy and Performance Reciprocal Effects. This figure illustrates the self-efficacy (SE) model, other-efficacy (OE) model, and collective efficacy (CE) model, each comprised of a single efficacy construct and objective dyad performance, estimated to examine similarities in direction, and magnitude of the predictive pathways across the three separate models. Not drawn are the pathways representing within and between person effects of past efficacy on subsequent efficacy, and covariances between pairs of efficacy variables across the flyer and base partners (e.g., Flyer Efficacy 4 and Base Efficacy 4). $^{\dagger}p = .05$. $*p < .05$. $**p < .01$. $***p < .001$.

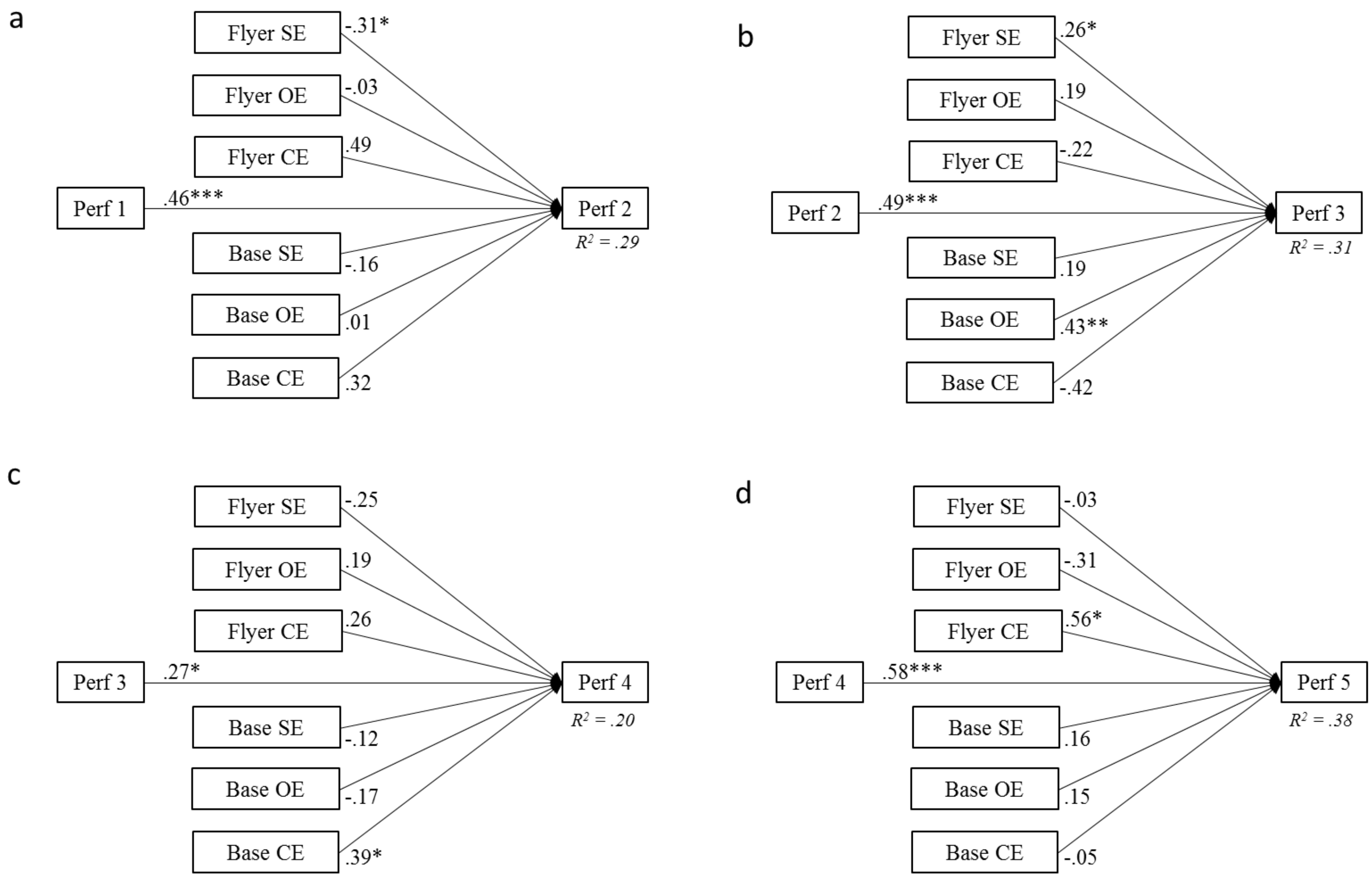

Figure 2. Efficacy-to-Performance Models. This figure illustrates four separate models, each comprised of multiple efficacy constructs, estimated to examine unique contribution of flyers' and bases' self- (SE), other- (OE), and collective efficacy (CE) beliefs in the prediction of Objective Dyad Performance 2, 3, 4, and 5. Predictor variables are residualized scores in line with Feltz et al. (2008). **p* < .05. ***p* < .01. ****p* < .001.