Task Structure, Dyadic Relations, and Athlete Role in Team-sports Settings: Implications for Athletes' Self, Relational, and Collective Efficacy Beliefs and Performances

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Thesis submitted to the University of Stirling
in fulfilment of the requirements for the degree of Doctor of Philosophy.

September, 2017

Acknowledgements

"You can't do epic things with basic people"

There is no question that I am surrounded by good people even when they are half-way around the world. I would like to acknowledge my parents for supporting me and teaching me that a good life has no days off. I wish to thank my Granny and Grumps, as they have been there for every peak and valley with words of wisdom and sprinkles of sarcasm that kept me grounded. I am so grateful to my close friends that I can pick back up with right where we left off. I must also recognize the academics at Stirling, especially Pete and Calum, and those beyond that have had an impact throughout the last few years. And above all I must praise my supervisor for his time and dedication. Bob, I can't imagine having anyone else as epic as you are for a supervisor. You have shaped me into something far more than I thought I would ever become and that goes well beyond the pages of this thesis.

Thesis Abstract

The performances of athlete pairs correspond to the agency observed in self, relational, and collective efficacy beliefs. A dyadic perspective offers potentially important conceptual and methodological advantages to the investigation of interdependent action. The general purpose of this thesis was to investigate how athletes influence one another in athlete pairs of different (i.e., distinguishable) roles with a specific focus on the efficacy-performance relationship. Chapters 1 and 2 provide the general introduction and review of literature on dyads and efficacy beliefs. Chapters 3-6 include original research. In Chapter 3 relationships among the individual- and dyad-level performances of cheerleading pairs competing at a national-level competition were assessed to provide a measurement tool for dyadic performance settings in which athletes have distinguishable roles. In Chapter 4 person-related sources of variance (in line with the Social Relations Model framework) in athletes' efficacy beliefs and performances were examined during repeated performance trials of a paired-cheerleading stunt-task with distinguishable roles. The purpose of Chapter 5 was to examine the efficacy-performance predictive chain of an athletic dyad task to extend Feltz' (1982) efficacy-performance path analysis in an individual sporting context in conjunction with the Actor-Partner Interdependence Model appropriate for dyads with distinguishable roles. The purpose of Chapter 6 was to conduct a replication of the Social Relations Model investigation in Chapter 4 using same-gender distinguishable dyads and extending the framework to four-person cheerleading groups. The final chapter is a summary of the findings with commentary on the findings' implications, strengths and limitations of the studies, identification of future research directions, and significance of the findings. Overall, the findings in this thesis support that task structure, dyadic relations, and athlete role in a team-task influence how athletes perceive and are perceived relative to self, relational, and collective abilities, with some effects including implications for efficacy-performance predictive relationships.

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Chapter 1

Introduction and Overview of Thesis

Team performance accomplishments are achieved by individuals that make up the team and the *interactions* between those individuals (Arthur, Edwards, Bell, Villado, & Bennett, 2005; Tesluk, Mathieu, Zaccaro, & Marks, 1997). When interacting members of a team have mutual influences on one another, the interactions can be described as having interdependence (Kenny, Kashy, & Cook, 2006). Interdependence is a characteristic of teamwork that has been commonly investigated in sports teams because the structured interactions regulating athletes' performances also have consequences for their psychological states (Snyder & Stukas, 1999). Some have examined interdependence from a broad perspective describing teams as high or low in interdependence (e.g., Katz-Navon & Erez, 2005). Others have examined individuals' perceptions of interdependent performance responsibilities (e.g., Bray, Brawley, & Carron, 2002). Very little attention, however, has been focused on dissecting interdependence from the perspective of one-to-one (i.e., dyad) relations within a team when, in fact, the fundamental properties of dynamics and interpersonal influence occur at the dyadic level (Williams, 2010).

A dyad perspective of interdependence, as employed in this thesis, favors an investigation of the individual within a social context because dyads tie the individual to the group in the simplest design (Levine & Moreland, 2006; Wageman, 2001). Two-person interactions are substantially void of third-party behavioral influences indicating dyads are an elementary unit in which to understand and measure individual performance within a sporting group (McGarry, 2009). Moreover, multi-person action is two-sided because two individuals will simultaneously produce and respond to one another's behaviors (Laursen, 2005; Malloy & Albright, 2001). Neither individual- or team-focused investigations account for athletes' experiences of those two-sided, bidirectional effects attesting current understanding of team dynamics may be incomplete (Kenny, et al., 2006; McGarry, 2009). Dyadic methods, therefore, offer potentially important conceptual and methodological advantages to the investigation of interdependent action (Jackson, Beauchamp, & Knapp, 2007; Kenny et al., 2006).

Implications on Efficacy Beliefs

In interpersonal settings, it is possible for multiple levels of agency to operate simultaneously because athletes (i.e., self agency) have mutual impact on one another's contributions (i.e., relational agency) towards group/dyad outcomes (i.e., collective agency). Self-efficacy represents just one construct amid a network of efficacy beliefs as a consequence (Jackson, Bray, Beauchamp, & Howle, 2015). Efficacy beliefs can also be relational when the perception is about a specific other or partner one closely interacts with (i.e., other-efficacy; relation-inferred self-efficacy; Lent & Lopez, 2002). There is also a substantial amount of literature that suggests the importance of athletes' beliefs concerning a group's collective abilities (i.e., collective efficacy; Bandura, 1997). Yet, uncertainty exists for how an athlete will simultaneously weigh, process, and separate evidence among several related types of efficacy beliefs (Feltz & Lirgg, 2001; Lent & Lopez, 2002). Conceptual overlap among the efficacy beliefs, as one might expect, poses challenges for researchers to tease apart a network of interactive efficacy beliefs within a particular relationship. Such difficulties, are likely able to explain why further attention on the development of efficacy beliefs in relational contexts is needed (Jackson et al., 2015). Athlete dyads of high interdependence, where it is possible for agency to simultaneously exist at the self, relational, and collective levels, provide the necessary context for developing research that integrates current efficacy theories (Beauchamp, Jackson, & Morton, 2012).

The commentary so far has described how the performances of athlete dyads correspond to the agency observed in self, relational, and collective efficacy beliefs. The implications for theory, however, can be extended further by examining the characteristics of dyads that potentially influence athletes' efficacy beliefs. It is often assumed that because athletes are of equal status in a performance relationship, their mutual influence is symmetric (Gaudreau, Fecteau, & Perreault, 2010). Some dyads fall into this category because both athletes perform in similar roles (e.g. synchronized-diving pairs). In instances that athletes perform very different roles in a dyad (e.g., paired ice-skating), however, mutual influences are not necessarily equivalent (Fiske, 1993; Lent & Lopez, 2002; Snyder & Stukas, 1999). Instead, athlete dyads with different (i.e., distinguishable) roles can have asymmetric dependencies wherein the quality of one athlete's personal contributions to performance depend highly on the quality of the other athlete's personal contributions to performance. According to Snyder and Stukas (1999), asymmetric dependence in a relationship has implications for each athletes' psychological functioning through the orientation of attention required to perform in a certain role. Those in a *high-dependence role* are required to attend closely to their partners' behavioral cues while those in a *low-dependence role* require attention to others to a lesser extent. Research on dyads with distinguishable roles may potentially clarify how, as indicated by Bray et al. (2002), athletes' perceptions emerge in respect to one's role with specific regards to the extent self, relational, and collective perceptions are informed by a partner's or group's abilities.

Research Purpose and Rationale

The aim of this thesis was to examine the link between athletes' perceptions and task structure, dyadic relations, and athlete role. With a focus on efficacy beliefs and athlete performance, this thesis examined the intricacies of dyadic relations and interdependencies among athletes using statistical methods employed with intact dyads. The rationale for this aim was two-fold. First, Beauchamp et al. (2012) have indicated it is not well-known if an intervention to bolster one type of efficacy belief (e.g., self-efficacy) will in effect alter other types of efficacy beliefs (e.g., other-efficacy). Before interventions are employed, it would be helpful to contribute to the extant literature with investigations of these beliefs in intact athlete dyads. Further, unique effects of self, relational, and collective efficacies have not been as extensively examined in intact athlete dyads compared to coach-athlete dyads even though, as indicated by Lent and Lopez (2002) and Bandura (1997), the outcomes of these beliefs are important for functioning in any achievement-related relationship/group (for exceptions, see Beauchamp & Whinton, 2005; Jackson, Beauchamp, & Knapp, 2007; Myers, Feltz, & Short, 2004).

Second, Jackson et al. (2015) suggest dyadic investigations should be more common-place within sport and exercise psychology because of the regularity with which interpersonal relationships occur in sport and the importance these relationships have for athletes' personal functioning. Many theories in sport psychology, in line with social cognitive theory, emphasize the role of social influence on personal psychological regulations and actions. Lent and Lopez (2002) argue that social inputs from others have tended to be analysed at the individual-level by either holding constant or without measuring other persons. Individual-level analyses offer very little conceptual and/or methodological advancements for understanding interpersonal effects on athletes' efficacy beliefs in interdependent team settings (Kenny & Cook, 1999).

The general purpose of this thesis, therefore, was to investigate how partners influence one another in athlete pairs with a specific focus on the efficacy-performance relationship. This purpose was achieved by examining self, relational, and collective efficacy beliefs and performances in highly interdependent cheerleading stunt-tasks. Cheerleading tasks often require a smaller athlete to stand on the hands of his or her partner(s) and/or be tossed into the air (i.e., a high-dependence performance role) with the larger athlete(s) responsible for the tossing and catching of the smaller athlete (i.e., a low-dependence performance role). An error from any athlete performing a stunt-task can result in catastrophic injury (Jacobson, Redus, & Palmer, 2005; Mueller, 2009), but each athlete's role includes different responsibilities for safe performance execution. Cheerleading stunt-tasks also require agency at personal, relational, and collective levels signifying the appropriateness for addressing the purpose of this thesis.

Thesis Structure

The scope of research questions answered in this thesis concerned, at the broadest level, how partners influence one another in athlete pairs of distinguishable roles with a specific focus on the efficacy-performance relationship. The remaining seven chapters in this thesis include one chapter synthesizing the key research (i.e., literature review), four chapters describing original research (two of which are published), and a final chapter providing a general discussion of the implications of the findings in this thesis. These chapters are subsequently described in greater detail.

Chapter 2

Chapter 2 includes a review of the literature conducted relevant to the purpose of this thesis. First, the original conceptual and theoretical background on dyads and efficacy-performance relationships is summarized. Second, the key empirical research in sport psychology concerning these topics is provided. Finally, the limitations of the current literature are highlighted in relation to the subsequent research chapters.

Chapter 3

Study 1 (entitled The Development of an Individuals-within-Dyads

Multilevel Performance Measure for an Interactive Cheerleading Task) is a published article (in *Measurement in Physical Education and Exercise Science*) focused on examining a dual-level performance measure for dyads of distinguishable roles. In addition to examining the reliability and validity of the provided measures, the study in this chapter provided a basis for examining the relationships among three perspectives of a paired cheerleading stunt-task: (a) individual performance of a partner in the low-dependence role, (b) individual performance of a partner in the high-dependence role, and (c) their dyad-level performance. The individual- and dyad-level performance measures were then used in two of the subsequent research chapters to investigate how efficacy beliefs relate to these measures of performance.

Chapter 4

Study 2 (entitled It Depends on the Partner: Person-related Sources of Efficacy Beliefs and Performance for Athlete Pairs) is an article accepted for publication (*in Journal of Sport & Exercise Psychology*). This investigation focused on observing the variations in efficacy beliefs reported by athletes that occur in association with the partner being replaced by similar others. Using the Social Relations Model framework, sources of person-related variance associated with personal tendencies, partner characteristics, and unique relationship interactions were accounted for in athletes' self, other, and collective efficacy beliefs and subjective performances, and individual-level objective performances. The profiles of variance partitioning were compared between athletes performing in a low- and high-dependence role in the performance tasks. Further, the investigation also examines any changes in person-related variance associated with task difficulty (i.e., low-, high-difficulty).

Chapter 5

Study 3 (entitled The Unique Effects of Self-, Other-, and Collective Efficacy Beliefs and Performance in Athlete Pairs) focused on the reciprocal efficacy-performance relationship in dyads. Using Actor-Partner Interdependence Model path models, actor and partner effects were investigated for self-, other-, and collective efficacy beliefs with individual and collective performance perceptions, and objective dyad performance. A secondary analysis, in line with suggestions by Feltz, Chow, and Hepler (2008), was employed to investigate the three types of efficacy beliefs simultaneously in the same model. In addition to examining any unique effects across the types of efficacy, the magnitude of effects was compared across the low- and high-dependence roles for consideration of asymmetric dependence in a dyad.

Chapter 6

Studies 4a and 4b (entitled Examining Person-related Sources of Variance in Same-gender Dyads of Distinguishable Roles within Four-person Cheerleading Groups) included a sample of all-female cheerleaders that addressed a possible gender confound in Studies 2 and 3. Study 4a was a replication of the procedures described in Chapter 3. In light of all-female cheerleading tasks requiring more than two members, Study 4b included an extension of the Social Relations Model to examine dyadic relationships within four-person groups. Examining the variance partitioning for all dyadic combinations of the group provided the opportunity to examine athletes' perceptions in a slightly larger task structure.

Chapter 7

Chapter 7 includes a summary of the findings from Chapter 3-6, followed by the theoretical and applied implications of those findings and comments regarding the strengths and weakness of the thesis and specific future research directions. Finally, this chapter concludes with a statement of the significance and contribution of this thesis and a conclusion.

Chapter 2

Literature Review

This chapter begins with a review of the conceptual background regarding dyads and the efficacy beliefs that develop within athlete dyads. The key research in sport psychology is then presented, and followed by the limitations of the current literature. These limitations were addressed empirically within subsequent research Chapters 3-6.

Dyads

By definition, dyads are the smallest sized group and the only group size that cannot be subdivided into any smaller-sized groups (Levine & Moreland, 1998, 2006). While extending group size beyond two is important and a necessary step to understanding interpersonal influence emerging within larger groups, the fundamental questions typically begin at the dyadic level (Williams, 2010). The predictions of influences and diffusion of impact, in most instances, operate in the same way for dyads as do the processes in larger-sized groups. As argued by Williams, the only necessity for examining dynamics and interpersonal influence is having a dyad.

Characteristics of dyads. One of the most fundamental aspects of dyads is *nonindependence* (Kenny & Cook, 1999; Kenny, Kashy, & Cook, 2006). Nonindependence indicates that two individuals within a dyad are separate, but not independent working units. In conceptual terms, nonindependence is present when each member of a dyad is more alike to one another than to any other person not in the same dyad. Nonindependence can result from four sources; (a) similarities across members before being paired together (i.e., compositional effects), (b) situations when the characteristic or behavior of one partner affects the other partner (i.e., partner effects), (c) situations when both members' outcomes directly affect one another (i.e., mutual influence), and (d) when both dyad members are exposed to the same causal factors (i.e., common fate). Each of these sources highlight ways that nonindependence indicates a change in state for one member of the dyad will be associated with a change in state for the other member of the dyad (Laursen, 2005; Laursen & Bukowski, 1997).

Partner effects are a defining feature of dyads as measurements of each dyad member reflect the characteristics of the person who provides the score and the characteristics of the partner (Kenny & Cook, 1999). Dyadic models are designed to explicitly capture effects of both partners characteristics while controlling for nonindependent influences (Kenny, Mannetti, Pierro, & Livi, 2002). *Actor effects* are present when something about a person affects his or her own outcomes (Kenny et al., 2006). *Partner effects* are present when something about the partner affects his or her partner's outcome. In sports teams, for example, the quality of an athlete's personal performance is influenced by the quality of his previous personal performance actions (i.e., actor effects) and the quality of other members' performance actions (i.e., partner effects). The presence of partner effects is what constitutes two persons are meaningfully related and that at least one of the members of a dyad is dependent on characteristics of the other member (Kenny & Cook, 1999). For athlete performance, partner effects represent dependencies one has on another to perform as suggested to occur in interdependent teams.

A second important characteristic of a dyad is whether the two members within a dyad can be distinguished from one another by a meaningful variable (Gaudreau, Nicholls, & Levy, 2010; Kenny et al., 2006). When athlete roles are equivalent, a dyad is classified as an *exchangeable dyad* (e.g., tennis doubles pair). In contrast, *a distinguishable dyad* involves athletes who have distinct roles from one another in the performance (e.g., skipper-crew sailing pair). In the distinguishable case, the level of dependence each athlete has on his or her partner may not always be mutual or symmetric (Kenny et al., 2006; Lent & Lopez, 2002). Instead, one performer may be in a low-dependence role and the other performer may be in a high-dependence role. In such instances, the task structure will encompass an asymmetric dependence wherein one athlete (i.e., high-dependence role) is largely constrained to a performance environment directed by the other athlete (i.e., low-dependence role). Differences in dependency have ramifications for both members behavioral (e.g., performance) and psychological (e.g., efficacy) adjustments (Snyder & Stukas, 1999).

Advantages of dyadic analyses. There is a conceptual incongruence with examining social theories of behavior using research methods and data analyses designed for testing individuals in isolation from interpersonal experiences (Kenny et al., 2006). From a statistical perspective, standard ANOVA and multiple regression designs are not appropriate for employment with dyads because individuals' scores on a measure are nonindependent. Dyadic data, as a consequence, typically violate the basic assumption of nonindependence in standard designs (Kenny et al., 2002; Kenny et al., 2006). Whenever this violation is present, it is necessary to treat the observations as a dyad (or group) rather than as isolated individuals (Cook & Kenny, 2005). Dyadic analyses designed to control for nonindependence, therefore, offer a statistical advantage over standard analyses.

Most often, dyad research is nomothetic with research interests in establishing laws of behavior that apply to all dyads of a similar nature. In a *standard dyadic design*, each person is linked to only one other person and is, therefore, only a part of one dyad (Kenny et al., 2006). When both members in a dyad are measured, the design is referred to as *two-sided* or *reciprocal*. A common statistical model used for standard designs is termed the Actor-Partner Interdependence Model (APIM; Kashy & Kenny, 2000; Kenny, 1996). The APIM requires a measure from each partner on an independent and outcome variable. Effects are then estimated so that both partners' outcome variables (e.g., personal performances) are predicted by both partners' independent variables (e.g., efficacy beliefs; Kenny et al., 2006). The APIM offers an advantage of examining a dyad as a system in which members are simultaneously influencing one another (Kenny & Cook, 1999). When employed with distinguishable dyads, the APIM is useful for establishing patterns of dyadic interactions by comparing the size of actor and partner effects across partners. Partner effects of different magnitudes, for example, are a numerical indicator of one partner being more dependent on the other (Cook & Kenny, 2005; Kenny et al., 2006). In sum, the APIM is useful for addressing research problems concerning social contexts in which personal outcomes within a team are mutually influenced by the self (i.e., actor effects) and others (i.e., partner effects).

Sometimes, athletes will experience working with new partners (Jackson et al., 2015; Wickwire, Bloom, & Loughead, 2004) or be switched across multiple partners within a larger team (Magyar, Feltz, & Simpson, 2004). In these instances, the size of actor and partner influence may vary across involvements in the different dyadic combinations. Some dyadic analyses are designed for persons interacting with many partners. One such model is titled the Social Relations Model (SRM; Kenny, 1994; Kenny & La Voie, 1984). In the SRM, the variance in a measurement of efficacy, for example, across multiple-dyadic linkages provides insights about the extent one's efficacy beliefs change with different partners. A unique feature of the SRM is that it addresses questions about the extent an athlete's perceptions and behaviors are determined by individual-level effects (i.e., actor, partner) and dyad-level effects (i.e., relationship; Kenny et al., 2006). Kenny et al. argue the SRM's relationship effect quantifies the extent a variable is dyadic; something other dyadic analyses do not do. In sum, the SRM model provides the opportunity to examine person by partner interactions and then account for person-related variance explaining perceptions and behaviors relevant to interdependent groups.

Efficacy Beliefs

One may recognize, upon reflection of performing in a dyad, that the group's performance is attained by some integration of both athletes' abilities. This invites individuals to develop efficacy beliefs about targets other than themselves that shape performance outcomes (Beauchamp, 2008). This section considers efficacy beliefs in relation to agency at self, relational, and collective levels that develop within athlete pairs.

Self-efficacy Beliefs

According to Bandura's (1986) Social Cognitive Theory, people regulate their cognitions, emotions, and behaviors to achieve their desired outcomes. As a proactive agent of the environment, one will use forethought, self-regulation, and self-appraisal to reach his or her goals. In Bandura's (1977) seminal work, he defines self-efficacy as "the conviction that one can successfully execute the behavior required to produce the outcomes" (p. 193). Self-efficacy beliefs differ from predictions of performance outcomes and from more general trait-like conceptions of confidence and competence (Bandura, 1997; Maddux, 2009). Provided an athlete possesses a sufficient level of physical skill/ability, efficacy beliefs are theorized to be cognitive mediators of future behavior in an achievement-oriented environment. Although Bandura's suggestions of conscious cognitive processing opposed conventions at the time (i.e., behaviorism), self-efficacy, has since been recognized as a psychological characteristic that often differentiates between successful and nonsuccessful athletic performances (Feltz & Lirgg, 2001; Gould, Weiss, & Weinberg, 1981).

Sources of self-efficacy. Self-efficacy beliefs are a product of the cognitive processes of self-appraisal and self-persuasion that arise from four major sources of information available in the environment (Bandura, 1977, 1990). These are, namely, personal performance accomplishments, vicarious experience, verbal persuasion, and physiological/affective states. Of these sources, personal performance accomplishments are argued to have the strongest influence on self-efficacy because they are most germane to one's performance abilities (Bandura, 1997). Sources of personal information argued to enhance efficacy beliefs include personal verbal persuasion strategies of self-talk and self-imagery, and interpretation of one's physiological state (Bandura, 1977). Perceptions of physiological states can include feelings of being physically fit, fatigued, and/or in pain. Relatedly, an emotional state can inform efficacy beliefs. The interpretation of physiological and emotional symptoms typically associated with anxiety may be perceived as a signal that one does not possess the capabilities to successfully perform a task leading to diminished efficacy beliefs (Feltz, 1982; Feltz & Lirgg, 2001).

Sources of efficacy stemming from outside the self are also efficacy altering in line with Bandura's (1986) assertions of observational learning and modelling. Accordingly, seeing or imagining others perform well (i.e., vicarious experiences) are a personally efficacy-enhancing experience. Through social comparison, one can observe the consequences of performing a task and then use this information to form judgements about one's own abilities to perform the same or a similar task (i.e., symbolizing capabilities; Maddux, 2009). Relatedly, verbal persuasion from others viewed to be reliable, credible, and have a strong domain knowledge can provide meaningful information for evaluating personal abilities (Bandura, 1997). Persuasion strategies used by others include evaluative feedback and verbalizing other's expectations. Persuasion strategies, according to theory, tend to be the least salient in isolation from the other sources of efficacy (e.g., personal performance accomplishments; Bandura, 1997; Feltz & Lirgg, 2001).

Bandura (1977) articulates that the information available from the four sources contained in the environment can differ from how the information is processed, transformed, and interpreted by the individual. This is an important consideration in trying to understand team athletes' self-efficacy beliefs because information relative to other teammates has consequences for how personal abilities are interpreted. Providing the "correct" sources of self-efficacy may not always lead to the positive outcomes associated with strong efficacy beliefs, if personal mastery experiences are discounted to other teammates' efforts and abilities. Bandura argues tasks accomplished with effort, perceived as difficult, attempted without assistance, and experienced with very few failures carry the greatest potential value for resulting in favorable efficacy beliefs (Feltz & Lirgg, 2001). In a complicated environment such as a team task, however, the sources of self-efficacy may not be as straightforward as might appear in theoretical contentions.

Outcomes of self-efficacy. The efficacy construct has gained popularity in sport psychology because it is associated with thought patterns and behaviors important to achievement. There are many positive effects of self-efficacy including those on one's performance (Bandura, 1977). According to Bandura (1997), performance is a *conglomerate index* resulting from a combination of effects including self-efficacy, motivation, effort and persistence, and thought/emotional patterns. Self-efficacy, however, is argued to be the driver of the latter effects (i.e., motivation, effort and persistence, and thought/emotional patterns) as described below.

Bandura (1977, 1997) proposed efficacy is a primary determinant of motivation to accomplish a given level of performance. Through symbolizing capabilities, people create an expected future that inspires their personal actions in the present. Athletes are motivated to set performance goals based on what they believe can be accomplished and avoid physical challenges that appear too challenging. Relatedly, effort and perseverance are typically necessary for achieving performance. Upon reflection of one's current standing being under par relative to a performance goal, an athlete will make a choice about the extent to which he or she will continue pursuit of that performance goal. In such instances, those high in self-efficacy are more likely to increase effort and persistence in a goal pursuit than those low in self-efficacy.

The relationship between efficacy beliefs and motivation is argued to occur through intentions, forethought, self-reaction, and self-reflection (Bandura, 2006). Sometimes, these processes can be related to thought patterns and emotional responses associated with achievement (Feltz, Short, & Sullivan, 2008). Athletes will experience thought patterns and emotional reactions during real and anticipated encounters with the environment (Bandura, 1986). According to Bandura (1997), those high in self-efficacy tend to perceive a stressful environment and the associated emotional arousal as less threatening, while those low in self-efficacy tend to perceive similar environments as highly threatening. In competitive situations associated with stress and anxiety, self-efficacy beliefs are an important influence on one's perception of personal control over thoughts, emotions, and behaviors.

Reciprocal effects. Bandura (1977) theorized that self-efficacy and performance have a temporally recursive relationship. Bandura (1990, 1997) emphasized that the relationship between efficacy and performance is reciprocal because mastery performances are a major source of information to evaluate self-efficacy, and self-efficacy is a key mechanism for achieving a given level of performance. These reciprocal effects, as described in the theory, occur on a performance-by-performance basis wherein each performance in a series provides new information in which to re-evaluate personal abilities. The extent to which new information requires evaluation is related to the extent efficacy will predict subsequent performance above and beyond previous performance (Bandura, 1997).

Relational Efficacy Beliefs

Lent and Lopez (2002) extended self-efficacy theory into interpersonal settings to contextualize how people process efficacy-relevant information within close relationships. Their extension resulted in a tripartite (i.e., three-part) framework of relational efficacy beliefs theorized to be important to the functioning of a relationship. In their tripartite model, three types of efficacy are described with the first being self-efficacy. Their notion of self-efficacy is aligned with theoretical assertions from Bandura (1977, 1997) with the other two types of efficacy beliefs emerging within a specific relationship. These latter efficacy beliefs are termed *other-efficacy* and *relation-inferred self-efficacy*. Overall, Lent and Lopez use the term relational efficacy in referring to the network of interpersonal or interactive efficacy beliefs about the self and other within the context of a specific relationship and argue that personal, partner, and relationship outcomes result from these relational efficacy beliefs.

Other-efficacy is conceptualized as "an individual's beliefs about his or her significant other's ability to perform particular behaviors" (Lent & Lopez, 2002, p. 264). Other-efficacy beliefs are theorized to emerge from perceptions of a partner's previous performances, beliefs about similar others, third party views, and social stereotypes. Much like self-efficacy, the functions of other-efficacy help explain what paired activities one chooses to engage in, whom one chooses to be paired with, and the level of effort expended in a paired activity. The amount, provision, and acceptance of social support with the partner are also related to other-efficacy beliefs (Lent & Lopez, 2002). Further, a partner's evaluations are likely to be more accepted if that partner is viewed to be highly able in the domain that the dyad is operating within. Relatedly, feedback from the partner is attended to and relied upon to the extent to which one has strong beliefs in the partner's abilities. Altogether, other-efficacy is thought to relate to the extent one is satisfied and willing to persist through difficulties within a relationship.

Relation-Inferred Self-Efficacy (RISE) describes "an individual's beliefs regarding how a significant other views the individual's efficacy at particular tasks or behavioral domains" (Lent & Lopez, 2002, p. 268). RISE is a complex judgement because it requires an individual to make inferences about a partner's beliefs. RISE beliefs require attention, encoding, and recall processes that are subject to error. Lent and Lopez argue that RISE is a relationship-specific source of self-efficacy that augments Bandura's four primary sources of self-efficacy. Although Bandura appears to disagree (as cited in Feltz, Short, & Sullivan, 2008), RISE is argued to differ from verbal persuasion because RISE is the cognitive filter in which social persuasion is processed (i.e., the degree to which any feedback is accepted, discounted, and integrated).

RISE is theorized to mediate the relationship between one partner's other-efficacy belief to the other partner's self-efficacy belief (Lent & Lopez, 2002). That is, the causal sequence begins with Partner A's other-efficacy influencing particular actions from Partner A (e.g., verbal and nonverbal behavior reflecting his or her beliefs in the partner). Partner A's actions are then inferred by Partner B to comprise a RISE belief that then serves as a source of Partner B's self-efficacy. Because of this causal sequence, RISE is assumed to indirectly affect one's coping efforts, skill development, and perceptions of social support from a partner. Lent and Lopez (2002) also proposed a reciprocal relationship between self-efficacy and RISE because if the two perceptions are not similar (i.e., high self-efficacy, low RISE), then one may be motivated to change the RISE perception (and ultimately the other partner's other-efficacy). RISE, like other-efficacy, is thought to have consequences on relationship maintenance behaviors.

It is assumed people enjoy and seek relationships in which others believe in one's own capabilities; so, RISE is associated with one's satisfaction and persistence in a relationship.

Relational efficacy beliefs and role. Relational efficacy beliefs are argued to be less salient for individuals holding a role of power or status in a dyad (Laursen & Bukowski, 1997; Lent & Lopez, 2002). As Snyder and Stukas (1999) have explained, each individual will have different motivations in a relationship. Those in a high-dependence role are most affected by the relationship and consequently will seek cues to fit oneself into a relationship environment created by the member in a low-dependence role. In line with this reasoning, Lent and Lopez hypothesized that persons will experience relational beliefs differently depending on their role because those in a high-dependence role are more heavily invested in the relationship compared to those in a low-dependence role.

Collective Efficacy Beliefs

Collective efficacy is defined as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 477). The perception of self- and collective efficacy differ in only the unit of agency as both are theorized to have similar sources, serve similar functions, and have similar operating processes. Importantly, group outcomes are comprised of interactive components of functioning that make a group's beliefs inequivalent to the sum of individuals' self-beliefs.

Bandura (1997) proposed the original sources of self-efficacy were parallel for collective efficacy beliefs and include: group performance, verbal persuasion targeting the group, vicarious experiences related to other groups, and the psychological and physiological states of the group. It has also been suggested that collective efficacy beliefs are influenced by group composition, team size, effective leadership, the available knowledge of group members' abilities, group and task structure, the selected team strategy, and the members of the group interacting in a facilitating manner (Bandura, 1997; Watson, Chemers, & Prieser, 2001).

The outcomes of collective efficacy are also similar to self-efficacy. Collective group performance is, perhaps, the most notable outcome associated with collective efficacy, especially for teams high in interdependence (Gully, Incalcaterra, Joshi, & Beaubien, 2002). Indirect effects to performance, however, are also proposed to occur through group goals, lower task-anxiety, and increased engagement (Beauchamp et al., 2012; Bray, 2004).

Self-efficacy versus collective efficacy. Bandura (1997) states, "In appraising their personal efficacies, individuals inevitably consider group processes that enhance or hinder their efforts" (p. 478). One's beliefs of personal abilities are not detached from his or her beliefs about a system of abilities in a larger team. This is especially true for teams performing tasks of high-interdependence when self-action is less distinct from collaborative or interdependent actions (Bray et al., 2002; Katz-Navon & Erez, 2005). Relatedly, when assessing collective efficacy, members will consider how well key teammates execute their individual roles (Bandura, 1997). Beliefs about team abilities are not fully removed from all thoughts about individuals who contribute a great deal to the collective abilities of the team. Bandura states the individual and team level perceptions of efficacy to be moderately correlated as a consequence, albeit the constructs are recognized as completely separate.

Key Research in Sport Psychology Literature

Overall, there has been an abundant amount of research evidencing the proposed antecedents and consequences of self, relational, and collective efficacy beliefs. The following three sections are dedicated to a review of the key research that inform this thesis' investigation of efficacy-performance relationships in athlete dyads.

Self-efficacy Beliefs in Sport

Consistent evidence supporting the theoretical components of Bandura's (1977, 1997) self-efficacy theory has had implications for researchers' understanding of individual sport settings. The empirical evidence supports mastery performance has the strongest influence on self-efficacy beliefs and verbal persuasion is most effective on self-efficacy after experiencing mastery performance (Wise & Trunell, 2001). Mastery-focused imagery accounts for variance in self-efficacy and performance and, relatedly, perceptions of physical and affective states predict athletes' and exercisers' self-efficacy beliefs (Beauchamp, Bray, & Albinson, 2002; Jackson, Knapp, & Beauchamp, 2008; Matsuo, Matsubara, Shiga, & Yamanaka, 2015). Individuals more certain in their capabilities tend to set more challenging goals (e.g., Kane, Marks, Zaccaro, & Blair, 1996), are more effortful and persistent in their pursuits (e.g., Beattie & Davies, 2010; Hutchinson, Sherman, Martinovic, & Tenenbaum, 2008), and experience more positive emotional responses (e.g., Tritter, Fitzgeorge, Cramp, Valiulis, & Prapavessis, 2013).

Regarding individual performance contexts, self-efficacy has been consistently linked to individual performance outcomes. Although some researchers have indicated situations in which efficacy is negatively related to performance (e.g., Woodman, Akehurst, Hardy, & Beattie, 2010), meta-analyses have supported findings for a moderate, positive relationship between self-efficacy and individual sport performance (Moritz, Feltz, Fahrbach, & Mack, 2000; Woodman & Hardy, 2003). Further, evidence supports the reciprocal relationship between self-efficacy and performance (e.g., Feltz, 1982, 1988).

Self-efficacy in relational and group contexts. The effects of self-efficacy have also been investigated in relational and group settings. For example, highly confident members of coach-athlete dyads tend to have adaptive motivational responses, increased commitment to a relationship, and decreased perceptions of relationship conflict (Jackson & Beauchamp, 2010; Jackson et al., 2007, 2008; Jackson et al., 2011). Relatedly, athletes can believe more strongly in their own abilities when performing with a talented partner because, as argued by Katz-Navon and Erez (2005), self-action lacks distinction from collaborative actions to some degree in group performance (e.g., Dunlop, Beatty, & Beauchamp, 2011). International-level athletes performing in dyads have reported that their perceptions of their partner and dyad help to regulate their self-efficacy beliefs (Jackson et al., 2008). This evidence suggests that others' abilities are processed and interpreted in evaluations of self-efficacy.

Relational Efficacy Beliefs in Sport

Since Lent and Lopez (2002) first proposed their framework of relational efficacies, the sport literature has supported the importance for efficacy beliefs within relational contexts (Beauchamp et al., 2012; Jackson et al., 2015). Researchers has investigated the sources of, relationships between, and outcomes of relational efficacy beliefs.

Not much empirical work has been focused on the sources of relational efficacy beliefs compared to those on the outcomes of these beliefs (Jackson et al., 2015). Nonetheless, the sources of efficacy beliefs in elite coach-athlete and athlete-athlete dyads have been investigated qualitatively (Jackson et al., 2008; Jackson, Knapp, & Beauchamp, 2009). Jackson and colleagues found that characteristics of the partner (e.g., verbal and nonverbal communications from the partner, partner's mood) and dyad (e.g., previous success, experience as a dyad) were perceived to facilitate both other-efficacy and RISE beliefs. In these interviews, RISE was perceived to also be influenced by personal characteristics such as self-efficacy and personal motivation, supporting Lent and Lopez' (2002) assertion of reciprocity in the relationship between RISE and self-efficacy beliefs. Relatedly, youth persons can perceive cues from their coaches (e.g., verbal affirmations, assigned to a leadership/challenging position) and physical education teachers (e.g., transformational teaching) that facilitate their RISE beliefs (Bourne et al., 2015; Saville, Bray, Martin Ginis, Marinoff Shupe, & Pettit, 2014).

The investigation of relationships among the components of the tripartite relational efficacy framework have supported Lent and Lopez' (2002) theorizing. RISE and other-efficacy have been shown to predict individuals' self-efficacy beliefs (Jackson et al., 2008; Jackson, Knapp, & Beauchamp, 2009). Relational efficacy beliefs related to physical education teachers, exercise rehabilitation counsellors, and group-exercise instructors have demonstrated the positive effects other-efficacy and RISE have on beliefs in one's own abilities (Bray et al., 2013; Jackson, Dimmock, Taylor, & Hagger, 2012; Jackson, Whipp, & Beauchamp, 2013). Relational efficacy beliefs have also been indirectly, through self-efficacy beliefs, predictive of effort, satisfaction, enjoyment, and personal performance (Jackson, Grove, & Beauchamp, 2010; Jackson, Myers, Taylor, & Beauchamp, 2012).

In addition to the indirect effects of relational efficacy beliefs through self-efficacy on performance, two studies have examined direct effects of relational efficacy on performance above and beyond self-efficacy beliefs. In the context of performing dyads, other-efficacy has explained unique variance in personal and dyad performance. First, Dunlop, Beatty, and Beauchamp (2011) demonstrated other-efficacy beliefs have important implications on personal performance. Participants that reported the highest levels of other-efficacy beliefs performed the best individually, regardless of how confident they were in their own abilities. Dunlop, Beatty, and Beauchamp argued other-efficacy, compared to self-efficacy, may be the most substantive cause of successful individual performance in relational contexts. Second, Beauchamp and Whinton (2005) used horse-rider pairs to demonstrate that while the riders' self-efficacy beliefs explained 16 percent of the variance in equestrian performance, riders' other-efficacy beliefs (about their horse) explained an additional four percent of the variance. This study demonstrated, as theorized by Lent and Lopez (2002) that other-efficacy augments the effects of self-efficacy in collective performance outcomes.

The generalized other. RISE beliefs were originally theorized to be specific to a relationship partner (Lent & Lopez, 2002). When performing in a larger-sized group, however, individuals may reflect on the extent to which members of their team, as a whole, believe them to be capable (Jackson, Gucciardi, Lonsdale, Whipp, & Dimmock, 2014). Based on a symbolic interactionist perspective (i.e. Mead, 1934), self-perceptions are rooted in reflected capabilities and these appraisals can occur from inferences relative to groups of others (i.e., a generalized other). Jackson and colleagues provided initial evidence that group-focused RISE perceptions were empirically distinct from conceptually-related constructs and directly predicted positive outcomes above and beyond the effects of other types of efficacy beliefs. In larger-sized groups, teammate-focused RISE estimates are potentially important to consider within the network of efficacy beliefs.

Collective Efficacy Beliefs in Sport

Bandura (1997) argued that collective efficacy beliefs are a primary determinant of group behavior and thought patterns. As a consequence, collective efficacy has been linked to many group outcomes including: choices and goals (e.g., Bray, 2004), effort and persistence (e.g., Greenlees, Graydon, & Maynard, 1999), attributions (e.g., Allen, Jones, & Sheffield, 2009), and emotional reactions (e.g., Fransen et al., 2012). Perhaps most notable, is the effect of collective efficacy on group performance. In fact, the reciprocal relationship between collective efficacy and performance has been well examined. Myers, Payment, and Feltz (2004) found that collective efficacy has a moderate and positive relationship to team performance when controlling for past team performance, and in turn, team performance has a small, positive relationship to subsequent collective efficacy when controlling for past collective efficacy. In consideration that performance is nested within teams across a season, Myers, Feltz, and Short (2004b) found that collective efficacy remained a positive predictor of subsequent team performance, when controlling for previous team performance. The team performance to collective efficacy predictive direction, however, was associated with a positive effect across teams within any given week, but a negative effect within teams across the season. Regardless, the overall consensus is that collective efficacy has a moderate, positive relationship with group performance (Stajkovic, Lee, & Nyberg, 2009).

Self-efficacy versus collective efficacy. As suggested by efficacy theory, much of the empirical support for collective efficacy has paralleled the findings of self-efficacy (Bandura, 1997). Research comparing self-efficacy to individual perceptions of collective efficacy suggests that the concepts are related but separate evaluations of abilities (e.g., Katz-Navon & Erez, 2005). In rowing crews, collective efficacy beliefs have been observed to be partially predicted by self-efficacy beliefs. However, in an investigation using ice-hockey teams, a team's win or loss resulted in significant changes in collective efficacy in theory consistent directions, but had no effect on self-efficacy beliefs. It has been clarified in some research that the extent to which self- and collective efficacy perceptions are discriminant is related to the level of interdependence in the task (Gully et al., 2002; Katz-Navon & Erez, 2005; Magyar et al., 2004).

Dyadic Analyses in Sport

In sport psychology, the APIM has been employed with both athlete-athlete dyads and coach-athlete dyads. Jackson et al.'s (2007) investigation of relational efficacy beliefs and relationship satisfaction and commitment in youth athlete tennis pairs was one of the first sport psychology investigations using the APIM. The authors of the study argued that evidence of a partner effect in their results indicated the use of a dyadic model (i.e., the APIM in their study) has potentially important conceptual and methodological advantages (i.e., observation of partner effects) for studying athletes in interpersonal settings.

Since then, use of the APIM has been focused towards understanding interactions between coaches and their athletes. In coach-athlete relationships, for example, actor and partner effects have been observed between RISE beliefs and commitment, satisfaction, and effort (e.g., Jackson & Beauchamp, 2010), personal attachment styles on coach-athlete relationship quality (e.g., Davis, Jowett, & Lafrenière, 2013), and the transfer of well- and ill-being across a training session (e.g., Stebbings, Taylor, & Spray, 2016). In coach-athlete dyads, it has been observed that a members' role moderates the direction and magnitude of observed effects as proposed in theory (Fiske, 1993; Snyder & Stukas, 1999). Coaches that believe strongly in an athletes' capabilities (i.e., other-efficacy) promote their athletes to report positive appraisals of a relationship, but the effect from athlete other-efficacy to a coach's appraisal of a relationship was significantly weaker (Jackson & Beauchamp, 2010). Relatedly, coach affect in the beginning of a training session is transferred to an athlete by the end of a training session, but the inverse relationship (i.e., athlete affect transferred to coach) was not supported. These observed differences in the magnitude of partner effects indicate that coach-athlete relationships demonstrate a flow of influence from a low-dependence role to a high-dependence (Jackson, Grove, & Beauchamp, 2010). The implications of these findings suggest that for dyads with distinguishable roles, asymmetric dependence has ramifications for both members behavioral and psychological outcomes (Snyder & Stukas, 1999).

The SRM for distinguishable roles has yet to be cited in the sport psychology literature, although Jackson et al. (2015) have encouraged its use in investigations of athlete characteristics (e.g., role) that predispose perceptions of others to be (in)consistent. As identified by Kenny, Mohr, and Levesque (2001), the SRM can be viewed as a special case of generalizability theory. Generalizability theory is a statistical theory and framework for evaluating reliability/consistency of a measure across various environmental conditions (Shavelson & Webb, 1991). There has been some use of generalizability theory to investigate perceived support in coach-athlete relationships. Coussens, Rees, and Freeman (2015) and Rees, Freeman, Bell, and Bunny (2012) observed that an athlete's perception of social support from a coach was mostly attributable to a unique connection between a coach and athlete (i.e., a relationship effect) rather than a feature of an athlete perceiving all coaches in the same way (i.e., actor effect) or a coach eliciting the same perceptions of his or her social support by all athletes (i.e., partner effect). Identifying actor, partner, and relationship effects in athletes' interpersonal perceptions and behaviors offers a potential focus for interpersonal interventions in a performance domain (Coussens et al., 2015).

Limitations in the Literature

The review of literature and key research demonstrates several limitations requiring attention to continue the development of theories informing team dynamics. Some of these limitations, expanded on below, were addressed within the remaining chapters of this thesis. First, team performance has typically been assessed using either individuals' or teams' statistics, yet the agency driving interdependent action reflects three separate but related sources of variance (i.e., each member of a dyad and the interaction between the two members). Theoretical assertions of team dynamics are limited to the extent the dynamic aspects of performance (i.e., how the parts all relate) are largely ignored because it is unclear if or to what extent interdependent performances have three sources of variance simultaneously occurring. Therefore, it was a necessity to focus on how the three pieces of performance information residing in interdependent performances are related before perceptions of those performances can be attended to in subsequent investigations. This limitation was addressed by the examination of the reliability of and relations among a dual-performance measure for interdependent cheerleading paired-tasks (Chapter 3).

A second limitation of the reviewed literature includes the lack of attention on certain types of dyads. It appears that overall the coach-athlete relationship receives substantial attention compared to athlete dyads. Further, investigations of athlete dyads have included experimentally linked dyads (i.e., Dunlop et al., 2011), dyads with exchangeable roles (i.e., tennis pairs; Jackson et al., 2007), or provided information from only one member of an intact dyad (i.e, rider in equestrian dyads; Beauchamp & Whinton, 2005). There has not been, to the best of my knowledge, an investigation measuring both members of intact athlete dyads with distinguishable roles, despite the advances these types of dyads provide to an understanding of interdependence and role relations. This type of dyad (i.e., intact cheerleading dyads) was the sample of participants obtained for each research chapter (Chapters 3-6) to focus an investigation on asymmetric dependencies and the effects this task structure imposed on the efficacy-performance relationship.

Third, despite the parallels across theoretical tenets of self, relational, and collective efficacy, it is not currently well known how athletes simultaneously perceive personal, partner, and team abilities (Feltz & Lirgg, 2001). Current evidence indicates each efficacy is determined in part by the sources proposed to predict efficacy at another level (e.g., self-efficacy increases when the partner/dyad is viewed as highly capable; Jackson et al., 2008). Individual characteristics such as athlete role have not been examined in relation to the sources of efficacy to help clarify under what circumstances overlap of the sources of efficacy are most likely to exist. This limitation exists, despite the evidence in coach-athlete literature for the meaningful effects of role on efficacy beliefs. This limitation was addressed throughout the thesis with the various sources of efficacy being examined in Chapters 4 and 6. The simultaneous investigation of efficacy-performance relationships were also examined in Chapter 5.

Fourth, as indicated by Jackson et al. (2015), investigations encompassing partner influences are uncommon especially considering athletes tend to depend on several others for performance (e.g., nutritionist, trainer, strength coach, parents, etc.). Although theories often emphasize the importance of the social context, individual-level approaches, by either holding constant or without measuring other persons, remains a common analytic method (Lent & Lopez, 2002). As previously discussed there are inherent conceptual and statistical problems with this approach. This limitation was mainly addressed using two dyadic designs, namely, the Actor-Partner Interdependence Model (employed in Chapter 5) and the Social Relations Model (employed in Chapters 4 and 6).

In summary, the empirical studies provided in the remaining chapters of this thesis address some of the limitations in the current literature. As discussed throughout the thesis chapters and summarized in the final discussion chapter, the findings of these studies are provided as an extension of theoretical contentions in the area of efficacy and performance in team sports settings.

Chapter 3

Study 1: The Development of an Individuals-within-Dyads Multilevel Performance Measure for an Interactive Cheerleading Task[1, 2]

[1] This chapter (verbatim) has been accepted for publication as;
Habeeb, C. M., & Eklund, R. C. (2016). The development of an individuals-within-dyads multilevel performance measure for an interactive cheerleading task. *Measurement in Physical Education and Exercise, 20*(1), 16-26.
doi: 10.1080/1091367X.2015.1082474

[2] The performance data analyzed in this chapter were extracted from a data set obtained during the candidate's master's degree. The analyses and reliability assessments of the performance data were not used in the submission for the previous research degree. This chapter also includes a dyad-level performance assessment not submitted for the previous research degree.

Adequate team performance, typically, cannot be achieved without each individual performing his or her role to some degree of correctness. However, team performance is not always equivalent to the sum of individual parts and the quality of *interactions* between team members is often influential on success. Team statistics (e.g., goals, turnovers, assists, pass completions, etc.) are typically used as indicators of performance, but the critical analysis of individual contributions to the interactive components of performance could augment knowledge about the success of winning teams (Fernandez, Camerino, Anguera, & Jonsson, 2009). Unfortunately, little research has been directed towards analyzing interdependent skills in team sport performance (Hughes & Bartlett, 2002; Travassos, Davids, Araújo, & Esteves, 2013).

Subgroups of differing size will exist within a team. However, a *dyad* ties the individual to the group in the simplest form. The dyad is the only size of group that cannot be further divided into subgroups (Levine & Moreland, 1998). In addition, two-person interactions are substantially void of third-party behavioral influences (Levine & Moreland, 2006). Larger group sizes generate a more complex network of dynamic and mutual influences that must be accounted for among individuals (Hare, 1976). Therefore, dyads function as an elementary unit in which to understand and measure individual performance within any size sporting group (McGarry, 2009). Despite this, interpersonal behavior studies within sport tend to focus on larger size teams (Gaudreau, Fecteau, et al., 2010).

Organizing team-level behaviors into lower-level dyadic interactions also elicits consideration of the individuals within the dyads. Researchers conceptually approach relationships as two partners acting as interdependent units with distinct contributions towards developmental outcomes (Laursen & Bukowski, 1997). That is, two individuals will have multiple, bidirectional interconnections through simultaneously producing and responding to one another's behaviors (Laursen, 2005; Malloy & Albright, 2001). However, without performance information related to each individual disjointedly, the mutual influences can only be assumed (Kenny, Kashy, & Cook, 2006). A unidirectional measure of one partner's performance does not provide adequate information about the other partner's performance, or their performance together, for that matter. Laursen (2005) further clarifies that data from each partner is more revealing of interdependent behaviors because, in general, measuring variance within relationships is impractical if only one source of variation is addressed and reported.

Conceptually, team accomplishments derive from the individuals that make up the team *and* the interactions between those individuals (Arthur et al., 2005; Tesluk et al., 1997). Multiple points of data from varying levels and perspectives, as an adequate representation of two interacting performers, include (a) a measure of partner A's individual performance, (b) a measure of partner B's individual performance, and arguably (c) a measure of their performance together at the dyad level. While data points (a) and (b) are theoretically nested under data point (c), an aggregation score may be statistically misleading and conceptually meaningless for a dyad-level performance score (Malloy & Albright, 2001). As illustration, the interaction of two moderate performers and the interaction of one great performer and one poor performer are not analogous interactions but could be represented by identical mean scores (Laursen, 2005). Not only could the sum of points (a) and (b) be unknowingly incongruent to data point (c), but the uniqueness within each dyadic interaction, as determined by the individuals within those interactions, is removed from a dyad-level performance score. The complexity of a team performance decomposed into dyadic interactions that are further decomposed into individual behaviors provides one approach to understanding how a particular performance, at any given level, occurs in the context of team competitions (Travassos et al., 2013).

The aim of this investigation was to identify, measure, and describe aspects of individual and interactive outcomes within joint sport performance conditions. First, we provided a conceptual breakdown of a performance task into two contributing levels and individual role requirements. Second, an adequate measure of each theoretically contributing unit (i.e., partner A, partner B, and dyad) within task performance was developed. Relatedly, initial validity and reliability of each measure was determined using a panel of observers. Third, relationships among performance scores were analyzed so as to interpret the reality of individuals performing within a conjoint performance outcome. The current investigation provides implications for improving sport scoring procedures, a systematic framework of task outcome quality from multiple perspectives, and descriptive relationships of real dyadic performance data.

Sport Specific Background

Like many aesthetic sports, cheerleading performances are given a score linked to task difficulty and points are deducted for differences between the desired behavior and observed behavior (i.e., errors; Zelaznik, 2014). A brief review of scoring systems in interdependent paired sports similar to cheerleading (i.e., synchronized diving, synchronized swimming, paired acrobatic gymnastics, paired ice-skating, and paired dance) revealed wide variability in assessment quantification conventions. Each sport scoring procedure was unique and, therefore, did not provide a shared fundamental approach to measuring dyadic sport performance. However, performance was commonly indicated by both individual- and dyad-level aspects across each scoring system. In comparison, competitive cheerleading scores are awarded for the overall quality of team execution even though many of the tasks are completed by subgroups. Therefore, the focus of this investigation was to develop measures for the performance of individuals and dyads within cheerleading teams.

Research questions that address lower-level contributions toward a team outcome require concordant outcome measures (Kenny et al., 2002). For this investigation, the judges' team-level scores are less valuable because variability attributed to dyads and individuals is absent (Laursen, 2005; Tesluk et al., 1997). Judges presumably assess the individuals and dyads in some sense in evaluating the team, but there is not a written score that represents or provides direct evidence for individual or dyad performance assessments. The current investigation is not intended to be used for criticism of the scoring system within competitive cheerleading. The investigation may provide a unique account of individual contributions and interactions often ignored in highly interdependent team sports.

Measures in this investigation were developed in relation to one interdependent paired-stunt task performed within each team routine. Successful task completion required multiple sets of male-female dyads to perform the same paired-task in unison. The task was chosen because it provided observable differences between individual-, dyad-, and team-level performance requirements. Within the context of this investigation, individual-level performance was defined as utilizing proper technique required by one's unique role. The dyad-level performance was defined as the degree to which two partners integrate behaviors so as to avoid errors, and the team-level performance was defined as the quality of unified movements across dyads (although not assessed in this investigation).

Performance Modelling and Observation Framework

Performance assessment interests researchers, practitioners, coaches, judges, and athletes (O'Donoghue, 2010). To suit the range of persons who would find these measures useful, a scientific approach and coaching perspective were merged (Franks & Goodman, 1986). This required considerable knowledge in the sport as well as a review of existent performance models and observation schemes used in more traditional team sports.

A theoretical definition of performance is a fundamental starting point for the development of a performance measurement scheme (Morrison, 2000). With the idea that performance is an execution of action, at least in aesthetic sports, many accept the terms technique and performance as synonymous. However, the two terms are not equivalent (Lees, 2002). Better performance outcomes do not directly indicate a better use of technique. For example, observing the landing of a tumbling skill does not indicate the form used in-flight directly before the landing. Thus, one cannot assume that the completion of the task (performance outcome) is equivalent to the aesthetic quality of the acrobatic skill (proper execution or technique; Hauw, Renault, & Durand, 2008). However, observed first-rate technique does tend to indicate a better performance quality and outcome. Therefore, analysis of technique, a process-oriented rather than outcome-oriented analysis, is a superior indicator of performance compared to performance outcomes alone (Barnett et al., 2009; Burton & Miller, 1998).

Technique is a sequence of movements described as body lines and angles in relation to their temporal occurrences (Lees, 2002). Technique analysis is a common concept that lacks a strong conceptual framework partly due to the unique requirements of every sport skill, especially those of acrobatic nature. While the biomechanics of a movement pattern may be valuable for technique analysis, the detailed process often lacks the capability to meaningfully link pieces of information to an entire task (Lees, 2002). Qualitative technique analyses, as characterized by subjective observations of performance, are more common in applied settings. While qualitative observation usually requires extensive knowledge about the task, it is relatively less time consuming and can be used by people with a varying range of expertise (Lees, 2002). Qualitative procedures best addressed the purposes of this investigation because, within performance settings, analyses regarding whole-body movement are likely more warranted and applicable by coaches and judges. Intricate details are a partial representation of performance and often require supplementary qualitative considerations to make sense of biomechanical analyses (Hughes & Bartlett, 2002).

McPherson's (1990) and Hay and Reid's (1982, 1988) models for qualitative movement diagnosis both emphasize that creating a systematic observation scheme to accurately detect errors relies on heavy inquiry during two steps within the preobservation stage. Step one, *movement analysis*, includes the identification of critical features of the skill and consideration of the factors that alter perception of the skill. Step two, *planning the observation*, includes developing a recording form and outlining an assessment process (McPherson, 1990). The manner in which important features of the skill are highlighted will prompt the observation scheme, organization of assessment, and recording tool.

Movement analysis. The organization of an observation scheme is important because it will directly influence how a movement is perceived (Knudson, 2013). Gangstead and Beveridge's (1984) model for sport skill observation and analysis is a well-used qualitative model. The systematic observation model operates to indicate discrepancies in actual and desired behaviors across multiple athletes while reducing the complex visual display of a body in motion (Gangstead & Beveridge, 1984). Drawing observer attention to specific parts of movement through spatial and temporal markers so as to reduce the observer's perceptual load is a unique feature of the model.

Gangstead and Beveridge (1984) stated their model was fashioned to manipulate the observers' visual experiences so as to simplify the evaluation process. Lees' (2002) review of technique analysis in sport highlights three strategies to organize observational depictions of movement as in line with Gangstead and Beveridge (1984). First, *phase analysis* involves breaking down a task into subjective phases of movement determined by the specific task and purpose of analyses. Second, *temporal analysis* is related to the rhythm, timing, and the sequences of movements important to performance. Noticeably, phase and temporal analyses are intuitively intertwined. Third, *critical features*, or components absolutely essential to the skill, are identified. Critical features must be observable aspects, least modified by a performer, to achieve the desired outcome. The most common strategy used to control observer perceptual load has been to indicate critical features within temporal phases (Gangstead & Beveridge, 1984; James & Dufek, 1993; Lees, 2002).

Planning the observation. To aid observation and evaluation, model performance templates are created to provide observers with ideal representations of movements. Any deviations from the model template characterize quality of technique within performance. Templates are multilayered and generalizable across many athletes, yet specifically vary according to how the skill is subjectively analyzed (Knudson, 2013). When skills are more complex, increasing the number of observation trials is argued to relieve limited perceptual capacities of the observers (Knudson, 2013). Hay and Reid (1988) suggest two or three observation trials should be utilized for gathering a general impression of the movements, and then further trials can be focused on parts of movement for systematic review. Additional strategies suggested to increase the validity and reliability of subjective observations include providing observer training, specifying measurement guidelines, and simply increasing the total number of trials (Knudson, 2013).

Investigative Rationale

Team sports including net and wall games, invasion games, and striking and fielding games, have been provided with recommended performance indicators for analytical purposes (Hughes & Bartlett, 2002). The current investigation, to our knowledge, was the first attempt to provide performance indicators for dyadic relationships within aesthetically-based, interactive team sports. This involved indicating a logical structure of interdependent performance relative to the specific sport yet grounded in previous performance analysis models. Measurement scales were then developed and applied in a performance assessment. As a consequence, each paired-stunt task produced three performance scores representing (a) the male's performance, (b) the female's performance, and (c) their conjoint performance.

Relationships between differing outcome scores within the performance framework were expected. The dyad-level performance score was hypothesized to relate positively with both individual-level scores due to the conceptual deployment of the performance hierarchy. In addition, the individual-level performance scores were hypothesized to relate positively with one another because the scores were measured at the same level. To further clarify how each level of analysis related, an aggregated dyad-level score was created. Aggregating individuals' scores to indicate group-level variables is a common practice associated with many statistical and conceptual issues (Tesluk et al., 1997). Relationships were compared between the three observed performance scores and the aggregated dyad-level score to illustrate the extent to which a purposefully designed dyad measure uniquely informed conjoint performance. In addition, evidence of observer agreement was to be identified for each of the performance scales. Finally, interpretations of performance scores were aimed at emphasizing the natural interdependencies within a competing sport team. The unique attributes of the paired-stunt task caused a largely exploratory nature of task analysis. However, the clear divisions between levels of measurement and the divided contributions from each individual provided an ideal structure for this investigation to operate within.

Method

Participants

Sixty-six cheerleading dyads (132 individuals) competing in a national competition agreed to participate in a larger study. Each athlete performed within only one dyad which comprised of one female (flyer role) and one male (base role).[3] Eleven university teams from the southwest (*n* = 5), southeast (*n* = 3), midwest (*n* = 2), and west (*n* = 1) regions within the United States were included in the study. Participants were from 18 to 31 years of age (base *M* = 22.13 years, *SD* = 2.93; flyer *M* = 19.88 years, *SD* = 1.45). The larger study was approved by the institutional review board and the informed consent explicitly acknowledged that participation included assessment of publicly-available video recordings of competition routines described in this investigation. No additional video recording occurred.

Performance Task

The paired-stunt task had an average duration of 6.5 s (*SD* = 1.86, range =

[3] A *base* is defined as "any person who is in direct contact with the performing surface and is supporting another person's weight" and a *flyer* is defined as "any person who is either being supported by another while off of the performing surface or who has been tossed into the air by another person" (NCA, 2013, p. 2).

6 – 11 s) within a two and a half minute competition routine.[4] Task inclusion criteria specified that performance of task skills would require only one base and one flyer. Safety rules implemented by the competition required very difficult skills to be performed with an additional spotter. To eliminate any third-person confounds, task exclusion criteria dismissed any skills requiring a spotter. As a consequence of the inclusion and exclusion criteria, tasks were comparable across teams. All tasks followed a sequence of the flyer being freely tossed from her hips into the air by the base (entrance). The flyer's feet then landed on the base's hands that were formed as a platform over his head. The flyer held a controlled body position while being extended in the air (middle portion). For the termination of the skill, the base released the flyer's feet and caught the flyer's hips to assist her two-footed landing on the competition surface (dismount).

Performance Measures

Dyad-level performance. The assessment of dyad-level performance was adapted from the National Cheerleading Association's (NCA; 2013) college rulebook. The gold-standard scoring system provided guidelines, originally created for team performance assessments, applicable to each dyad. Both *difficulty* and *execution* were components of the dyad scores. Dyad-level performance ranged from 0 - 10 with higher scores representing proper execution (less errors) of a more elite skill range. Categories of skills were provided from the NCA (2013) rulebook and are listed in Table 1. Each dyad was placed in a score range linked to the difficulty of the attempted performance task and deductions of 0 - 2 points, in increments of .5 points, were given in accordance to gradations of errors (NCA, 2013). Table 2 provides descriptions for the appropriate allocation of deductions. For analyses, each dyad-level performance score was the mean of four observers' scores

Individual-level performance. Each individual was assessed on nine dimensions. The athlete's body was divided into three segments; *arms and shoulders, core and hips,* and *legs and feet*. Each body segment was then assessed across three temporal phases of the performance task; *entrance, middle portion*, and *dismount*. The nine dimensions were each assessed on a four-point, Likert-type scale and then summed. The four-point scale included anchors at 0

[4] Public access to the performance videos (for the large co-ed division) are available at the following website (http://varsity.com/event/1725/2013_NCA_NDA_College).

Table 1. NCA Categories of Task Difficulty adapted for Dyad-Level Performance Assessments

Score Range	Category	Descriptions
5 - 6	Beginning Stunt Skills	Shoulder stands Extensions Chair sits
6 - 7	Intermediate Stunt Skills	Liberty (with variations) Awesomes *Includes minimal inverting/twisting/unique transitions, mounts, and dismounts*
7 - 8	Intermediate Stunt Skills	Liberty (with variations) Awesomes *Includes strong incorporation of inverting/twisting/unique transitions, mounts, and dismounts*
8 - 9	Advanced Stunt Skills	Toss one arm and/or one leg stunts to an extended position *Includes strong incorporation of inverting/twisting transitions, mounts, and dismounts*
9 - 10	Elite Stunt Skills	Twisting/inverting mounts into one leg and/or one arm stunts that *also* include inverting/twisting dismounts

Table 2. NCA Categories of Deductions Adapted for Dyad-Level Performance Assessments

Value of Deduction	Category	Descriptions of Errors
- 0.5	Bobbles	Stunts that almost drop/fall, but are saved.
		Incomplete twisting cradles.
		Memory mistakes involving obvious execution of incorrect moves.
		Knee or hand touching ground during cradle or dismount.
		Severe balance checks.
		Severe timing issues.
- 1.0	Mistakes	Drops from stunt that land in a cradle.
		Drops from stunt to a pop down dismount (early dismount).
- 1.5	Falls	Drop to the ground.

Note. There is a maximum deduction of 2.0 points per dyad.

(*perfect technique/no errors*), -1 (*imperfections/flaws*), -2 (*mistakes/slip ups*), and -3 (*failures/unsuccessful*). The lowest total score (-27) indicated poor performance (numerous errors) and the highest total score (0) indicated excellent performance (no errors). For analyses, each individual-level performance was the mean of two observers' total scores.

Critical features were identified for individual performance relative to the unique performance requirements of each role. The execution of technique was expressed in four levels of quality across each dimension in concordance to the Likert-scale anchors resulting in 27 portrayals of possible movement features for each role. For example, the following critical features refer to the legs and feet during the middle portion of the task. For the base, points were deducted as follows: (0) legs absorb as needed, placement of legs should be just outside of shoulders with knees forward, staying in same spot, (-1) stance is too wide or narrow, legs are not utilized to absorb, one step, (-2) small, unnecessary steps are taken and stunt remains in air, (-3) lots of unnecessary steps are taken, does not save stunt. Separate critical features indicating decrements of role-specific errors were identified for the flyers. [5]

Procedure

The procedures were mostly directed towards development of the individual-level scoring system as the dyad-level scoring system was an adaption of an existent performance scoring procedure employed within the sport. However, both systems were piloted through observer training and adjustments were made accordingly.

Movement analysis. For movement analysis, critical features and factors altering perception required consideration. Input from a panel of university-level coaches provided information regarding how performance is typically perceived by experts. Six current college coaches (five males and one female) were each asked to list the five most important aspects for successful performance by the base and flyer separately. Answers from the coaches provided several links to observation strategies in the existent literature. Specifically, aspects were uniquely identified for only parts of the task reflecting the temporal phases approach.

[5] Full list of critical features is available from first author upon request. (Available in Appendix A at the end of the of thesis)

Coaches also made apparent the complexity of the acrobatic movements. Not only were the critical features different for the base and flyer, but they were associated to specific sections of the body. Therefore, observer attention would need to be specifically directed towards general moving parts so as to reduce perceptual load. Dividing the body into three segments structured across each temporal phase of the task reduced the degrees of freedom and kept the partners' performances intuitively connected. Critical features for each dimension were developed by the lead author (as she has cheerleading experience as a top-level performer and coach of top-level athletes) and edited several times after conferring with the same coaches and later with observers when issues arose.

Planning the observation. Planning the observation required attention towards outlining the process of assessment and developing a suitable recording form. Four current co-ed college cheerleaders (two males and two females) were recruited as adept performance observers in this investigation. Each observer had an average of four years of experience in co-ed style cheerleading, an average of nine years of overall experience in cheerleading, at least three years of experience competing at the national level, and each had participated in various judging opportunities within the sport.

The observers received three training sessions, each lasting about two hours. In the first training session, the observers were introduced to the critical features for both roles that would guide performance assessment. Following an explanation of the critical features, the four observers and lead author discussed potentially confusing issues as well as possibilities not considered. The following training sessions required the observers to practice assessing individuals and dyads from random teams not participating in the investigation.

During the second observer training session, the four observers assessed all dyad and all individual performances for a random team (six dyad performances with the associated 12 individual performances per observer). Perhaps unsurprisingly in retrospect, it became obvious that role-experience had an influence on the observers' ability to score individual performance in those roles. Perceptual abilities linked to observer experience have long been known to be an overriding issue of technique analysis (Armstrong & Hoffman, 1979; Biscan & Hoffman, 1976; Weekley & Gier, 1989), so responsibility for observing individual performances was divided with the male observers assessing the base performances and the female observers assessing the flyer performances. This division of individual-level observation was piloted during the third observer training session (10 dyad performances with associated 10 individual performances per observer). The observers and lead author were satisfied with the reduced workload and increased observer confidence to employ the rating scales, so this served as the final training session for the observers. Viewing sessions during data collection were operated in correspondence to the final training session.

Performance assessment protocol. Professional videos by competition personnel were made available on the internet and projected onto a large screen. No more than 17 dyads (about two teams) were observed in one sitting with a maximum of two hours per observation session. Each dyad score required about 60 - 90 s to complete (three trials) and each individual score required about three to four minutes (10 trials) to complete. Observations were completed in five sessions, resulting in about 10 hours of performance assessment per observer (3,372 trials in sum).

Across sessions. To reduce measurement errors attributable to observers' varying attitudes, effort, and emotions across the five viewing sessions, a warm-up dyad (randomly chosen from a nonparticipating team) was observed. All dyads included in the investigation were randomly assigned to a viewing order within their respective team and all teams were viewed in a random order. Within each team, individual performances were assessed after, and in the same random order as, the dyads. For all viewings, the entire team was visible to the observers on the projected screen. The video was played a few seconds before the task and stopped immediately after the task was completed. Observers were never able to see other skill-elements performed in the routines. Before each trial, the dyad of focus was indicated with a red laser-pointer and verbalized by the lead author to direct attention towards where the dyad of interest would begin the task.

Within sessions. In line with Hay and Reid's (1988) recommendations, observation trials were provided for both general impressions and more specific parts of movements. For each team, observers first watched performance without focus on a particular dyad or individual and determined the performed task's difficulty range from the provided dyad-level scoring guidelines. After which, the observers had three trials to assess each dyad-level performance. First, the observers familiarized to the pair's general movements and were asked to not record any values. During the next two trials, the observers assessed a starting score within the appropriate range, designated any deductions, and recorded the final score.

Individual-level performances were assessed by watching ten trials of each participant. As before, the observers were given one trial to familiarize with the general movements of the particular individual he or she was observing without recording any values. For the remaining trials, observers were asked to utilize three trials per a body segment; always beginning with the arms and shoulders and ending with the legs and feet. The body segment order was fixed, but the observers were given freedom to appraise technique during the temporal phases as willed. The limited freedom reduced perceptual load, maximized knowledge of the entire task in relation to a specific body section, and reinforced utilizing all trials to provide an accurate performance score. Before each trial, the body segment of focus and number of remaining trials were verbalized. Between trials, all observers utilized the critical features to assign performance scores as all written guidelines were readily accessible.

Analysis

Analyses were conducted using SPSS (version 21.0) to examine the reliability of the two related performance measures. Cronbach's alphas and interclass correlations were calculated to observe the relatedness among observations as well as the consistency of each observer. Pearson product-moment correlations were calculated as an indication of how the performances were generally related. Furthermore, a dyad-level aggregation score was generated, from the base and flyer scores, to demonstrate the potential differences in the type of score representing a dyad's performance.

Results

The flyers' performance scores ranged from -20.5 to -3 points (M = -8.39, SD = 3.74). The bases' performance scores ranged from -23.5 to -4.5 points (M = -12.80, SD = 3.94). Performance scores for flyers were non-normally distributed with skewness of -1.27 (SE = 0.30) and kurtosis of 1.98 (SE = 0.58). Performance scores for bases were more normally distributed with skewness of -0.55 (SE = 0.30) and kurtosis of 0.40 (SE = 0.58). Dyad-level performance ranged from 3.72 to 8.78 points (M = 6.97, SD = 1.06). Normality was more similar to the base performance distribution as the skewness value was -0.58 (*SE* = 0.30) and the kurtosis value -0.06 (*SE* = 0.58) for dyadic performance scores. The aggregated dyad performance scores ranged from -22 to -5.25 (*M* = -10.50, *SD* = 3.50) with skewness of -1.11 (*SE* = 0.30) and kurtosis of 1.24 (*SE* = 0.58).

Within this sample, the performance scores for flyer (α = .89) and base (α = .89) were provided from two observers while the performance scores for the dyad (α = .96) were provided from four observers. Interclass correlations set to absolute agreement for the base (.87, $p < .001$, 95% *CI* [0.76, 0.93]), flyer (.88, $p < .001$, 95% *CI* [0.79, 0.93]), and dyad (.95, $p < .001$, 95% *CI* [0.92, 0.97]) performance scores with average measures were observed for the same observer groups.

The flyer and base performance scores, assessed by independent observer pairs, had a moderately high correlation ($r = .69$, $p < .01$). This indicates if either the flyer or base performed well (committed less errors) then his or her partner would likely have also performed well. The relationships between the dyad-level score and each individual-level role score were both positive and moderate. The flyer performance scores had only a slightly stronger relationship ($r = .42$, $p < .01$) than the base performance scores ($r = .35$, $p < .01$) with the dyad scores. This indicates neither role was dominantly related to the dyad performance scores. The aggregated dyad scores were only moderately related to the observed dyad-level scores ($r = .42$, $p < .01$) indicating that the two dyad-level indices are not equivalent. As expected in an aggregation index, both the base ($r = .92$, $p < .001$) and flyer ($r = .91$, $p < .001$) individual scores were almost perfectly associated with the aggregated dyad scores. This further highlights that relationships between individual- and dyad-level scores are unique when dyadic performance is independently assessed, rather than aggregated.

Discussion

Within this investigation, performance measures were used to describe dyadic sport interactions from three aspects of the same interdependent performance. A framework of measurement tools for an applied dyadic performance setting were provided. Competitive cheerleading performances were used to demonstrate the relationships between paired athletes as individual and combined performing units. Significant relationships were observed among the base, flyer, and dyad scores as hypothesized. The individual-level performance scores were strongly correlated, even as products of independent observer pairs. In addition, both the flyer and base scores were moderately associated with the dyad-level score. The key findings support general theoretical interpretations of close partnerships to be relative for the measurement of interdependent sport behaviors.

Individuals' behaviors are determined, in part, by other members of a group (Wageman, 2001). Even when performance can be distinctly distributed among individuals, actions are constrained by the simultaneous and subsequent actions of other team members (Tesluk et al., 1997; Wageman, 2001). Therefore, any measure assigned to a particular athlete will result in performance indicators that take from or add to indications of performance for another athlete (McGarry, 2009). The lack of a theoretical framework forces qualitative task analysis to be partially subjective (Lees, 2002). Determining individual components within the bidirectional influences of team behaviors make performance measurement less than transparent.

Partners' outcomes are interconnected because their behaviors occur within the same performance task (Laursen, 2005; Malloy & Albright, 2001). A heightened similarity exists between partners when compared to any other person in the sample. As a consequence, correlations between individual-level performances are likely to be naturally inflated (Kenny et al., 2006). The strong likeness to one-another causes intact dyad members to typically violate the assumption of independent observations (Gaudreau, Fecteau, et al., 2010; Kenny et al., 2006). Even when individual performances can be clearly evaluated, a higher-order effect is still evident (Arthur et al., 2005; Tesluk et al., 1997). As in the current investigation, dyad-level analyses should be considered within the measurement of individuals' interdependent behaviors (Gaudreau, Fecteau, et al., 2010).

Interdependence between partners does not automatically eliminate the importance of individual contributions to a relationship (Laursen & Bukowski, 1997). Higher-level performance scores can often result in some information being lost or misinterpreted (Malloy & Albright, 2001). For example, it is typically assumed that each member's input is an equal contribution to the team-level outcome (Tesluk et al., 1997). This assumption is not always the reality. Neglecting individual performance information will result in an incomplete and deficient analysis of a team (Arthur et al., 2005). The current investigation exemplifies individual performance assessments indicative of unequal inputs. The flyer is largely dependent on her partner's performance; suggesting, if any role were more determinant of a dyad-level observation, it would likely be the base. However, the flyers had a slightly stronger correlation, relative to their partners, with the observed dyad scores. Perhaps, the flyer role, in large constraint of her partner's ability, is more telling of a pair's performance. Equal significance of individuals' behaviors cannot always be assumed. Straightforward assessments of lower-level units provide contextual meaning to performance behaviors (McGarry, 2009; Travassos et al., 2013).

Aggregation is commonly used to acknowledge differing levels of the same variable because this technique does not violate statistical assumptions (Kashy, Campbell, & Harris, 2006; Tesluk et al., 1997). However, higher-level constructs represented by aggregated individual data often waste useful information and provide inadequately equal representations of team performance (Malloy & Albright, 2001). Individual scores are not directly indicative of relationship behaviors (Arthur et al., 2005). Within this investigation, the individual and aggregated dyad scores were practically identical performance descriptions. The results reflect the often small benefit gained from collective behavior described by aggregation scores (McGarry, 2009). Aggregation scores are not necessarily useless measures of performance, but should be guided by a strong theoretical rationale, evidence of individual's empirical likeness, and recognition of changing measurement properties (Tesluk et al., 1997).

In line with Wickwire, Bloom, and Loughead's (2004) qualitative assessment of intact dyads, this investigation demonstrated the importance of analyzing performance from a multilevel framework highlighting both individual and conjoint contributions. Data from the current investigation was at the descriptive level and continued efforts to critically assess multilevel processes embedded in overarching team outcomes are encouraged (Travassos et al., 2013). Several influences likely exist within performing dyads including within each level (i.e., nonindependence; Kenny et al., 2006)), cross-level moderations, and top-down effects present within the dyad-individual hierarchy (Gaudreau, Fecteau, et al., 2010). These aspects will largely vary across sports and tasks to the degree to which interdependence dictates athlete interactions and the outcome calls for collective action (Wageman, 2001). Future research featuring causal influences within dyadic sport interactions are encouraged as a more robust test of theories and models surrounding interdependence (Gaudreau, Fecteau, et al., 2010).

A particularly important extension from dyadic research entails the study of interdependent actions within differing larger group sizes. McGarry (2009) suggests that player-player dyads offer a basic unit of analysis for investigating space-time dynamics in more traditional team sports and argues the individual within a complex system is centered on dyadic interactions. Current performance analysis approaches that focus on discrete actions in isolation from a meaningful performance context, including team members' actions, have major weaknesses (Travassos et al., 2013). The use of dyadic, subgroup, and team performance analyses in combination offers a more complete picture of coordinated sport behaviors (Travassos et al., 2013).

While researchers have recently considered the emergence of sport behaviors in context of athletes behaving simultaneously, there is a lack of meaningful information that functions to support coaches, athletes, and sport governing bodies (McGarry, 2009; Travassos et al., 2013). Research conclusions shaped for applied sport settings are vital because noncontextual conclusions of sport performance offer little operational advantages (Travassos et al., 2013). Systematic performance analysis of individual contributions and errors within a dyadic interaction may offer solutions for recovering from poor group performances and prevent athletic coordination from deteriorating altogether. The conclusions and procedures within this investigation offer adjustments to the current cheerleading scoring procedures. Suggested adjustments from results in the current investigation include consideration of the multiple levels of coordination present within interactive aesthetic sports. Future research investigating which particular level or combination of levels provides the best representation of performance is needed for better recommendations. Effective scoring systems, guided in scientific principles, can navigate governing bodies to the critical components related to required performance behaviors (McGarry, 2009).

Evidence for reliability of both developed measurement tools indicated modest to satisfactory observer agreement for newly developed measures. Future studies using experienced judges would further indicate the quality of the developed scoring system. Judges can never be trained to the level of perfect agreement because, as human raters, each judge will be associated with errors and inconsistencies (Huang & Foote, 2011; Looney, 2004). Applied performance measurement delicately exists between robust scientific accuracy and the reality of human raters using subjective scales within real time.

The current investigation is limited by the undetected sources of possible measurement biases within subjective observation scores that are difficult to differentiate (Kottner et al., 2011). Often considered as possible sources of measurement error are observers' interpretations of performances and use of different personal standards when applying rating scales (Hoyt & Kerns, 1999). Sex-linked differences, an obvious variable distinguishing the observer pairs for each role in the current investigation, are one example of previously studied influences on impression formation. Specifically, subpar impressions of males' physical attributes, specifically by male observers, have been reported to generate harsher criticism and significantly lower ratings of physical attributes when compared to female observers (Shields, Brawley, & Martin Ginis, 2007). Although bases may have actually been less technically correct than the flyers, role-related differences in performance score distributions may reflect systematic observer biases such as those linked to an observer's sex.

High quality perception requires an observer's brain to be structured and informed towards specific movement patterns for proper interpretation (Knudson, 2013). While observer biases likely were present in the current investigation, strategies were implemented to reduce such effects. Tactics, as reported by Hoyt and Kerns (1999) to minimize a large variance of observer errors, included providing at least five hours of observer training, aggregating scores from multiple observers, using a completely crossed-lagged observation design, and minimizing the occurrence of observer inferences with the rating scales. One limitation within the investigation's design was the lack of a statistically supported criterion to terminate observer training. The mentioned protocols may have minimized measurement error related to observer perceptions, but further investigation and would reveal the extent biases and error are represented within each of the performance scores.

Complicated measurement issues surrounding interdependence should not deter researchers from testing intricate relationships in sport (Gaudreau, Fecteau, et al., 2010). It was evident that one measure of performance was not a direct indicator of the other two performance perspectives, but in totality, the two-level performance measures provided a conceptually grounded picture of performing dyads. Each partner's individual-level performance score, although related to one another and nested within a dyadic interaction, provided a unique performance indicator relative to the dyad-level performance score. Behavioral exchanges defined by dyadic interactions are vital to team effectiveness and the measurement of the joint connections should be emphasized (McGarry, 2009; Tesluk et al., 1997; Travassos et al., 2013). This investigation generated a foundation in which to study the individual performing within a group, presented adequate confirmation to attend to the multiple levels of performance beyond aggregation when appropriate, and provided a conceptual framework for observing behavioral outcomes in interactive sports.

Chapter 4

Study 2: It Depends on the Partner: Person-related Sources of Efficacy Beliefs and Performance for Athlete Pairs[6]

[6] This chapter (verbatim) has been accepted for publication as;
Habeeb, C. M., Eklund, R. C., & Coffee, P. (in press). It Depends on the Partner: Person-related Sources of Efficacy Beliefs and Performance for Athlete Pairs. *Journal of Sport & Exercise Psychology.*

For athlete-athlete dyads, the partner is an important feature of one's performance environment (Kenny, Mohr, & Levesque, 2001). The performance of a given task can feel subjectively easier or more difficult depending upon the partner. For example, as much as an American football receiver might be renowned for his ability to make unlikely catches, the possibility of success remains largely dependent on the quarterback being able to deliver the ball within the receiver's "catchable zone." One can imagine, therefore, that the receiver's confidence in successful pass completion on a certain route can vary according to which quarterback is passing the ball. In fact, elite athletes have reported that how a partner performs will influence both personal and team strategies (Wickwire et al., 2004). It is reasonable to posit, as a consequence, that each athlete in a performance dyad will likely have beliefs about self-performance (e.g., self-efficacy), the partner's performance (e.g., other-efficacy), and their dyadic performance (e.g., collective efficacy) as postulated in theory (Bandura, 1977, 1997; Lent & Lopez, 2002). Unfortunately, how these beliefs are specifically dependent on perceptions of others in performing dyads remains an understudied aspect of team dynamics research (Back & Kenny, 2010; Kenny et al., 2001). The purpose of this study was to examine the person-related sources of variance in self-, other-, and collective efficacy beliefs and performances for dyad athletes performing in a low- versus high-dependence role during both low- and high-difficulty tasks.

Efficacy Beliefs

Self-efficacy refers to the belief in one's own capabilities to execute action (Bandura, 1977) and, as indicated by Feltz and Lirgg (2001), is one of the most important psychological constructs thought to affect performance outcomes (for review see Feltz & Lirgg, 2001; Feltz, Short, & Sullivan, 2008). Meta-analyses support self-efficacy is a moderate predictor of individual sport performance (Moritz et al., 2000; Woodman & Hardy, 2003). These beliefs are grounded in interpretations of personal successes, vicarious and imagined modelling, verbal persuasion, and personal emotional and physiological responses (Bandura, 1977). Verbal persuasion and vicarious modelling, typically requiring input from outside the self, tend to be less influential sources of efficacy beliefs (Bandura, 1997; Feltz & Lirgg, 2001). Nonetheless, athletes can believe more strongly in their own abilities when performing with talented partners because, as argued by Katz-Navon and Erez (2005), self-action lacks distinction from collaborative actions to some degree in group performance. International-level athletes performing in dyads have indeed reported that their perceptions of their partner and dyad help to regulate their self-efficacy beliefs (Jackson et al., 2008). Sources focused on the self, independent of others, are theorized to have the most potential impact on self-efficacy (Bandura, 1977).

Other-efficacy is a construct that relates to one's belief in a specific partner's capabilities (Lent & Lopez, 2002). For example, in a paired-skating "throw jump" task, the female may be highly confident in her male partner's ability to throw her into the air for takeoff (i.e., other-efficacy) regardless of how confident she is in her abilities to land without assistance (i.e., self-efficacy; for review see Jackson, Bray, Beauchamp, & Howle, 2015). Initial evidence supports other-efficacy contributes uniquely to the prediction of both personal and dyadic performance beyond what self-efficacy contributes (Beauchamp & Whinton, 2005; Dunlop et al., 2011). Other-efficacy beliefs are theorized to emerge from perceptions of a partner's previous performances, beliefs about similar others, third party views, and social stereotypes (Lent & Lopez, 2002). Dyad athletes suggest that levels of other-efficacy result from comparing a current partner to previous partners while also considering past mastery achievements and experience as a dyad (Jackson et al., 2008). Perceptions regarding the self, however, were not a reported source suggesting other-efficacy beliefs are not influenced by focusing on one's personal performance abilities (Jackson et al., 2008, 2009).

Finally, the collective efficacy construct is focused upon perceptions of joint performance capabilities (Bandura, 1997). Lent and Lopez (2002) asserted that collective efficacy was important for conjoint consequences because levels of collective efficacy moderately influence group performance (Bandura, 1997; Stajkovic et al., 2009). In parallel to self-efficacy, collective efficacy beliefs are subject to group-related mastery and vicarious experiences, verbal persuasion, and interpretations of emotional/physiological states (Bandura, 1997). Perceptions of the dyad have been indicated as a source of both self- and other-efficacy (Jackson et al., 2008, 2009). However, Lent and Lopez' (2002) suggestion of self-, other-, and collective efficacy being complimentary and mutually influential towards conjoint consequences has been essentially overlooked on this account. Interpersonal behavior studies have tended to be focused on larger size groups minimizing the focus of collective efficacy towards dyad performance (Gaudreau, Fecteau, & Perreault, 2010). Nonetheless, two-person teams are by definition the smallest size group (Williams, 2010). Collective efficacy, irrespective of a team's size, has been observed to be partially predicted by self-efficacy beliefs (Gully et al., 2002; Katz-Navon & Erez, 2005; Magyar et al., 2004) and at times depend on pivotal members in one's group (Bandura, 1997; Damato, Grove, Eklund, & Cresswell, 2008), yet is proposed to be mostly influenced by group-level determinants (Bandura, 1997).

Dyad Task Structure

Dyadic interactions come in many forms with the extent of interdependence and the relationship between dyad roles serving to differentiate among dyad types (Gaudreau et al., 2010; Kenny, Kashy, & Cook, 2006). There are many influences (e.g., social and structural interdependence) that make individuals in a dyad more or less dependent on one another. Task interdependence is implicated when group members have a common goal and each individual's performance in pursuit of that goal is affected by the other athlete (Katz-Navon & Erez, 2005). Typologies of task interdependence can vary (see Wageman, 2001 for further discussion), but the general consensus is that task interdependence exists on a continuum from actions that are entirely independent contributions towards the outcome through actions involving complex coordination between performers. For dyads with high task interdependence, the actions of each individual in the dyad elicits and constrains the actions of the other (Wageman, 2001) which then also shapes individuals' psychological processes including their efficacy beliefs (Katz-Navon & Erez, 2005).

Dyad performance tasks require each athlete to have a role in the dyad with a relationship existing between those roles (Bray et al., 2002). When athlete roles are equivalent, the dyad is classified as an *exchangeable dyad* (Kenny et al., 2006). In contrast a *distinguishable dyad* involves athletes who have distinct roles from one another in the performance (Gaudreau et al., 2010). In the distinguishable case, the level of dependence each athlete has on his or her partner may not always be mutual or symmetric (Kenny et al., 2006; Lent & Lopez, 2002). Competitive college cheerleading, for example, involves a variety of dyad tasks with distinguishable roles wherein breakdowns in performance can have injurious consequences. Many of the two-person acrobatic stunts require the smaller athlete to stand on the hands of his or her partner and/or be tossed into the air with the larger athlete responsible for the tossing and catching of the smaller athlete. An error from either partner can result in catastrophic injury (Jacobson et al., 2005; Mueller, 2009), but each athlete's role clearly includes different responsibilities for safe performance execution. In summary, dyads with distinguishable roles can have asymmetrical dependencies because of the task structure even while partners are seemingly equal in status in the partnership (Bray et al., 2002; Gaudreau, Fecteau, et al., 2010; Katz-Navon & Erez, 2005).

A dyad task structure with distinguishable roles is particularly important to the current study because efficacy beliefs emerge in respect to an athlete's role and that role is linked to a level of dependence on the partner (Bray et al., 2002). Athletes in a high-dependence role need to concentrate on partner cues so as to enhance control of their personal contribution to dyad performance (Fiske, 1993; Snyder & Stukas, 1999). At the same time, athletes in a low-dependence role tend to concentrate less on a partner, instead focusing attention on the self because fulfillment of personal performance contributions fundamentally determines overall performance of the dyad. In competitive cheerleading dyads, both members' perceptions are likely focused on the larger athlete because the quality of performance actions from the larger athlete (e.g., poor "throwing") determines the potential quality of the dyad's performance. As a consequence of asymmetric dependence, the larger low-dependence athlete is more strongly self-focus oriented and the smaller high-dependence athlete is more strongly other-focus oriented. The extent to which information about a partner influences one's perceptions is determined, at least in part, by the athlete being in a high- or low-dependence role in the dyad (Back & Kenny, 2010; Kenny et al., 2001; Snyder & Stukas, 1999).

Finally, the difficulty of a task may also shape the extent to which perceptions are influenced by a partner. Efficacy beliefs are grounded in perceptions of difficulty and vary relative to changes in difficulty demand (Bandura, 1997, 2006). In dyadic tasks requiring one high- and one low-dependence role, asymmetrical dependence is likely exacerbated in more difficult tasks because the abilities of the low-dependence athlete have greater potential influence on prospective dyad success. As a consequence, compared to easier tasks, the self- and other-focus orientations may be intensified in more difficult tasks.

The Social Relations Model

Multi-dyad paradigms that allow for the changing of partners across repeated interactions have been commonly employed in Social Relations Model investigations (SRM; Kenny, 1994; Kenny & La Voie, 1984). The SRM is an analytical framework that isolates the self, other, and collective sources of a construct by partitioning the total observed variance of a measured variable into actor, partner, and relationship variance components (Kenny, 1994; Kenny et al., 2001). The conceptual interpretations of these three components are provided in Table 1 with examples of how each component relates to dyad athlete's efficacy beliefs and performances. By definition, the *actor variance* represents personal consistencies occurring across a variety of partners while *partner variance* represents a tendency for a partner to be perceived (or behaved with) by all others in a consistent manner (Kenny, 1994). *Relationship variance* represents uniqueness occurring from a particular pairing of two athletes. Altogether, the observed variances across components numerically represent the extent to which an efficacy belief or performance is guided by reference to the self, the other, and/or the collective (Kenny, 1994; Kenny et al., 2001).

In the present study, we examined person-related sources of variance in self-, other-, and collective efficacy beliefs and performances among competitive cheerleading athletes performing in their low- or high-dependence role during low- and high-difficulty tasks. Theoretically, the actor, partner, and relationship variance components should generally account for the most variance in, respectively, self-, other-, and collective efficacy beliefs and performance (Bandura, 1977, 1997; Lent & Lopez, 2002). As a related matter, previous literature indicates that the size of variance components may differ by role for distinguishable dyads with asymmetric dependence because the low-dependence athlete has a self-focus and the high-dependence athlete has an other-focus orientation of attention (Bray et al., 2002; Gaudreau et al., 2010; Back & Kenny, 2010). Finally, in consideration of task difficulty, asymmetric dependencies should intensify the self- and other-focus orientations of attention required of each role. Taken together, our first hypothesis was that the actor variance

Table 1. The interpretation of person-related variance components within the Social Relations Model for dyad athlete's efficacy beliefs and performance.

Variance Component	Person- Source	General Interpretation	Efficacy Example	Performance Example
Actor	Self	Athlete's average rating across all partners.	An athlete reports a consistent level of confidence regardless of partner.	An athlete performs at a consistent level regardless of partner.
Partner	Other/Partner	Athlete's average rating elicited from all partners.	An athlete reports a level of confidence with a partner because all athletes report that certain level of confidence when with that partner.	An athlete performs at a particular level with a partner because all athletes perform at that particular level when performing with that partner.
Relationship	Collective/Dyad	Athlete's average rating unique to a particular partner beyond what is associated with actor or partner tendencies.	An athlete reports a unique level of confidence with a particular partner.	An athlete performs at a unique level with a particular partner.

component would be largest for the low-dependence athletes' self-perceptions during more difficult tasks. Our second hypothesis was that the partner variance component would be largest for the high-dependence athletes' other-perceptions during more difficult tasks. Our third hypothesis was that the relationship variance would be largest in collective perceptions for both members of the dyad during more difficult tasks. Finally, we hypothesized that the profile of variance partitioning for each role's objective performance would parallel the expected profiles for each role's subjective evaluations.

Method

Participants

Male (*n* = 51) and female (*n* = 51) college cheerleaders aged 18-25 years (M_{males} = 20.5 years, *SD* = 1.69; M_{females} = 19.1 years, *SD* = 1.10) from teams with national collegiate competition experience participated in the study. In accordance with the American Association of Cheerleading Coaches and Administrators (AACCA, 2015), dyad tasks require one *base* (i.e., the partner in direct contact with the performing surface while supporting the other dyad member's weight) 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 and females always performed in the flyer role. Females are traditionally introduced into the sport at an earlier age than males (Clifton & Gill, 1994), so unsurprisingly flyers in this study averaged over twice the duration of general cheerleading experience as bases (M_{bases} = 3.7 years, *SD* = 2.97; M_{flyers} = 9 years, *SD* = 3.82). Experience in co-ed cheerleading was comparable across roles (M_{bases} = 2.9 years, *SD* = 1.71; M_{flyers} = 2.8 years, *SD* = 1.71). Participants were in the beginning of their first (*n* = 48; 47.1%), second (*n* = 29; 28.4%), third (*n* = 18; 17.6%), or fourth (*n* = 7; 6.9%) year with their respective teams. These teams were members of National Collegiate Athletic Association Division I (*n* = 4), Division II (*n* = 1) and National Junior College Athletic Association Division I (*n* = 1) from the Midwest (*n* =1), Northeast (*n* = 2) and Southeast (*n* = 3) regions of the United States.

Procedures

After obtaining approval from the Human Subjects Committee at the University of Stirling, information sheets were emailed to 15 coaches at addresses gathered from respective team websites. Seven coaches responded to the invitation, and six agreed to their athletes being involved in data acquisition during a regularly scheduled practice at the beginning of the sport season. After participants provided informed consent, coaches placed three flyers and three bases into each group so as to provide each participant with three partners varying in experience levels while minimizing issues potentially impacting upon safety (e.g., participants' strength, size). Participants completed personal information sheets on age and experience before receiving a questionnaire packet on efficacy beliefs completed immediately before each task performance and subjective performance completed immediately after each task performance. For the remainder of the study, participants were asked to refrain from any verbal and nonverbal communication as is typical for cheerleaders performing in front of an audience. Participants performed four tasks with the same three partners, for a total of 12 performances, with the partner order being randomized. For all performance tasks, the lead author counted off the sequence for all dyads to perform simultaneously in front of a video camera. Objective performance, using video images of a front-view angle of each team of dyads set-up by the first author, was assessed post-data collection.

Performance Tasks

Four cheerleading paired-stunt tasks were employed in this investigation (see Figure 1). These dyadic tasks were selected from established early learning progressions for college-level cheerleading (AACCA, 2015). Tasks were performed at a standard pace requiring three full 8-counts for completion (i.e., approximately 9 seconds in duration). As illustrated in Figure 1, all tasks followed the same sequence including: (a) the flyer being freely tossed from her hips into the air by the base, (b) the flyer's feet landing on the base's hands in an overhead position, and (c) the base releasing the flyer's feet and catching the flyer's hips to assist her two-footed landing on the performance surface. The variation across tasks occurred in the overhead position with each subsequent task being somewhat more challenging in difficulty than the preceding task. Tasks 1 and 2 were relatively low in difficulty for cheerleaders at this competitive level (i.e., the flyer was held up by two feet) with Tasks 3 and 4 being higher in difficulty (i.e., the flyer was held up by only one foot). As was expected with these participants, self-reported experience on a scale ranging from 0 (*not experienced*) to 10 (*extensively experienced*) in performing the tasks was quite

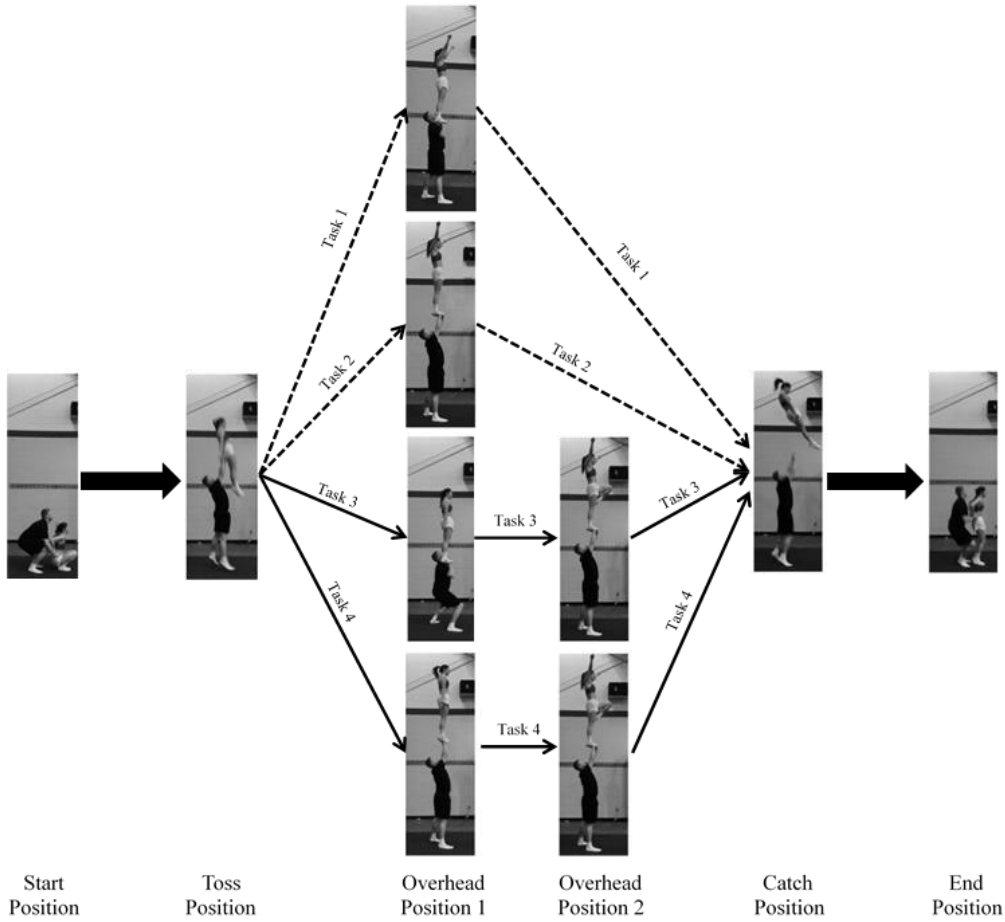

Figure 1. The sequence of positions, from start to end, for the four performance tasks are represented by arrows and pictures. *Thick black arrows* indicate the sequences (i.e., start to toss, catch to end) required for performance in all four tasks. *Dashed arrows* indicate sequences of low-difficulty requiring the base to catch the flyer’s feet (one in each hand, shoulder width apart) at shoulder height (Task 1) or full extension (Task 2). *Solid black* arrows indicate sequences of high-difficulty requiring a transition from overhead position 1 at shoulder height (Task 3) or full extension (Task 4) to a second overhead position requiring the base to hold the flyer’s right foot with both hands at full extension. In overhead position 2, the flyer stands on her right leg with the left leg bent (left foot placed at the right knee).

high (M_{bases} = 7.6 - 9.6, SD = 1.52 - 2.97; M_{flyers} = 8.8 – 9.7, SD = 1.25 - 1.91). Consistent with AACCA (2015) safety guidelines, respective team coaches automatically assigned spotters to athletes who were less experienced in a small proportion of performances (n = 93; 15% of the total number of tasks). These spotters were instructed to provide safety for the flyers with minimal task interference.

Measures

Efficacy beliefs. Participants' responses to self-, other-, and collective efficacy were obtained using single-item measures. Previously, Feltz' (1982) measure of self-efficacy across four performance trials consisted of a four-item measure with each item quantifying one's confidence to perform a dive task of a certain difficulty. Subsequently, an extension of Feltz' (1982) study by LaForge-MacKenzie and Sullivan (2014), used a single-item measure of self-efficacy across the same skill performed for six trials. In the current study, single-item measures were employed because participants reported their efficacy related to the self, other, and collective across twelve performance trials (i.e., a requirement of 36 responses from each participant). Evidence suggests these measures are satisfactory in demonstrating relationships with performance of small to moderate effects (Moritz et al., 2000). Participants responded to the same question format for each efficacy belief with slight changes in the reference to provide target-specific efficacy beliefs (Dunlop et al., 2011; Jackson et al., 2007, 2010; Katz-Navon & Erez, 2005). Participants responded 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*). The presentation order of the three efficacy items was randomized within and between participants to manage potential order effects across response periods.

Subjective performance. Participants rated self, other, and collective performances in a similar format to the efficacy inventory. Participants were asked to *please describe the performance* and then 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*). The presentation order of the three subjective performance items was randomized within and between participants (questionnaire available in Appendix B).

Objective performance. Standardized behavioral assessments of base and flyer performance were employed as described by Habeeb and Eklund (2016). The protocol involves assessing an individual's performance on nine facets; three temporal phases of the performance task (as outlined in the task description) by three segments of the athlete's body (arms and shoulders, core and hips, and legs and feet). Each of the nine facets were assessed on a four-point Likert-type scale representing *no errors* (0), *minor errors* (-1), *major errors* (-2), and *complete failures* (-3). The nine facet scores were then summed. Accordingly, the lowest possible score (i.e., -27) indicated poor performance and the highest possible score (i.e., 0; no errors) indicated excellent performance. All task performances (n = 1,224) were assessed by the first author and a second independent rater assessed a sample of performances to evaluate performance assessment objectivity. The second rater assessed 72 performances (i.e., 36 base, 36 flyer performances) from one team for the purpose of training and provision of feedback with the objective performance evaluation protocol. The second rater then independently assessed another 336 performances (i.e., 168 base, 168 flyer performances) from the remaining teams (i.e., 27% of the total number of performances within the current study). 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 coefficients (i.e., base performance ICC = .87; flyer performance ICC = .90).

Analyses

A SRM asymmetric half-block design (Kenny et al., 2006) was employed in this investigation wherein groups are divided by a meaningful variable (e.g., role, as occurred in this study) and members of each subgroup (e.g., flyer) are paired with all members of the other subgroup (e.g., base). Data were analyzed using Kenny's (1990) BLOCKO program to allow for the required by-role analyses. The SRM is focused on partitioning observed variance into components with any variance not partitioned into the actor or partner components being automatically assigned to the relationship variance component (Kenny et al., 2001). The relationship variance component is, therefore, contaminated by error variance. This is remedied when variance components are observed to be stable across two or more indicators of a single construct (Kenny et al., 2006; Kenny, 1994). In this study, tasks were used as indicators to generate low-difficulty (i.e., Tasks 1, 2) and high-difficulty (Tasks 3, 4) constructs to allow for error variance to be partitioned into a separate component.

Actor, partner, relationship, and error variance component means were estimated at the group-level (n = 17) within BLOCKO. Absolute variance component values were used for hypothesis testing, but the more easily understood relative values were also calculated for informative purposes. A relative variance value is equal to a component's absolute variance value divided by the total absolute variance for that measured variable. Construct means computed within BLOCKO were then extracted for further hypothesis testing. One-sample Wilcoxon signed-rank tests were conducted within SPSS version 21 for inferential tests on each variance component because one-sample t-tests were inappropriate given the marked skewness of the distributions (i.e., normality was rejected based on Shapiro Wilk tests; Hollander, Wolfe, & Chicken, 2013). Tests on the variance components were one-tailed because a negative variance is theoretically impossible (Kenny, 1994). Rejection of the null hypothesis, therefore, indicated that an observed variance was significantly larger than zero.

Comparisons of the magnitude of variance components at the construct level were subsequently conducted using 4 x 2 x 2 mixed-model RM-ANOVAs to examine variance component (actor, partner, relationship, error) by role (flyer, base) by task difficulty (low, high) interactions for efficacy and performance. A significant three-way interaction can be interpreted as the interaction between two variables differing across levels of the third variable. Kirk (1995) suggests that a series of tests of simple main effects should be performed to better understand significant three-way interactions. In this study, the two-way interaction between variance component and role was separately examined for low-difficulty and high-difficulty tasks. Next, for any significant two-way interaction, the one-way variance component interactions were separately examined for the base and the flyer roles. Finally, for any significant one-way interaction, within role pairwise comparisons were conducted in accordance to the hypotheses with the referent category for self-, other-, and collective perceptions being, respectively, the actor, partner and relationship variance components. The partial eta-squared effect sizes were interpreted using Cohen's guidelines for small (.01), medium (.06), and large (.14) effects (Richardson, 2011).

Results

Descriptive statistics for the efficacy variables, and subjective and objective performances are reported in Table 2 for the low- and high-difficulty tasks.[7] The estimated SRM variance component means for low- and high-difficulty tasks are presented in Tables 3 and 4 for, respectively, the efficacy and performance variables.[8] Descriptively, there were very different profiles of variance partitioning patterns when comparing the bases and flyers. Inferentially, all variance components were significantly different than zero based on the Wilcoxon signed-rank tests, *Zs* = 2.21 - 3.62, *ps* $\leq$ .001 - .031, except for the components relating to self-efficacy in low-difficulty tasks for flyers' partner variance, *Z* = 0.00, *p* = 1.00, and relationship variance, *Z* = 1.60, *p* = .125.

The results from the three-way mixed-model RM-ANOVAs conducted for the efficacy and performance variables are presented in Table 5. Mauchly's test indicated the assumption of sphericity was violated, χ^2 (5) = 10.96 – 171.58, *p* < .001 - .05, in all but two instances, χ^2 (5) = 7.05 – 8.65, *p* = .12 - .22, so Greenhouse-Geisser adjustments on the degrees of freedom were used for a more conservative test of the effects. The three-way interactions were significant in all instances with medium to large sized effects (η_p^2 = .09 -.19). Results of the simple main effects from these analyses are subsequently reported within self-, other-, and collective perceptions followed by objective performance.

Self-perceptions. It was expected that within ratings of self-efficacy, the bases' actor variance components would be larger than all other variance components and this would be more pronounced in the high-difficulty tasks. Results of the simple main effects pertaining to self-efficacy are presented in the upper panel of Table 6. The two-way variance component by role interaction was significant for high task-difficulty, but not low task-difficulty. Within high task-difficulty, the one-way variance component interaction was significant for the bases, but not the flyers. Pairwise comparisons indicated for the bases within high

[7] The task-level descriptive statistics are reported in Table S1 of the online supplemental materials associated with this report. (Available in appendices at the end of the of thesis)

[8] As noted in the analyses subsection, relationship variance components are contaminated by error variance for individual tasks so they are uninterpretable on individual tasks. However, the actor, partner, and relationship variance components at the task-level are reported in Tables S2 and S3 of the online supplemental materials associated with this report (available in Appendix C).

Table 2. Means and standard deviations for efficacy and performance variables within the low- and high-difficulty performance tasks.

	Base		Flyer	
	M	*SD*	*M*	*SD*
Self-Efficacy				
Low-Difficulty	9.59	1.04	9.69	.72
High-Difficulty	8.56	2.28	9.13	1.30
Other-Efficacy				
Low-Difficulty	9.50	1.09	9.29	1.43
High-Difficulty	9.00	1.80	8.48	1.94
Collective Efficacy				
Low-Difficulty	9.46	1.15	9.09	1.44
High-Difficulty	8.40	2.20	8.25	1.90
Self-Performance				
Low-Difficulty	9.16	2.03	9.39	1.16
High-Difficulty	7.61	3.22	8.53	2.30
Other-Performance				
Low-Difficulty	9.51	1.42	8.99	1.89
High-Difficulty	8.70	2.33	8.13	2.58
Collective Performance				
Low-Difficulty	9.22	2.02	9.01	2.06
High-Difficulty	7.67	3.14	8.05	2.69
Objective Performance				
Low-Difficulty	-7.42	3.87	-4.09	3.58
High-Difficulty	-11.05	5.35	-5.85	4.24

Note. The reported means are a product of each participant (*n* = 51 bases, 51 flyers) reporting three observations (*n* = 153 bases, 153 flyers) across two tasks (Tasks 1, 2) for low-difficulty and two tasks (Tasks 3, 4) for high-difficulty.

Table 3. Absolute and relative variance component means of efficacy beliefs for the base and flyer roles.

Variable		Bases' Variance Components				Flyers' Variance Components			
		Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Efficacy									
	Low-Difficulty	.78 (.36)	.10 (.04)	.09 (.04)	1.22 (.56)	.47 (.52)	.00 (.00)	.06 (.06)	.37 (.41)
	High-Difficulty	5.54 (.75)	.07 (.01)	.29 (.04)	1.49 (.20)	1.27 (.51)	.08 (.03)	.30 (.12)	.81 (.33)
Other-Efficacy									
	Low-Difficulty	.39 (.21)	.54 (.29)	.21 (.11)	.73 (.39)	.34 (.11)	1.54 (.51)	.42 (.14)	.72 (.24)
	High-Difficulty	1.63 (.41)	.92 (.23)	.61 (.15)	.84 (.21)	.47 (.08)	3.65 (.60)	.68 (.11)	1.32 (.22)
Collective Efficacy									
	Low-Difficulty	.62 (.27)	.36 (.16)	.26 (.11)	1.04 (.46)	.40 (.13)	1.08 (.36)	.41 (.14)	1.15 (.38)
	High-Difficulty	3.70 (.60)	.63 (.10)	.58 (.09)	1.28 (.21)	.91 (.17)	2.59 (.48)	.61 (.11)	1.32 (.24)

Note. The relative variances are reported in parentheses. Low task difficulty = Tasks 1, 2. High task difficulty = Tasks 3, 4.

Table 4. Absolute and relative variance component means of subjective and objective performances for the base and flyer roles.

		Bases' Variance Components				Flyers' Variance Components			
Variable		Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Performance									
	Low-Difficulty	1.22 (.22)	.49 (.09)	.89 (.16)	2.99 (.53)	.27 (.10)	.28 (.11)	.17 (.06)	1.94 (.73)
	High-Difficulty	7.74 (.61)	.67 (.05)	.96 (.08)	3.37 (.26)	.62 (.09)	1.97 (.29)	1.89 (.28)	2.21 (.33)
Other-Performance									
	Low-Difficulty	.37 (.11)	.37 (.11)	.73 (.22)	1.83 (.55)	.29 (.07)	1.11 (.27)	.52 (.12)	2.25 (.54)
	High-Difficulty	2.02 (.32)	.87 (.14)	1.20 (.19)	2.14 (.34)	.59 (.06)	4.96 (.51)	2.00 (.20)	2.23 (.23)
Collective Performance									
	Low-Difficulty	.96 (.17)	.49 (.09)	1.10 (.19)	3.09 (.55)	.23 (.04)	.91 (.16)	1.18 (.21)	3.19 (.58)
	High-Difficulty	5.92 (.45)	1.09 (.08)	1.26 (.10)	4.79 (.37)	.54 (.05)	4.63 (.43)	1.89 (.17)	3.73 (.35)
Objective Performance									
	Low-Difficulty	5.32 (.25)	.89 (.04)	1.20 (.06)	13.48 (.65)	.53 (.04)	2.66 (.21)	1.93 (.16)	7.31 (.59)
	High-Difficulty	13.75 (.43)	2.53 (.08)	5.27 (.17)	10.22 (.32)	2.21 (.10)	6.88 (.32)	2.75 (.13)	9.77 (.45)

Note. The relative variance is reported in parentheses. Low task difficulty = Tasks 1, 2. High task difficulty = Tasks 3, 4.

Table 5. Results of the three-way repeated measures analysis of variances for efficacy beliefs, subjective performances, and objective performance.

		Efficacy					Subjective Performance					Objective Performance				
Target	Effect	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2
Self																
	Role	1	32	5.24	.029	.14	1	32	7.98	.008	.20	1	32	9.73	.004	.23
	Difficulty	1	32	16.73	.000	.34	1	32	18.70	.000	.37	1	32	14.25	.001	.31
	Component	1.10	35.34	9.57	.003	.23	1.90	60.85	7.33	.002	.19	1.90	60.84	12.24	.000	.28
	Role by Difficulty	1	32	4.87	.035	.13	1	32	1.45	.238	.04	1	32	0.10	.752	.00
	Role by Component	1.10	35.34	3.36	.072	.10	1.90	60.85	8.77	.001	.22	1.90	60.84	5.87	.005	.16
	Difficulty by Component	1.17	37.55	8.61	.004	.21	1.87	59.87	3.96	.027	.11	2.62	83.95	1.91	.142	.06
	Role by Difficulty by Component	1.17	37.55	5.33	.022	.14	1.87	59.87	6.99	.002	.18	2.62	83.95	2.99	.042	.09
Other																
	Role	1	32	1.75	.196	.05	1	32	2.48	.125	.07					
	Difficulty	1	32	14.59	.001	.31	1	32	16.20	.000	.34					
	Component	1.86	59.41	3.84	.030	.11	2.33	74.65	4.54	.010	.12					
	Role by Difficulty	1	32	0.51	.479	.02	1	32	1.58	.218	.05					
	Role by Component	1.86	59.41	3.94	.027	.11	2.33	74.65	5.58	.004	.15					
	Difficulty by Component	2.17	69.32	1.83	.166	.05	2.45	74.47	2.96	.047	.09					
	Role by Difficulty by Component	2.17	69.32	3.56	.031	.10	2.45	74.47	4.39	.010	.12					
Collective																
	Role	1	32	0.00	.997	.00	1	32	.49	.491	.02					
	Difficulty	1	32	25.63	.000	.45	1	32	23.87	.000	.43					
	Component	1.93	61.79	3.28	.046	.09	2.21	70.85	6.51	.002	.17					
	Role by Difficulty	1	32	1.58	.218	.05	1	32	0.68	.417	.02					
	Role by Component	1.93	61.79	6.69	.003	.17	2.21	70.85	6.69	.002	.17					
	Difficulty by Component	1.97	63.13	6.37	.003	.17	2.63	84.07	1.81	.159	.05					
	Role by Difficulty by Component	1.97	63.13	7.26	.002	.19	2.63	84.07	4.85	.005	.13					

Note. The degrees of freedom (df1, df2) are reported for the Greenhouse-Geisser adjustment.

Table 6. Results of the tests of simple main effects within the three-way repeated measures analysis of variances.

		Efficacy					Subjective Performance					Objective Performance				
Target	Effect	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2
Self																
	Component by Role (low-difficulty)	1.90	60.78	.22	.795	.011	2.19	70.11	.12	.901	.004	2.05	65.71	3.78	.027	.085
	Component by Role (high-difficulty)	1.10	35.09	11.59	.001	.253	1.76	56.46	16.59	<.001	.328	2.10	67.10	10.48	<.001	.207
	Component for Base Role (low-difficulty)											1.69	27.03	20.22	<.001	.289
	Component for Flyer Role (low-difficulty)											1.94	31.03	8.56	<.001	.093
	Component for Base Role (high-difficulty)	1.07	17.06	36.47	<.001	.509	1.24	19.84	33.28	<.001	.412	1.50	24.07	16.57	<.001	.229
	Component for Flyer Role (high-difficulty)	1.49	23.78	1.15	.320	.043	1.79	28.67	1.11	.338	.032	1.62	25.88	7.88	<.001	.132
Other																
	Component by Role (low-difficulty)	1.44	45.96	1.80	.184	.036	2.01	64.29	.52	.589	.013					
	Component by Role (high-difficulty)	2.00	64.13	14.27	<.001	.292	2.05	65.72	13.83	<.001	.266					
	Component for Base Role (high-difficulty)	1.40	22.42	2.99	.086	.057	1.99	31.87	2.03	<.001	.049					
	Component for Flyer Role (high-difficulty)	1.43	22.84	32.39	<.001	.400	1.51	24.15	23.12	<.001	.308					
Collective																
	Component by Role (low-difficulty)	2.36	75.50	.72	.510	.026	2.46	78.81	.23	.835	.006					
	Component by Role (high-difficulty)	1.68	53.63	25.86	<.001	.407	2.36	75.48	14.13	<.001	.284					
	Component for Base Role (high-difficulty)	1.17	18.66	42.07	<.001	.437	1.49	23.87	19.46	<.001	.257					
	Component for Flyer Role (high-difficulty)	1.76	28.21	9.77	<.001	.213	1.64	26.27	9.83	<.001	.161					

Note. The degrees of freedom (df1, df2) are reported for the Greenhouse-Geisser adjustment.

task-difficulty, the actor variance component was significantly greater than the partner variance component, $t(16) = 2.84$, $p = .012$, and relationship variance component, $t(16) = 2.70$, $p = .016$ (see Figure 2a). In contrast, however, the flyers' variance components were similar within and between low- and high-difficulty tasks.

The variance partitioning of self-performance evaluation ratings resulted in a profile similar to that of the self-efficacy ratings. Results of the simple main effects pertaining to subjective self-performance are presented in the upper panel of Table 6. Pairwise comparisons revealed for the bases within high task-difficulty, the actor variance component was significantly greater than the partner variance component, $t(16) = 3.30$, $p = .005$, and relationship variance component, $t(16) = 3.25$, $p = .005$ (see Figure 3a).

Other-perceptions. It was expected that within ratings of other-efficacy, flyers' partner variance components would be larger than all other variance components and this would be more pronounced in the high-difficulty tasks. Results of the simple main effects pertaining to other-efficacy are presented in the middle panel of Table 6. The two-way variance component by role interaction was significant for high task-difficulty, but not low task-difficulty. Within high task-difficulty, the one-way variance component interaction was significant for the flyers, but not the bases. Pairwise comparisons indicated for the flyers within high task-difficulty, the partner variance component was significantly greater than the actor variance component, $t(16) = 3.28$, $p = .005$, and relationship variance component, $t(16) = 2.98$, $p = .009$ (see Figure 2b). In contrast, the bases' variance components were similar within and between low- and high-difficulty tasks.

The variance partitioning of other-performance evaluation ratings result in a profile similar to that of the other-efficacy ratings. Results of the simple main effects pertaining to subjective other-performance are presented in the middle panel of Table 6. Pairwise comparisons revealed for the flyers within high task-difficulty, the partner variance component was significantly greater than the actor variance component, $t(16) = 2.91$, $p = .010$, and relationship variance component, $t(16) = 2.29$, $p = .036$ (see Figure 3b).

Collective perceptions. It was expected that within ratings of collective efficacy, the relationship variance component would be larger than all other

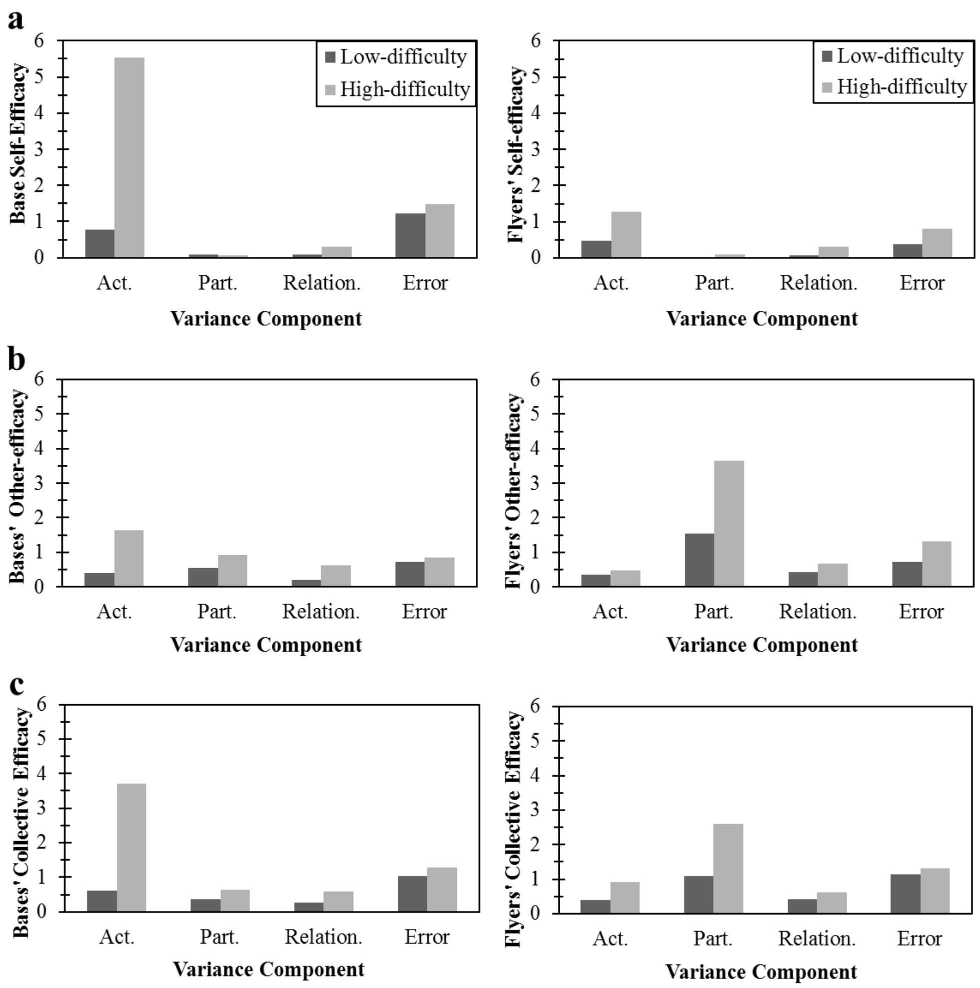

Figure 2. The bases' (i.e., low-dependence role) and flyers' (i.e., high-dependence role) variance components (Act. = actor, Part. = partner, Relation. = relationship, Error) by low and high task-difficulty for (a) self-efficacy, (b) other-efficacy, and (c) collective efficacy.

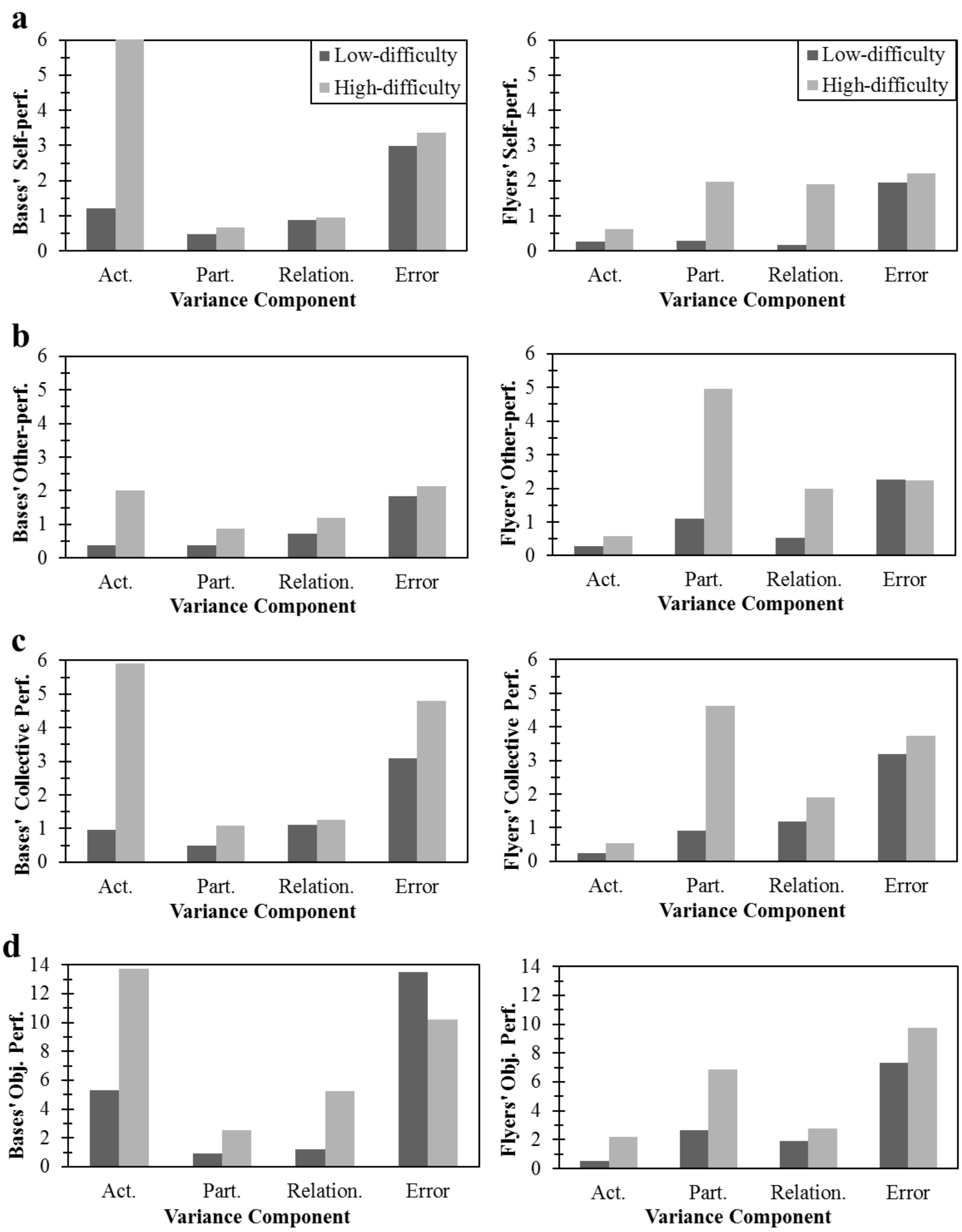

Figure 3. The bases' (i.e., low-dependence role) and flyers' (i.e., high-dependence role) variance components (Act. = actor, Part. = partner, Relation. = relationship, Error) by low and high task-difficulty for (a) self-performance, (b) other-performance, (c) collective performance, and (d) objective performance.

variance components, regardless of role, and this would be more pronounced in the high-difficulty tasks. Results of the simple main effects pertaining to collective efficacy are presented in the lower panel of Table 6. The two-way variance component by role interaction was significant for high task-difficulty, but not low task-difficulty. Within high task-difficulty, the one-way variance component interaction was significant for both the bases and flyers. Pairwise comparisons indicated for the bases within high task-difficulty, the relationship variance component was significantly smaller than the actor variance component, $t(16) = -2.66$, $p = .017$, but not significantly different from the partner variance component, $t(16) = -.07$, $p = .947$ (see Figure 2c). Pairwise comparisons indicated for the flyers within high task-difficulty, the relationship variance component was significantly smaller than the partner variance component, $t(16) = -3.00$, $p = .008$, but not the actor variance component, $t(16) = -1.03$, $p = .317$ (see Figure 2c).

The variance partitioning of collective performance evaluation ratings resulted in a profile similar to that of collective efficacy ratings (see the lower panel of Table 6). Pairwise comparisons revealed for the bases within high task-difficulty, the relationship variance component was significantly smaller than the actor variance component, $t(16) = -3.08$, $p = .007$, but not significantly different from the partner variance component, $t(16) = .34$, $p = .738$ (see Figure 3c). Pairwise comparisons indicated for the flyers within high task-difficulty, the relationship variance component was significantly smaller than the partner variance component, $t(16) = -2.179$, $p = .045$, but not the actor variance component, $t(16) = 2.04$, $p = .058$ (see Figure 3c).

Objective performance. It was expected that the profile of variance partitioning for each role's objective performance would parallel the expected profiles for each role's subjective evaluations. Results of simple main effects pertaining to objective performance are presented in the upper panel of Table 6. The two-way variance component by role interaction was significant for low and high task-difficulty. Within low and high task-difficulty, the one-way variance component interaction was significant for both the bases and flyers. Pairwise comparisons indicated for the bases within low task-difficulty, the actor variance component was significantly larger than the partner variance component, $t(16) = 3.49$, $p = .003$, and relationship variance component, $t(16) = 2.93$, $p = .010$. Pairwise comparisons indicated for the bases within high task-difficulty, the actor variance component was significantly larger than the partner variance component, $t(16) = 2.39$, $p = .030$, but not the relationship variance component, $t(16) = 1.54$, $p = .142$ (see Figure 3d). Pairwise comparisons indicated for the flyers within low task-difficulty, the partner variance component was significantly larger than the actor variance component, $t(16) = 2.51$, $p = .023$, but not the relationship variance component, $t(16) = 1.00$, $p = .332$. Pairwise comparisons indicated for the flyers within high task-difficulty, the partner variance was not significantly different from the actor, $t(16) = 1.77$, $p = .096$, or relationship variance components, $t(16) = 1.42$, $p = .176$ (see Figure 3d).

Discussion

The purpose of this study was to examine the person-related sources of variance in athletes' self-, other-, and collective efficacy beliefs and performances across athlete role and task-difficulty. The findings were largely, but not completely, consistent with what was hypothesized. First, the actor variance was largest for self-perception ratings by the bases indicating levels of self-efficacy for the low-dependence role remained mostly consistent, irrespective of a partner, and in line with a self-focus orientation. A different profile of variance partitioning was evident in self-perception ratings by the flyers who appeared to rely upon multiple sources of person-related information (i.e., self, partner, and dyad). Second, the partner variance was largest for other-perception ratings by the flyers indicating levels of other-efficacy for the high-dependence role were mostly varied, specific to a partner, and in line with an other-focus orientation. A different profile of variance partitioning was evident in other-perception ratings by the bases. Interestingly, the variance partitioning profiles in collective perception ratings paralleled the expected focus orientations for each role. Overall, the person-related sources of efficacy beliefs, as indicated by the differing profiles of variance partitioning, were not equivalent across roles, a finding similar to research on efficacy beliefs in coach-athlete dyads (Jackson & Beauchamp, 2010; Jackson et al., 2009).

As expected, role differences observed in the profiles of variance partitioning for objective performance paralleled role differences observed for athlete's subjective ratings. Bases' performances were mostly consistent across partners indicating their performances were least dependent on a partner whereas flyers' performances mostly varied with each partner indicating their performances were most dependent on a partner. The profiles observed for objective performance were indicative of one partner's performance being more dependent on the other partner's performance. The results support Snyder and Stukas' (1999) contentions that asymmetrical dependencies within dyads can result in the quality of Partner A's individual performance contributions being the boundary for the quality of Partner B's individual performance contributions. Parallel patterns of variance profiles across subjective and objective performance evaluations and efficacy beliefs also suggest asymmetric dependence in a performance task has a reasonable link to whom athletes form efficacy beliefs around within a dyad. In the current study, athletes' objective performances were not equally dependent on one another, especially in high-difficulty, which helps clarify Gaudreau et al.'s (2010) argument that task structure can meaningfully distinguish the dyad partners.

Contrary to theoretically based expectations, collective efficacy ratings were not observed to be relationally-oriented. Instead, profiles of variance partitioning paralleled the expected focus orientations associated with the high- and low-dependence roles. It may be that in dyads, collective efficacy is simply analogous to individual-level perceptions because each individual has more personal control of group coordination compared to when performing in larger size teams (Wickwire et al., 2004). As a related matter, early season collection of data could have resulted in collective efficacy beliefs having some equivalence to group members' beliefs about individual-level abilities (Feltz & Lirgg, 1998). So, in hindsight, it may have been improbable to assume collective perceptions would be mostly reflective of relationship uniqueness given the nature of dyad performance and time of season data were acquired. The use of distinguishable dyads in this study has provided results in line with Damato et al.'s (2008) findings and Bandura's (1997) assertions that a group's collective efficacy may depend on the athlete most essential to performance. Additional research, such as conducting the same study at season end, because collective efficacy beliefs emerge with the passing of time, might clarify the extent to which dyad athletes interpret collective abilities as akin to independent abilities (Feltz & Lirgg, 1998).

The current findings may have implications in larger team settings and should be considered for future research directions. Bandura (1997) asserts that one cannot assess personal capabilities towards a group task without making assessments of the entire group's capabilities. Yet, uncertainty exists for how an athlete will simultaneously weigh, process, and separate evidence among several related types of efficacy across team members (Feltz & Lirgg, 2001). The current findings suggest dependence on others to perform may help explain under what circumstances, and for which athletes, qualities related to the self, other, or group will be integrated into self-, other-, and collective perceptions. Variations of the SRM such as the round-robin design target one-to-one perceptions existent within groups of at least three members (Kenny et al., 2006). Such an investigation, although complex, would start to broaden understanding of the one-to-one relationships existent within larger teams.

For future research, studies with different dyad sports (e.g., paired sailing, synchronized diving) and relationships (e.g., coach-athlete, parent-athlete, and consultant-athlete) would clarify the way in which both task and formal dependencies shape athlete cognitions. First, comparisons made across exchangeable and distinguishable dyads would help depict how athlete cognitions emerge in regards to the asymmetry between performance roles (Bray et al., 2002; Gaudreau et al., 2010). Second, the examination of coach-athlete relationships has revealed differences across roles in the antecedents and consequences of efficacy beliefs (Jackson & Beauchamp, 2010; Jackson et al., 2009). Role differences can be further examined within a SRM analysis of any dyad involving one member who assumes a formal leadership role to provide a numerical representation of the extent to which efficacy beliefs vary across relationships for the leader and subordinate roles.

This study has limitations that occurred as a consequence of task structure and sport culture. The performance roles of the athletes inherently implicated other relatively stable factors (i.e., overall cheerleading experience, gender) that were not controlled for in this investigation. Even though average overall cheerleading experience was higher for flyers, task-specific experience was not a distinguishable factor between the roles because the average experience in co-ed cheerleading was comparable. Moreover, support for a gender explanation for differences in athletes' cognitive-performance relationships has not been previously observed in both athlete-athlete and coach-athlete dyads (Jackson & Beauchamp, 2010; Jackson, Beauchamp, & Knapp, 2007). Female cheerleaders have been reported to be more confident than males in feminine typed cheerleading tasks (i.e., cheers and motions, jumps, dance), but no differences in confidence were observed between females and males in the performance of partner-stunts such as those employed in this study (Clifton & Gill, 1994). This suggests the partners were distinguishable by role, but future research using the SRM should examine same gender dyads with distinguishable roles to more formally test the hypothesis that gender, rather than performance role, might have been a crucial factor in the findings observed in this study.

It is difficult to tease apart the network of interactive efficacy beliefs within a particular relationship (Feltz & Lirgg, 2001; Lent & Lopez, 2002). Findings from this study provided evidence that efficacy beliefs, subjective performances, and objective performances vary across performance pairs. Further, the results suggest the extent athlete performance depends on a partner, an aspect of one’s performance role, relates to the extent a partner is a source of athlete self-, other-, and collective efficacy beliefs.

Chapter 5

Study 3: The Unique Effects of Self-, Other-, and Collective Efficacy Beliefs and Performance in Athlete Pairs

The findings from Chapters 3 and 4 have demonstrated several differences across bases and flyers in support of the assertions that athletes’ roles are distinguishable, can vary in dependence on others, and have implications for athletes’ psychological and behavioral states. The findings reported in Chapter 3 indicated that the bases’ and flyers’ individual performances were nonindependent measures of performance that had relations of differing magnitude to a dyad level of performance. The focus on the Social Relations Model approach in Chapter 4 helped to determine that efficacy and performance were both dependent on the base role’s abilities more than the flyers’ abilities. The findings in Chapter 4, however, did not include any evidence for predictive relationships between athletes’ efficacy beliefs and performances. The current chapter extends the two previous chapters with an investigation of reciprocity in the efficacy-performance relationship for athlete dyads with distinguishable roles.

In line with findings on larger-sized teams, efficacy beliefs have important implications for performing dyads. An individual’s confidence in his/her partner predicts both personal and dyad performance (Beauchamp & Whinton, 2005; Dunlop, Beatty, & Beauchamp, 2011). The empirical support available to date, however, has only involved individual-level approaches to address the research problem. Some argue that conclusions about dyads based on individual-level analyses are not wholly representative of interpersonal relationships (Kenny, Kashy, & Cook, 2006; Laursen, 2005). Treating dyad partners as two unrelated individuals results in biased hypothesis testing, while measuring only one member of a dyad ignores partner influences altogether (Gonzalez & Griffin, 1997; Kenny & Cook, 1999; Kenny, 1995). To extend previous findings on the efficacy-performance relationship in dyads, a dyad analytic approach is required in which both partners’ perspectives, and the relationships between those perspectives, are considered (Jackson et al., 2015). The purpose of this study was to examine the extent to which both partners’ efficacy beliefs (i.e., self-, other-, collective) predict successive performances of an athletic dyad task and, in turn, the extent to which both partners’ athletic performances predict each partner’s efficacy beliefs.

Reciprocity in the Efficacy-Performance Relationship

Bandura (1997) emphasized that the relationship between efficacy and performance is reciprocal because mastery performances are a major source of information to evaluate self-efficacy, and self-efficacy is a key mechanism for achieving a given level of performance. A common approach to demonstrating this causal chain has been to obtain participants' self-efficacy beliefs between trials of the same performance task under invariant conditions (Heggestad & Kanfer, 2005). Feltz (1982), for example, conducted a path analysis of the relationship between self-efficacy and diving performance over four performance trials. Her findings supported past performance was a stronger predictor of self-efficacy compared to the effect of self-efficacy on subsequent performance. Further, the direct effect of past performance on subsequent performance was stronger than the effect of self-efficacy on subsequent performance. A collection of findings replicating Feltz (1982) has raised question to the importance of efficacy as a mediating mechanism between past performance and subsequent performance (e.g. Haney & Long, 1995; Watkins, Garcia, & Turek, 1994).

Strong criticism of these types of studies was received from Bandura (1997). He argued that past performance becomes an inflated predictor of subsequent performance when determinants of performance remain constant across a set of controlled trials. In such instances, the contribution of efficacy beliefs to subsequent performance is artificially attenuated. On the other hand, varying conditions across successive performances exhibit weaker direct effects from past performance to subsequent performance (George, 1994; Kane et al., 1996). Bandura suggests that only when psychological contributions are isolated from performance will the relative causality of each aspect be accurately estimated in a statistical model. Reasoning for this solution is based on a perspective that any given performance score is a conglomerate index representing many distinct parts such as self-efficacy beliefs, goal aspirations, and effort, which each help to facilitate performance (Bandura, 1997; Bandura & Locke, 2003). When interest is on the contribution of efficacy beliefs to subsequent performance, beyond past performance, then past performance must be operationalized to only represent performance aspects.

The method used to operationalize past performance affects the interpretation of the efficacy-performance relationship (Heggestad & Kanfer, 2005). The most appropriate solution, according to Bandura (1997), is to residualize past performance so that the variable only represents the part of past performance not attributable to efficacy beliefs. A residual past performance score is an adjusted score calculated by regressing past performance on a preceding measure of efficacy and saving the residual (Feltz et al., 2008). This solution is argued to avoid statistical over-control for past performance (Bandura, 1997). Heggestad and Kanfer (2005), however, have concluded that residualizing past performance is an over-adjustment for the issue because, by employing this procedure, any variable influencing both preceding efficacy and past performance (i.e., common-cause variance) is also removed from past performance. Thus, when included as predictors of subsequent performance, raw self-efficacy will carry variance attributed to the common-cause, while residual past performance will not. Efficacy becomes an inflated predictor of subsequent performance when common-cause variance is extracted out of past performance, leading to possible misconceptions about the magnitude of the efficacy-performance relationship.

In response to these debates, Feltz et al. (2008) compared several approaches to operationalizing predictor variables in an efficacy-performance causal chain. Their results suggest that the most appropriate treatment of the data is to residualize both the efficacy and performance predictors. A residual efficacy score is an adjusted score calculated by regressing raw efficacy on residual past performance and saving the residual (Feltz et al., 2008). They termed this approach as the Residualized Past Performance-Residualized Self-Efficacy model (RPPRSE). The RPPRSE model solves the problem of overcorrections by extracting the common-cause variance from both efficacy and past performance. In line with theoretical assertions, results using the RPPRSE model demonstrate both past performance and self-efficacy are strong and unique predictors of subsequent performance.

Extension to team efficacy-performance relationships. Self-efficacy is a weaker predictor of self-performance if factors beyond personal control are partially responsible for personal success (Bandura, 1990). Under this assertion, collective factors are important to consider for the efficacy-performance relationship in teams. Myers, Payment, and Feltz (2004), for example, found that collective efficacy has a moderate and positive relationship to team performance when controlling for past team performance, and in turn, team performance has a small, positive relationship to subsequent collective efficacy when controlling for past collective efficacy. In consideration of the multiple levels of agency for performing teams, Feltz and Lirgg (1998) found that a win or loss at the team-level had, respectively, a significant positive or negative effect on collective efficacy, but not on self-efficacy. Finally, Myers, Feltz, and Short (2004) found, when addressing performance is nested within teams across a season, collective efficacy remained a positive predictor of subsequent team performance, when controlling for previous team performance. The team performance to collective efficacy predictive direction, however, was associated with a positive effect across teams within any given week, but a negative effect within teams across the season. These studies indicate the existence of reciprocal efficacy-performance relationships in teams, but because the studies pre-date the RPPRSE model, the conclusions are based on methods that arguably over-adjust in favor of efficacy beliefs (Heggestad & Kanfer, 2005).

Actor and partner effects. For dyads with high-levels of interdependence, a member's outcome variable may be caused by both personal and partner characteristics (Kenny et al., 2006). Dyad athletes' reported levels of personal commitment, for example, are predicted by both partners' self-efficacy beliefs (Jackson et al., 2007). Shown in Figure 1, the standard Actor-Partner Interdependence Model (APIM; Kashy & Kenny, 2000; Kenny, 1996) accounts for both actor and partner effects. *Actor effects* (denoted as *a* in Figure 1) are present when a person's score on a predictor variable (e.g., X_1; flyer's efficacy) affects that same person's score on an outcome variable (e.g., Y_1; flyer's performance). *Partner effects* (denoted as *p* in Figure 1) are present when a person's score on a predictor variable (e.g., X_2; base's efficacy) affects the partner's score on an outcome variable (e.g., Y_1; flyer's performance). For distinguishable dyads, the APIM allows for the magnitude of effects to differ by role within the same model resulting in a simultaneous estimation of two actor effects and two partner effects (Kenny et al., 2006). The APIM can be extended for use with repeated-measures to explore mediating mechanisms in distinguishable dyads (Ledermann, Macho, & Kenny, 2011). This approach has been utilized to investigate the flow of influence in interpersonal behaviors in the coach-athlete relationship (e.g., Davis, Jowett, & Lafrenière, 2013; Stebbings, Taylor, & Spray, 2016). Differences in the magnitude of partner effects have been used to argue that for coach-athlete dyads, influence flows from coach (i.e., low-dependence role) to athlete (i.e., high-dependence role; Jackson, Grove, & Beauchamp, 2010). APIM path models would also be useful to investigate the

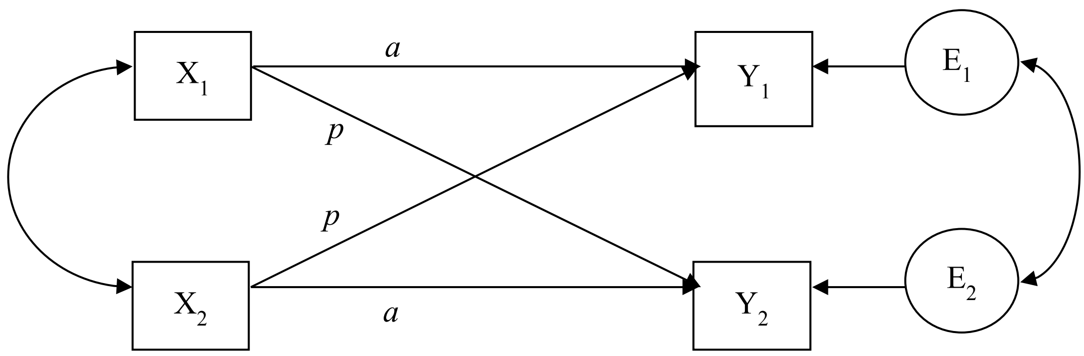

Figure 1. The standard Actor-Partner Interdependence Model.

direction of influence in athlete dyads with distinguishable roles by examining the magnitude of partner effects across an efficacy-performance causal chain (Gaudreau, et al., 2010).

Paired cheerleading performance is a multilevel outcome and attention can be granted to both individual- and dyad-level performance. In line with arguments made in Chapter 2 (Study 1), important information about the individual members in a dyad is lost when relying on aggregation scores. To map onto the APIM path model approach, both partners' predictor variables (i.e., self-, other-, collective efficacy) can be separately modelled to predict a dyad-level performance outcome. The effect of dyad performance on self-, other-, and collective efficacy can then be examined within the same causal chain. Observing both athletes' efficacy effects on dyad performance would extend previous findings involving measures from only one member of a dyad (e.g., Beauchamp & Whinton, 2005), and substantiate qualitative evidence for dyad performance being a source of self- and other-efficacy (e.g., Jackson et al., 2008).

Investigative Rationale, Purpose, and Hypotheses

The rationale for this study was the need to examine actor and partner predictive effects in the efficacy-performance reciprocal relationship within dyads to support theorizing (e.g. Lent & Lopez, 2002) and empirical evidence (e.g., Beauchamp & Whinton, 2005; Dunlop et al., 2011) regarding efficacy beliefs and performance for athlete pairs. To afford this end, an approach grounded in Feltz' (1982) original path analysis and Feltz et al.'s (2008) RPPRSE model was adapted for dyads using APIM modelling. First, APIM path models were employed to replicate Feltz' path models with the purpose of investigating the magnitude of actor and partner effects for self-, other-, and collective efficacy with self- and collective subjective performance, and objective dyad performance across the low- and high-dependence roles. Second, each panel of the APIM path models were analyzed in line with Feltz et al.'s RPPRSE model allowing for efficacies to be estimated in the same model. The purpose of the second set of analyses was to investigate any unique actor and partner effects among the seemingly similar constructs. Investigation of casual patterns in dyads strengthens the findings in previous chapters of this thesis by evidencing the implications of role on predictive pathways.

The purpose of this study was to examine the reciprocal relationships between efficacy and performance across multiple trials of a paired-cheerleading task to examine each perception as an actor and/or partner effect. In line with theory (Bandura, 1977), significant actor effects relative to self-efficacy and previous self-performance were expected and controlled for, although these were not of substantive interest to the study. Hypotheses were made about actor and partner effects for both predictive directions of the efficacy-performance relationship. It was first hypothesized that other-efficacy and collective efficacy beliefs would be significant predictors of one's perceptions of self-/collective performance, above and beyond previous perceptions of self-performance and self-efficacy. Second, it was hypothesized that athlete's perceptions of other- and collective performance would be significant predictors of one's own self-/other-/collective efficacy belief, above and beyond previous perceptions of self-efficacy and self-/collective performance. Previous research (e.g., Jackson et al., 2010) has exhibited partner effects more strongly influence outcomes for the athlete in a high-dependence role. The third hypothesis, in line with these findings, was that self-, other- and collective efficacy beliefs would predict both partners' perceptions of performances, above and beyond the actor effects, but the magnitude of the partner effects from base to flyer would be strongest. Fourth, it was hypothesized that self-, other-, and collective performance would predict the partner's self-/other-/collective efficacy beliefs. Fifth, partners' self-, other-, and collective efficacy beliefs were hypothesized to uniquely predict objective dyad performance, and in turn, objective dyad performance would predict both partners' efficacy beliefs.

Method

Participants

Seventy-four base-flyer dyads from university cheerleading teams within the United States participated in the study. Participants were from 18-27 years of age (M_{bases} = 21.0, *SD* = 2.14; M_{flyers} = 19.3, *SD* = 1.65). Similar to the previous studies in this thesis, flyers (i.e., females) in this study averaged a longer duration of general cheerleading experience than bases (i.e., males; M_{bases} = 5.2 years, *SD* = 3.59; M_{flyers} = 8.8 years, *SD* = 4.13), but experience in co-ed cheerleading was comparable across roles (M_{bases} = 3.6 years, *SD* = 2.27; M_{flyers} = 2.9 years, *SD* = 1.82). Participants were in the beginning of 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. Participants spent an average six hours (*SD* = 4.53) training together, and had been assigned to their dyad on average for two and a half months (SD = 2.91). Flyers spent an additional 4.5 hours (*SD* = 4.77) training with others, while bases only spent an additional 2.5 hours (*SD* = 4.64) training with others. Teams were a member of the National Collegiate Athletic Association Division 1 (*n* = 6) or Division II (*n* = 1). Universities were located within the northeast (*n* = 2), southeast (*n* = 4), and midwest (*n* = 1) regions of the United States.

Performance Task

Performance tasks were selected relative to a dyad's current level of ability. Based on a conversation between athletes and their respective coach, each dyad self-selected a moderately challenging task to attempt for five trials. Moderately challenging was defined to the participants as "any skill successfully performed about 50% of the time, at this moment in time." To be clear, a successful performance is regarded within the sport as a faultless execution of the performance task and not simply an effortful attempt (Chapter 2). Although there was a wide variability in the tasks selected, the tasks can be categorized into four levels of objective skill difficulty (Chapter 2; National Cheerleading Association, 2013). The lower range of intermediate stunt skills were selected by 23 dyads (i.e., 31% of the total sample) which included any non-spinning or non-flipping skill, while the upper range of intermediate stunt skills were selected by 26 dyads (i.e., 35% of the total sample) which included any skill requiring a 360-degree, vertical spin. Advanced skills, which must include an inverted position at any point in the skill (including 360-degree flips), were selected by 16 dyads (i.e., 22% of the total sample). Elite stunt skills, the most difficult category, were selected by nine dyads (i.e., 12% of the total sample). This final category included any skill requiring either a 720-degree spin or a simultaneous spin-inversion combination. The tasks, selected as moderately challenging in the beginning of the study were also rated as moderately challenging (M_{bases} = 5.2, *SD* = 2.42; M_{flyers} = 5.1, *SD* = 2.85) after completion of the five trials on a scale ranging from 0 (*not a challenge at all*) to 10 (*a complete challenge*).

Measures

Participants responded to self-, other-, and collective efficacy beliefs and subjective performance evaluations relative to each performance trial. Single-item measures were implemented in line with the previous chapters in this thesis and previous research (Bruton, Mellalieu, & Shearer, 2016; LaForge-MacKenzie & Sullivan, 2014). The presentation order of items within each inventory was randomized across participants to manage potential order effects across response periods (questionnaire available in Appendix D).

Efficacy beliefs. Participants' self-, other-, and collective efficacy beliefs were assessed using three target-specific, single-item measures. Participants responded 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 rated self, other, and collective performances in a similar format to the efficacy inventory. 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 performance. Standardized behavioral assessments of dyad performances were employed as described by Chapter 2. The protocol involves assessing a dyad's performance quality on a four-point Likert-type scale representing *no errors* (0), *minor errors* (-1), *major errors* (-2), and *complete failures* (-3). Accordingly, the lowest possible score (i.e., -2) indicated poor performance and the highest possible score (i.e., 0; no errors) indicated excellent performance. All task performances (n = 296) were assessed by the first author and a second independent rater assessed a sample of performances to evaluate performance assessment objectivity. The second rater assessed 12 dyad performances from one team for the purposes of training and provision of feedback with the objective performance evaluation protocol. The second rater then independently assessed another 60 dyad performances from the remaining teams (i.e., 20% of the total number of performances within the current study). 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 coefficients (i.e., ICC = .87).

Procedures

After obtaining approval from the Human Subjects Committee at the University of Stirling, information sheets were emailed to 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 dyad selected a paired-stunt task that was moderately challenging relative to their current dyad-level ability. The participants received a questionnaire packet on efficacy beliefs completed immediately before each task performance and subjective performance completed immediately after each task performance. The selected tasks were then performed for five trials, with the first trial being used for a standardized warm-up and familiarization trial. Participants were asked to refrain from any verbal and nonverbal communication except for during the specified communication periods. These communication periods were allocated between each performance trial because on a paired-stunt task of moderate challenge, it is necessary for partners to communicate a safe strategy for the next performance to avoid unnecessary risk of injury. Participants' self-reported efficacy beliefs were obtained prior to and subsequently after each communication period. Participants performed the five performance trials in front of a video camera. Finally, participants completed personal information sheets on age, experience, and a post-task subjective assessment of the task challenge-level. Dyad performance was subsequently assessed post data collection.

Analyses

Preliminary analyses. To test for the effect that efficacy would increase as a consequence of communication between partners, comparisons of reported self-, other-, and collective efficacy during pre- and post-communication were conducted using three 2 x 2 x 4 mixed model RM-ANOVAs to examine role (base, flyer) by communication (pre-, post-) by trial (trial 2-5) interactions. These analyses were conducted within SPSS version 21.0.

Before further analyses could be conducted it was necessary to test for the level of nonindependence in the data to determine if the data structure was dyadic by a statistical criteria (Jackson & Beauchamp, 2010; Kenny et al., 2006). With distinguishable dyads, Pearson product-moment correlations can be calculated, with any pair of outcome variables being correlated above .20 indicating that the data set has a dyad structure (Cook & Kenny, 2005; Kenny et al., 2006). In this study, correlations between partners' self-, other-, and collective efficacies (r = .34 - .68, $p < .001$) and performances (r = .32 - .74, $p < .001$) indicated that nonindependence existed within the data, so Actor-Partner Interdependence Modelling approaches were appropriate to employ.

All variables were standardized prior to computing any of the subsequent models because, for dyadic data, the standardized coefficients reported within statistical programs are calculated from formulas based on each role within the sample. This renders the pathway coefficients to be incomparable across roles in a dyad (Kenny et al., 2006). One solution is to use the grand mean and standard deviation values relative to the entire sample for calculating the standardized scores. In this study, all variables were standardized following this approach so that the standardized pathway coefficients were interpretable across the roles.

Path models. APIM path models were conducted using Mplus version 7.0. As depicted in Figure 2 the reciprocal predictive pathways between each partner's efficacy and performance and subsequent efficacy and performance were modelled starting with efficacy on trial 3 and ending with performance on trial 5. In line with APIM modelling, the first pair of variables (i.e., base efficacy 3 and flyer efficacy 3) were correlated to control for the interdependence between partners' scores. For the remaining subsequent pairs of variables, the errors were correlated to control for common causes (Ledermann et al., 2011).[9]

Three of the models (M1-M3) included performance scores pertaining to the self-performance measure, while an additional three models (M4-M6) included performance scores pertaining to the collective performance measure. Self-, other-, and collective efficacy were examined separately across the models so that the magnitude of actor and partner effects relative to each efficacy could be examined in isolation from the other two types of efficacy. Thus, M1 and M4 were modelled with only self-efficacy, M2 and M5 were modelled with only other-efficacy, and M3 and M6 were modelled with only collective efficacy. To examine relationships with objective performance, a similar approach was adopted with one major difference. Because objective performance was observed

[9] Within Figure 2, only the correlation between flyer performance 5 and base performance 5 is presented for simplicity and to reduce clutter.

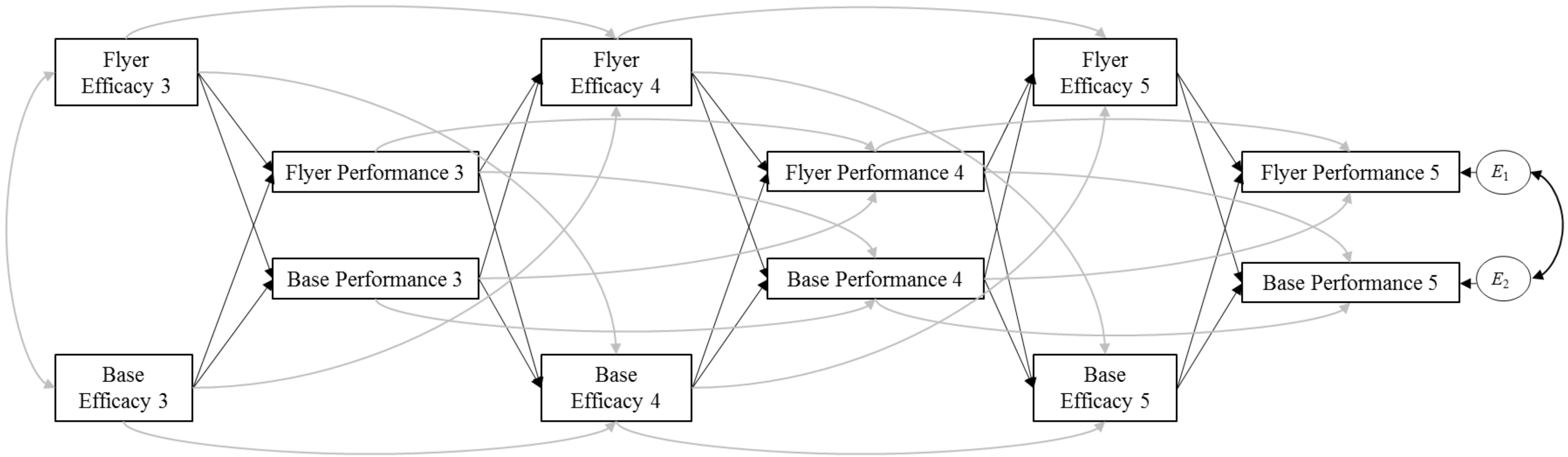

Figure 2. The conceptual drawing of the path models conducted in this study. *Black arrows* indicate pathways of substantive interest. *Grey arrows* indicate pathways required within the model to control for time-lagged effects. Not drawn are the arrows representing error covariances between pairs of variables across partners (e.g., flyer efficacy 4 and base efficacy 4) to control for the common causes not measured in this study (Ledermann, et al., 2011).

at a dyad-level, only one score was available per a trial for each dyad. Therefore, the two performance variables that were modelled in the APIMs were collapsed to a single variable. The partner and actor effect, consequently, were collapsed to a single pathway so that each efficacy was only associated with a single predictive pathway. To examine relationships between each efficacy belief and objective performance, three models were conducted; M7, M8, and M9 were modelled with, respectively, self-efficacy, other-efficacy, and collective efficacy.

All path models (M1-M9) were evaluated for fit of the model to the data using several model fit indices; Chi-square (χ^2), comparative fit index (CFI), Tucker-Lewis index (TLI), and the standardized root mean square residual (SRMR). CFI/TLI values between .95 and 1.0 indicate an excellent model fit and values below .90 indicate poor fit. SRMR values of .08 or less indicate good model fit (Hu & Bentler, 1999; Kenny et al., 2006).

Single-panel APIMs. Further analyses were conducted using raw and residual scores in line with Feltz et al.'s (2008) conclusion that the RRPRSE approach controls for common-cause variance in the predictors. A single-panel approach was adopted using APIM analyses for each panel of the data represented within the path analyses. Given interest in the reciprocal effects, the single-panel APIMs were examined for the efficacy to performance direction and the performance to efficacy direction. Both predictive directions were examined using raw score APIM models and residual score APIM models. To attain the residual scores, a series of steps were completed with these steps slightly differing according to the direction of prediction being examined. Details of the residual calculations appropriate to each predictive direction are described separately in the subsequent subsections (i.e., efficacy to performance; performance to efficacy). All single-panel APIMs, computed within Mplus 7.0, were fully saturated models so fit indices were not evaluated (Kenny et al., 2006).

Efficacy to performance. Figure 3 depicts the single-panel APIMs modelled in this study to represent the effects of efficacy to performance. For these analyses, performance was the outcome variable, with past performance being controlled for, and self-, other-, and collective efficacy being included in the model as predictors. Two series of APIMs were conducted with performance scores relative to the self- and collective performance measures. For the raw score APIM models, both partners' past performance scores, self-efficacy, other-

$$\textit{Base Performance 2} = \textit{Base SE 2} + \textit{Base OE 2} + \textit{Base CE 2} + \textit{Flyer SE 2} + \textit{Flyer OE 2} + \textit{Flyer CE 2} \quad \text{Equation 1}$$

$$\textit{Flyer Performance 2} = \textit{Base SE 1} + \textit{Base OE 2} + \textit{Base CE 2} + \textit{Flyer SE 2} + \textit{Flyer OE 2} + \textit{Flyer CE 2} \quad \text{Equation 2}$$

$$\textit{Base SE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 3}$$

$$\textit{Flyer SE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 4}$$

$$\textit{Base OE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 5}$$

$$\textit{Flyer OE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 6}$$

$$\textit{Base CE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 7}$$

$$\textit{Flyer CE 3} = \textit{Residual Base Perf. 2} + \textit{Residual Flyer Perf. 2} \quad \text{Equation 8}$$

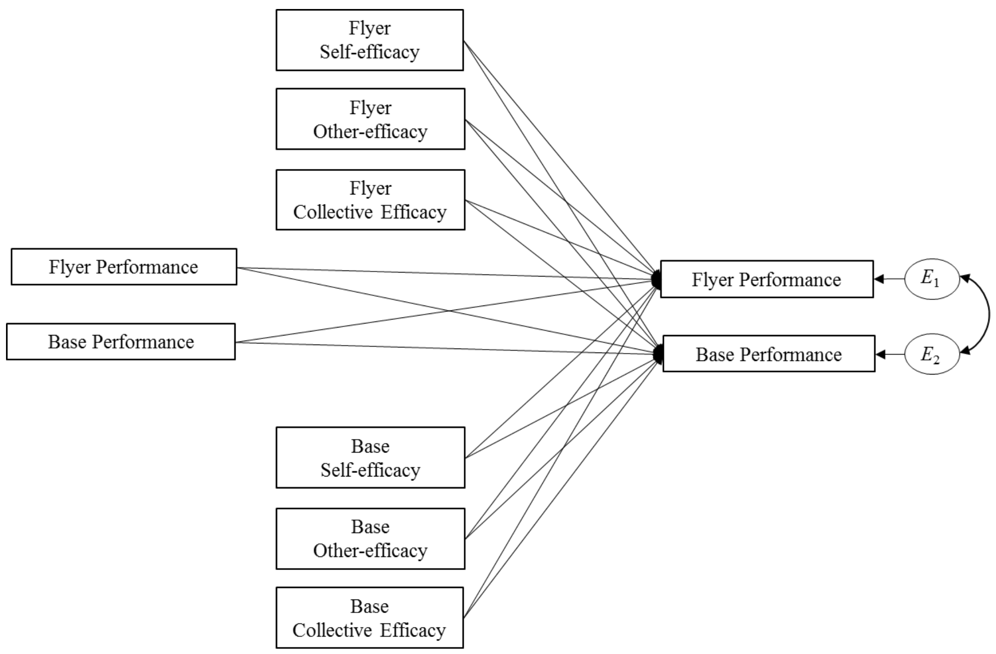

Figure 3. The conceptual drawing of the single-panel APIMs predicting performance outcomes. Not drawn are the arrows representing covariances between all predictor variables within and across partners.

efficacy, and collective efficacy were entered as predictors of both partners' subsequent performances. To attain the residual scores for the residual score APIM models, a series of steps were completed. First, residual performance scores were calculated by regressing past performance on the preceding measures of self-, other-, and collective efficacy and saving the residual. As indicated in equations 1 and 2, the actor and partner effects of both partners' measures of efficacies were removed when residualizing base performance 2 and flyer performance 2, respectively.[10]

The saved residuals from Equation 1 and 2 (i.e., residual base performance 2 and residual flyer performance 2) were then used to calculate residuals associated with the subsequently measured efficacies. This required each efficacy to be separately regressed on residual base performance 2 and residual flyer performance 2. As indicated in the following equations, both partners' performance effects were removed from self-efficacy (equations 3 and 4), other-efficacy (equations 5 and 6), and collective efficacy (equations 7 and 8). The residuals (i.e., residual base self-efficacy 3, residual flyer self-efficacy 3, residual base other-efficacy 3, residual flyer other-efficacy 3, residual base collective efficacy 3, and residual flyer collective efficacy 3) were then saved. To estimate the residual score APIM model, the residual variables resulting from equations 1-8, were then entered as predictors of performance 3 (a raw score). This process was repeated for the remaining trials.

As performed with subjective performance, a single-panel approach was employed using objective dyad performance. Again, the approach was very similar, but with one performance score per a dyad, the residualizing process was simplified. In the first step of the series, performance 2 was regressed on the six preceding measures of efficacy (i.e., equivalent to collapsing equations 1 and 2). For the second step of the series (i.e., equivalent to equations 3-8), each subsequent efficacy was regressed on residual objective dyad performance 2. Residuals were then entered as predictors of objective dyad performance 3. This process was repeated for the remaining trials.

Performance to efficacy. Figure 4 depicts the single-panel APIMs modelled in this study to represent the effect of performance to efficacy. For

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[10] *Note.* Abbreviations used within the equations should be read as SE = self-efficacy, OE = other-efficacy, CE = collective efficacy, and Perf. = performance.

$$\textit{Base Efficacy 3} = \textit{Base SP 2} + \textit{Base OP 2} + \textit{Base CP 2} + \textit{Flyer SP 2} + \textit{Flyer OP 2} + \textit{Flyer CP 2} \quad \text{Equation 9}$$

$$\textit{Flyer Efficacy 3} = \textit{Base SP 2} + \textit{Base OP 2} + \textit{Base CP 2} + \textit{Flyer SP 2} + \textit{Flyer OP 2} + \textit{Flyer CP 2} \quad \text{Equation 10}$$

$$\textit{Base SP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 11}$$

$$\textit{Flyer SP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 12}$$

$$\textit{Base OP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 13}$$

$$\textit{Flyer OP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 14}$$

$$\textit{Base CP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 15}$$

$$\textit{Flyer CP 3} = \textit{Residual Base Efficacy 3} + \textit{Residual Flyer Efficacy 3} \quad \text{Equation 16}$$

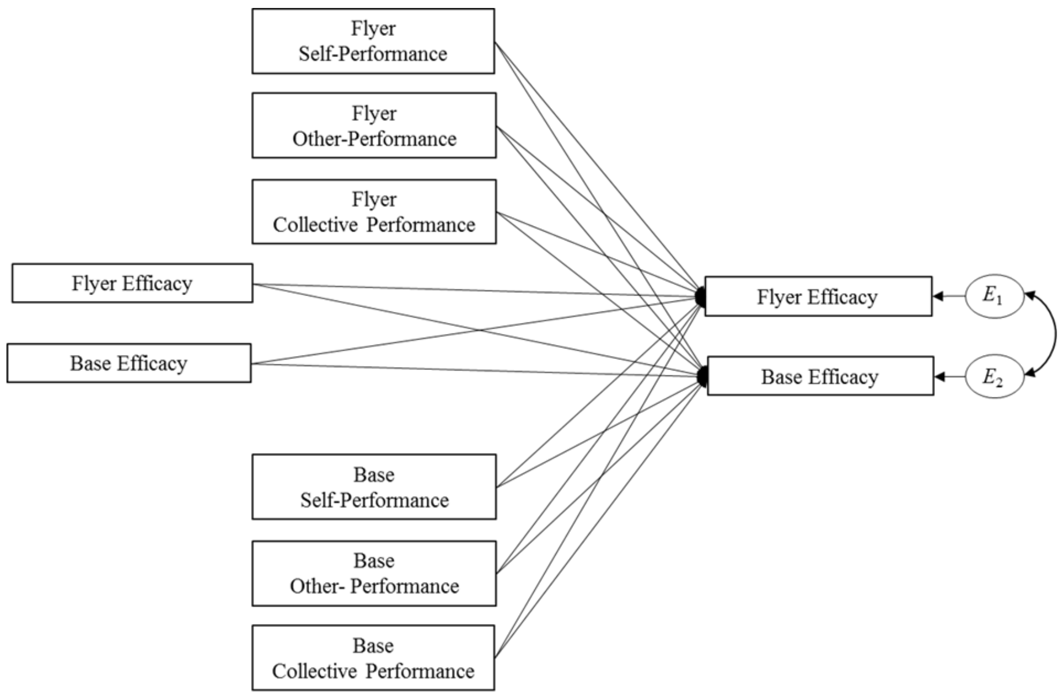

Figure 4. The conceptual drawing of the single-panel APIMs predicting efficacy outcomes. Not drawn are the arrows representing covariances between all predictor variables within and across partners.

these analyses, efficacy was the outcome variable, with past efficacy being controlled for, and self-, other-, and collective performance measures being included in the model as predictors. Three series of APIMs were conducted with self-, other-, and collective efficacy as the outcome variables. For the raw score APIM models, both partners' past efficacy scores, self-performance, other-performance, and collective performance were entered as predictors of both partners' subsequent performances. To attain the residuals for the residual score APIM models, the series of steps were completed in reverse order to those outlined for the direction of efficacy to performance. For these analyses, efficacy 3 was regressed on performance 2, and the residual efficacy 3 scores were saved. Then, self-, other-, and collective performance 3 scores were regressed on the residual efficacy 3 scores. Equations 9 and 10 represent step 1, and equations 1-16 represent step 2 to calculate the residuals. A similar approach was taken with objective performance, with the new direction of residualizing occurring with the same adaptions necessary for using a single performance score.[11]

Results

The descriptive statistics for all efficacy and performance data are presented in Table 1. Participants provided responses that were across the possible scale range, with the average responses to efficacy (M_{bases} = 7.55 – 8.76, SD_{bases} = 1.72 – 2.43; M_{flyers} = 7.15 – 8.23, SD_{flyers} = 1.82 – 2.58) and subjective performance (M_{bases} = 6.53 – 8.20, SD_{bases} = 2.35 – 3.51; M_{flyers} = 6.41 – 7.74, SD_{flyers} = 2.47 – 3.42) being in the upper end of the scale. Importantly, the self-selected tasks were on average of a moderate challenge to participants as indicated by the average objective dyad performance score across each trial remaining consistently near the middle of the possible scale range.

It was expected that participants' self-, other-, and collective efficacy beliefs would increase as a consequence of communication between partners. Reported efficacy was compared using three 2 x 2 x 4 mixed model RM-ANOVAs to examine role (base, flyer) by communication (pre-, post-) by trial (trial 2-5) interactions. Results of the RM-AVOVAs are presented in Table 2. Mauchly's test indicated the assumption of sphericity was violated, $\chi^2(5)$ = 15.14

[11] *Note.* Abbreviations used within the equations should be read as SP = self-performance, OP = other-performance, and CP = collective performance.

Table 1. Means and standard deviations for efficacy and performance data for the bases, flyers, and dyads across performances 2-5.

		Performance 2		Performance 3		Performance 4		Performance 5	
	Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Base	Self-efficacy (pre-com.)	7.57	2.04	7.97	1.79	7.87	2.08	7.96	2.43
	Other-efficacy (pre-com.)	8.10	2.07	8.58	1.84	8.39	2.17	8.47	2.17
	Collective Efficacy (pre-com.)	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	7.00	2.72	6.58	3.14	7.05	3.10	7.01	3.10
	Subjective Other-performance	8.20	2.35	7.51	3.11	8.16	2.64	8.05	2.70
	Subjective Collective Performance	6.97	3.07	6.53	3.51	7.05	3.21	6.77	3.29
Flyer	Self-efficacy (pre-com.)	7.70	1.98	7.78	1.96	7.69	2.44	8.00	2.20
	Other-efficacy (pre-com.)	7.23	2.06	7.58	2.15	7.54	2.58	7.80	2.39
	Collective Efficacy (pre-com.)	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	7.34	2.47	6.73	3.30	7.74	2.68	7.43	2.66
	Subjective Other-performance	7.03	2.99	6.63	3.22	7.22	3.12	7.25	2.76
	Subjective Collective Performance	6.69	3.24	6.41	3.42	7.12	3.11	6.84	3.24
Dyad	Objective Collective Performance	-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. Results of the role (base, flyer) by communication (pre-, post-) by trial (2-5) repeated measures analysis of variances for self-efficacy, other-efficacy, and collective efficacy.

Variable	Effect	df1	df2	*F*	*p*	η^2
Self-Efficacy						
	Role	1	144	0.00	.996	.000
	Communication	1	144	23.62	<.001	.141
	Trial	2.45	352.51	3.65	.019	.025
	Role by Communication	1	144	0.45	.505	.003
	Role by Trial	2.45	352.51	0.75	.499	.005
	Communication by Trial	2.80	403.47	0.43	.718	.003
	Role by Communication by Trial	2.80	403.47	0.92	.428	.006
Other-Efficacy						
	Role	1	144	6.79	.010	.045
	Communication	1	144	44.23	<.001	.235
	Trial	2.42	348.57	4.68	.006	.031
	Role by Communication	1	144	0.05	.826	.000
	Role by Trial	2.42	348.57	0.77	.485	.005
	Communication by Trial	2.97	427.86	2.68	.047	.018
	Role by Communication by Trial	2.97	427.86	0.11	.952	.001
Collective Efficacy						
	Role	1	144	2.35	.128	.016
	Communication	1	144	36.02	<.001	.200
	Trial	2.46	354.71	6.83	<.001	.045
	Role by Communication	1	144	0.03	.861	.000
	Role by Trial	2.46	354.71	0.49	.650	.003
	Communication by Trial	2.65	381.44	1.11	.341	.008
	Role by Communication by Trial	2.65	381.44	1.29	.279	.009

Note. The degrees of freedom (df1, df2) are reported for the Greenhouse-Geisser adjustment.

- 57.11, $p < .001 - .01$, in all but one instance, $\chi^2(5) = 2.04$, $p = .84$, so Greenhouse-Geisser adjustments on the degrees of freedom were used for a more conservative test of all the effects. Results of the RM-ANOVAs revealed that, regardless of one's role, both self- and collective efficacy increased from pre- to post-communication, with the absolute levels of efficacy for both roles slightly varying across trials. This was indicated by the large main effects for communication ($\eta_p^2 = .14 - .20$, $p < .001$) and moderately-small main effects for trial ($\eta_p^2 = .03 - .05$, $p \leq .001 - .02$). 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 ($\eta_p^2 = .05$, $p < .01$). Further, a significant two-way interaction effect between communication and trial ($\eta_p^2 = .02$, $p < .05$) indicated that other-efficacy increased from pre- to post-communication, but the change in other-efficacy slightly varied across trials. Given the evidence for efficacy to increase from communication, self-, other-, and collective efficacy measures obtained closest to a subsequent performance (i.e., post-communication) were used within the subsequent analyses.

Path models

Six time-lagged APIM path models were employed to examine the reciprocal efficacy-performance effects with three of the path models (M1-M3) pertaining to the self-performance measures and the other three path models (M4-M6) pertaining to collective performance measures. Finally, three path models (M7-M9) were included using the objective dyad performance measure.

Path models with the self-performance measure. M1 analyses were conducted to explore the reciprocal effects between both partners' self-efficacy and self-performance ratings and the observed fit was, $\chi^2(24) = 43.647$, $p = .008$; CFI = .98; TLI = .93; SRMR = .04. The observed pathways are reported in the left panel of Table 3.[12] As expected, self-efficacy and past self-performance tended to predict one's own subsequent self-efficacy and self-performance. In regards to the hypothesized pathways, the partner's self-efficacy predicted self-performance for both roles ($\beta_{base} = .43$, $p < .001$; trial 2 to 3; $\beta_{fly} = .25$, $p < .05$; trial 3 to 4), and in turn, the partner's self-performance predicted self-efficacy for

[12] Error covariances between pairs of variables across partners were $r = -.008 - .102$, $p = .001 - .997$ for the efficacy variables (M1–M9) and $r = .20 - .48$, $p < .001$ for the performance variables (M1-M6). The correlation between the flyer and base efficacy 3 was $r = .38 - .59$, $p \leq .001 - .002$.

both roles (β_{base} = .26, p < .01; trial 4 to 5; β_{fly} = .15, p < .05; trial 3 to 4).

M2 analyses were conducted to explore the reciprocal effects between both partners' other-efficacy and self-performance ratings and the observed fit was, $\chi^2(24) = 47.498$, p = .003; CFI = .97; TLI = .91; SRMR = .03. The observed pathways are reported in the middle panel of Table 3. Similar to M1, other-efficacy tended to predict one's own subsequent other-efficacy. In regards to the hypothesized pathways, other-efficacy predicted one's own self-performance for both roles (β_{base} = .26, p < .01; trial 4 to 5; β_{fly} = .27, p < .05; trial 2 to 3; β_{fly} = .28, p < .05; trial 3 to 4), and in turn, for the flyers, self-performance predicted other-efficacy beliefs (β = .30, p < .001; trial 3 to 4; β = .15, p < .05; trial 4 to 5). In regards to the partner effects, other-efficacy predicted the partners' self-performances for both roles (β_{base} = .42, p < .001; trial 2 to 3; β_{fly} = .17, p < .01; trial 3 to 4), and in turn, base performance predicted flyer other-efficacy (β = .20, p < .01; trial 3 to 4; β = .23, p < .001; trial 4 to 5).

M3 analyses were conducted to explore the reciprocal effects between both partners' collective efficacy and self-performance ratings and the observed fit was, $\chi^2(24) = 58.181$, p < .001; CFI = .95; TLI = .87; SRMR = .04. The observed pathways are reported in the right panel of Table 3. Collective efficacy only predicted one's own subsequent collective efficacy for one of the two trials (β_{base} = .47, p < .001; β_{fly} = .54, p < .001; trial 4 to 5). In regards to the hypothesized pathways, collective efficacy predicted collective performance for the bases (β = .31, p < .05; trial 3 to 4) and trended toward significance for the flyers (β = .26, p = .053; trial 3 to 4), and in turn, collective performance predicted collective efficacy for only the bases (β = .15, p < .01; trial 3 to 4; β = .38, p < .001; trial 4 to 5). In regards to the partner effects, the partner's collective efficacy emerged as a unique predictor of self-performance for both roles (β_{base} = .33, p < .01; trial 2 to 3; β_{fly} = .25, p < .05; trial 3 to 4), and in turn self-performance predicted collective efficacy for both roles (β_{base} = .29, p < .001; trial 3 to 4; β_{fly} = .46, p < .01; trial 3 to 4; β_{fly} = .21, p < .001; trial 4 to 5).

Path models with the collective performance measure. M4 analyses were conducted to explore the reciprocal effects between both partners' self-efficacy with collective performance ratings and the observed fit was, $\chi^2(24)$ = 44.757, p = .006; CFI = .97; TLI = .93; SRMR = .04. The observed pathways are

Table 3. The three self-performance APIM path models' effects (β) and explained variances (R^2) with self-efficacy, other-efficacy, and collective efficacy.

		Self-Efficacy			Other-Efficacy			Collective Efficacy		
		Effects (β)			Effects (β)			Effects (β)		
Outcome	Predictor	Actor	Partner	R^2	Actor	Partner	R^2	Actor	Partner	R^2
Base Self-performance 3				*.32****			*.28****			*.28****
	Efficacy 3	.22*	.43***		.10	.42***		.25†	.33**	
Flyer Self-performance 3				*.26***			*.15**			*.14*
	Efficacy 3	.52***	.00		.27*	.17		.31*	.08	
Base Efficacy 4				*.83****			*.82****			*.82****
	Efficacy 3	.69***	-.03		.86***	-.05		-.04	.70***	
	Self-performance 3	.34***	.12†		.06	.17**		.15**	.29***	
Flyer Efficacy 4				*.86****			*.87****			*.90****
	Efficacy 3	.73***	-.14**		.63***	.06		.09	.31*	
	Self-performance 3	.25***	.15*		.30***	.20**		-.21	.46**	
Base Self-performance 4				*.38****			*.29****			*.32****
	Efficacy 4	.51***	-.08		.03	.27		.31*	.09	
	Self-performance 3	.31*	-.10		.45**	-.21		.46**	-.21	
Flyer Self-performance 4				*.33****			*.27***			*.29****
	Efficacy 4	.42***	.25*		.28*	.16		.26†	.25*	
	Self-performance 3	.00	-.08		.07	.04		.05	.02	
Base Efficacy 5				*.81****			*.59****			*.65****
	Efficacy 4	.77***	-.05		.75***	-.10		.47***	.07	
	Self-performance 4	.14	.26**		.17†	.13		.38***	.10	
Flyer Efficacy 5				*.78****			*.83****			*.76****
	Efficacy 4	.55***	.03		.70***	-.13*		.54***	.11	
	Self-performance 4	.33***	.05		.15*	.23***		.14	.21***	
Base Self-performance 5				*.54****			*.57****			*.56****
	Efficacy 5	.16	-.15		.26**	-.10		.30*	-.18	
	Self-performance 4	.71***	-.09		.79***	-.20		.70***	-.15	
Flyer Self-performance 5				*.49****			*.42****			*.42****
	Efficacy 5	.45***	-.15		.13	.09		.16	.00	
	Self-performance 4	.32*	.13		.51***	-.01		.52***	.00	

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

reported in the left panel of Table 4. In regards to the hypothesized pathways, self-efficacy tended to demonstrate very similar relationships with the collective performance measure, with one difference worth noting. Flyer self-efficacy was not a significant predictor of her subsequent collective performance (β = .13, n.s., trial 3 to 4; β = .15, n.s., trial 4 to 5).

M5 analyses were conducted to explore the reciprocal effects between both partners' other-efficacy with collective performance ratings and the observed fit was, $\chi^2(24) = 53.452$, $p < .001$; CFI = .96; TLI = .90; SRMR = .03. The observed pathways are reported in the middle panel of Table 4. In comparison to M2, the actor effects in this model tended to increase in predictive strength for the efficacy to performance direction (e.g., $\beta_{base} = .37$, $p < .01$; trial 2 to 3; $\beta_{fly} = .51$, $p < .001$; trial 3 to 4) and the performance to efficacy direction (e.g., $\beta_{base} = .36$, $\beta_{fly} = .26$, $p < .001$; trial 4 to 5).

M6 analyses were conducted to explore the reciprocal effects between both partners' collective efficacy with collective performance ratings and the observed fit was, $\chi^2(24) = 55.174$, $p < .001$; CFI = .96; TLI = .90; SRMR = .04. The observed pathways are reported in the right panel of Table 4. In comparison to M3, the actor effects in this model tended to increase in predictive strength for the efficacy to performance direction (e.g., $\beta_{base} = .42$, $p < .001$, trial 2 to 3; $\beta_{fly} = .37$, $p < .01$; trial 3 to 4) and the performance to efficacy direction (e.g., $\beta_{base} = .60$, $p < .001$, $\beta_{fly} = .29$, $p < .001$; trial 3 to 4).

Path models with the objective dyad performance measure. Model M7 analyses were conducted to explore the reciprocal effects between both partners' self-efficacy with objective dyad performance ratings and the observed fit was, $\chi^2(13) = 30.361$, $p = .004$; CFI = .97; TLI = .91; SRMR = .05. The observed pathways are reported in the left panel of Table 5. As expected, past objective performance predicted subsequent performance. Interestingly, base self-efficacy predicted both partners' subsequent self-efficacy (βs = .68 - .64, $p < .001$), while flyer self-efficacy was not a significant predictor of subsequent efficacy beliefs. In regards to the hypothesized pathways, self-efficacy emerged as a predictor of objective performance for both roles ($\beta_{base} = .29$, $p < .05$; trial 3 to 4; $\beta_{fly} = .42$, $p < .001$; trial 2 to 3), and in turn, objective performance predicted self-efficacy for both roles ($\beta_{base} = .25$, $\beta_{fly} = .26$, $p < .001$; trial 4 to 5).

Table 4. The three collective-performance APIM path models' effects (β) and explained variances (R^2) with self-efficacy, other-efficacy, and collective efficacy.

		Self-Efficacy			Other-Efficacy			Collective Efficacy		
		Effects (β)			Effects (β)			Effects (β)		
Outcome	Predictor	Actor	Partner	R^2	Actor	Partner	R^2	Actor	Partner	R^2
Base Collective Performance 3				*.32****			*.25***			*.29****
	Efficacy 3	.22*	.45***		.37**	.24*		.42***	.20	
Flyer Collective Performance 3				*.25***			*.22***			*.19**
	Efficacy 3	.46***	.07		.34***	.15		.39***	.01	
Base Efficacy 4				*.81****			*.83****			*.83****
	Efficacy 3	.69***	.00		.81***	-.05		.81***	-.09	
	Collective performance 3	.27***	.12		.20***	.08		.18**	.18**	
Flyer Efficacy 4				*.86****			*.88****			*.89****
	Efficacy 3	.74***	-.16***		.63***	.03		.69***	-.04	
	Collective performance 3	.23***	.17**		.41***	.10		.32***	.12*	
Base Collective Performance 4				*.33****			*.32****			*.30****
	Efficacy 4	.36**	-.06		-.05	.37**		.17	.25	
	Collective performance 3	.36*	-.09		.47***	-.29†		.37*	-.21	
Flyer Collective Performance 4				*.24***			*.31****			*.32****
	Efficacy 4	.13	.33*		.51***	.00		.37**	.31*	
	Collective -performance 3	.24	-.12		.01	-.02		.11	-.19	
Base Efficacy 5				*.81****			*.64****			*.72****
	Efficacy 4	.78***	.00		.73***	-.09		.46***	.06	
	Collective performance 4	.17*	.18*		.36***	-.05		.60***	-.09	
Flyer Efficacy 5				*.78****			*.86****			*.79****
	Efficacy 4	.62***	.00		.65***	-.12		.48***	.11	
	Collective performance 4	.28***	.08		.26***	.20***		.29***	.15*	
Base Collective Performance 5				*.64****			*.62****			*.64****
	Efficacy 5	.23*	.05		.17	.03		.28*	.00	
	Collective performance 4	.77***	-.23*		.80***	-.16		.68***	-.16	
Flyer Collective Performance 5				*.46****			*.45****			*.46****
	Efficacy 5	.15	.10		.21	-.06		.26	-.09	
	Collective performance 4	.39**	.12		.37**	.16		.36**	.19	

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

Table 5. The three objective dyad performance path models' effects (β) and explained variances (R^2) with self-efficacy, other-efficacy, and collective efficacy.

		Self-Efficacy				Other-Efficacy				Collective Efficacy			
		Effects (β)				Effects (β)				Effects (β)			
Outcome	Predictor	Dyad	Base	Flyer	R^2	Dyad	Base	Flyer	R^2	Dyad	Base	Flyer	R^2
Objective Dyad Performance 3					*.17**				*.16**				*.14*
	Efficacy 3		.00	.42***			.25†	.22*			.04	.33**	
Base Efficacy 4					*.75****				*.82****				*.81****
	Efficacy 3		.76***	.10			.84***	-.02			.87***	-.05	
	Objective dyad performance 3	.18**				.20***				.26***			
Flyer Efficacy 4					*.82****				*.83****				*.86****
	Efficacy 3		-.11†	.82***			.04	.72***			.01	.73***	
	Objective dyad performance 3	.24***				.35***				.33***			
Objective Dyad Performance 4					*.16**				*.14*				*.15**
	Efficacy 4		.29*	-.14			-.02	.26*			.21	.15	
	Objective dyad performance 3	.28*				.14				.12			
Base Efficacy 5					*.79****				*.58****				*.59****
	Efficacy 4		.84***	.05			.77***	-.04			.56***	.11	
	Objective dyad performance 4	.25***				.21**				.34***			
Flyer Efficacy 5					*.76****				*.80****				*.74****
	Efficacy 4		.05	.68***			-.11	.77***			.16*	.57***	
	Objective dyad performance 4	.26***				.26***				.27***			
Objective Dyad Performance 5					*.36****				*.35****				*.36****
	Efficacy 5		.08	.20			.20	.09			.15	.15	
	Objective dyad performance 4	.44***				.44***				.39***			

Note. **p* < .05. ***p* < .01. ****p* < .001. † .050 ≤ *p* ≤ .064.

M8 analyses were conducted to explore the reciprocal effects between both partners' other-efficacy with objective dyad performance ratings and the observed fit was, $\chi^2(24) = 35.251$, $p < .001$; CFI = .96; TLI = .88; SRMR = .04. The observed pathways are reported in the middle panel of Table 5. Objective performance predicted subsequent performance in all but one trial. Interestingly, base other-efficacy predicted both partners' subsequent other-efficacy ($\beta s = .72$ - .84, $p < .001$), while flyer other-efficacy did not predict subsequent other-efficacy. In regards to the hypothesized pathways, flyer other-efficacy predicted objective performance (e.g., $\beta = .22$, $p < .05$, trial 2 to 3; $\beta = .26$, $p < .05$; trial 3 to 4), and base other-efficacy trended toward significance ($\beta = .25$, $p = .055$; trial 2 to 3). In turn objective performance predicted other-efficacy for both roles ($\beta_{base} = .21$, $p < .01$, $\beta_{fly} = .26$, $p < .001$; trial 2 to 3).

M9 analyses were conducted to explore the reciprocal effects between both partners' collective efficacy with objective dyad performance ratings and the observed fit was, $\chi^2(24) = 32.467$, $p = .002$; CFI = .96; TLI = .90; SRMR = .04. The observed pathways are reported in the right panel of Table 5. Objective performance predicted subsequent performance in all but one trial. Interestingly, base collective efficacy predicted both partners' subsequent collective efficacy ($\beta s = .16$ - .87, $p < .001$ - .05), while flyer collective efficacy only predicted her own subsequent collective efficacy (βs = .57 - .73, $p < .001$). In regards to the hypothesized pathways, only flyer collective efficacy was a significant predictor of objective performance ($\beta = .33$, $p < .01$; trial 2 to 3). In turn, objective performance predicted other-efficacy for both roles ($\beta_{base} = .34$, $\beta_{fly} = .27$, $p < .001$; trial 4 to 5).

Upon inspection of the path models, it is evident that the explained variance in performance is of a similar magnitude across the self-, other-, and collective constructs. It is not clear, however, if the explained variance is unique to each construct or the shared variance; although differences were evident in the magnitude of the pathway coefficients in some places. In trial 3 to 4, for example, the pathway from base efficacy 4 to base self-performance 4 was .51, .03, and .31 for, respectively, self-, other-, and collective efficacy.

Single-panel APIMs

To test if any of the effects were more than just the shared variance with self-efficacy, single-panel APIM models were conducted for both predictive directions using raw and residual score models to simultaneously estimate self-, other-, and collective pathways. In line with Feltz et al.'s (2008) arguments for residual predictor variables, only the residual scores are discussed subsequently in the text, although the raw values are reported in the tables alongside the residual scores for comparison.

Efficacy to self-performance. Across all trials, a significant proportion of variance in self-performance for bases (R^2 = .40 - .51) and flyers (R^2 = .32 - .51) was accounted for by both partners' past self-performances and self-, other-, and collective efficacy beliefs. The raw and residual pathway coefficients are reported in Table 6. Residual past self-performance was a significant predictor of performance in all three trials for the bases (*βs* = .33 - .68, p < .001 - .01) and all but one trial for the flyers (*βs* = .28 - .43, p < .001 - .01), while residual self-efficacy was a significant predictor of performance in all three trials for the flyers (*βs* = .39 - .57, p < .001 - .01) and all but one trial for the bases (*βs* = .47 - .51, p < .01 - .05). In regards to the hypothesized pathways, other- and collective efficacy were not unique predictors of one's own subsequent self-performance for either role. However, in trial 2 to 3, base self-performance was uniquely predicted by the flyer's residual self-efficacy (β = .37, p < .01) and other-efficacy (β = .59, p < .05), with flyer collective efficacy trending towards significance (β = -.52, p = .056).

Efficacy to collective performance. Across all trials, a significant proportion of variance in collective performance for bases (R^2 = .38 - .62) and flyers (R^2 = .32 - .47) was accounted for by both partners' past collective performances and self-, other-, and collective efficacy beliefs. The raw and residual pathway coefficients are reported in Table 7. Past performance consistently predicted performance for the bases across all trials (*βs* = .37 - .71, p < .001 - .01), but, for the flyers, was only significant in the final trial (β = .35, p < .001). In regards to the hypothesized pathways, a different pattern of prediction from the efficacies resulted across the three trials. In trial 2 to 3, flyer self-efficacy (β = .45, p < .01) and other-efficacy (β = .54, p < .05) were unique predictors of her collective performance with flyer self-efficacy also being a unique predictor of base collective performance (β = .42, p < .001). In trial 3 to 4, only partner effects for flyer performance emerged. Base other-efficacy (β = -.40,

Table 6. The self-performance single-panel APIM path models' effects (β) and explained variances (R^2) with self-efficacy, other-efficacy, and collective efficacy within the same model.

		Effects (β)				R^2	
		Actor		Partner			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual
Base Performance 3						*.57****	*.48****
	Performance 2	.58***	.45***	-.17	.11		
	Self-efficacy 3	-.15	.01	.43**	.37**		
	Other-efficacy 3	-.04	-.09	.50*	.59*		
	Collective efficacy 3	.10	.17	-.54*	-.52†		
Flyer Performance 3						*.34****	*.32****
	Performance 2	.35	.43***	.09	.02		
	Self-efficacy 3	.36	.46**	.06	.09		
	Other-efficacy 3	.32	.37	.22	.21		
	Collective efficacy 3	-.48	-.48	-.25	-.21		
Base Performance 4						*.39****	*.40****
	Performance 3	.28	.33**	-.12	-.06		
	Self-efficacy 4	.43	.47*	-.18	-.15		
	Other-efficacy 4	-.05	-.07	.21	.26		
	Collective efficacy 4	.04	.05	.01	.03		
Flyer Performance 4						*.35****	*.36****
	Performance 3	-.04	.07	-.03	.01		
	Self-efficacy 4	.41*	.39*	-.03	-.04		
	Other-efficacy 4	.19	.21	-.18	-.17		
	Collective efficacy 4	-.13	-.13	.37	.37		
Base Performance 5						*.58****	*.53****
	Performance 4	.71***	.68***	-.15	-.12		
	Self-efficacy 5	.20	.51**	-.15	-.24		
	Other-efficacy 5	.30	.27	-.08	.12		
	Collective efficacy 5	-.05	-.02	-.04	-.09		
Flyer Performance 5						*.50****	*.51****
	Performance 4	.28*	.28**	.17	.20*		
	Self-efficacy 5	.54***	.57***	-.07	.10		
	Other-efficacy 5	.09	.13	.15	.19		
	Collective efficacy 5	-.21	-.21	-.15	-.22		

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

Table 7. The collective performance single-panel APIM path models' effects (β) and explained variances (R^2) with self-efficacy, other-efficacy, and collective efficacy within the same model.

		Effects (β)				R^2	
		Actor		Partner			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual
Base Performance 3						*.54****	*.50****
	Performance 2	.67***	.64***	-.44**	-.23†		
	Self-efficacy 3	.03	.10	.47***	.42***		
	Other-efficacy 3	.10	.07	.19	.11		
	Collective efficacy 3	.09	.14	-.22	-.15		
Flyer Performance 3						*.32****	*.32****
	Performance 2	.03	.19	.06	.02		
	Self-efficacy 3	.48**	.45**	.20	.20		
	Other-efficacy 3	.53*	.54*	.31	.26		
	Collective efficacy 3	-.51	-.46	-.44	-.38		
Base Performance 4						*.37****	*.38****
	Performance 3	.42**	.37**	-.21	-.11		
	Self-efficacy 4	.28	.33	-.28	-.21		
	Other-efficacy 4	.02	.06	.24	.20		
	Collective efficacy 4	-.07	.00	.17	.18		
Flyer Performance 4						*.38****	*.38****
	Performance 3	.03	.20	-.08	-.04		
	Self-efficacy 4	-.09	-.10	-.26	-.27		
	Other-efficacy 4	.47	.54	-.43*	-.40*		
	Collective efficacy 4	.10	.06	.70**	.67**		
Base Performance 5						*.66****	*.62****
	Performance 4	.72***	.71***	-.15	-.15		
	Self-efficacy 5	.26*	.49***	.04	-.01		
	Other-efficacy 5	.11	.17	-.33	-.16		
	Collective efficacy 5	.03	.03	.20	.13		
Flyer Performance 5						*.47****	*.47****
	Performance 4	.34*	.35***	.20	.16		
	Self-efficacy 5	.14	.09	.12	.19		
	Other-efficacy 5	-.04	.11	-.05	-.03		
	Collective efficacy 5	.14	.22	-.13	-.09		

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

$p < .05$) and collective efficacy ($\beta = .67$, $p < .01$) were unique predictors of her collective performance. In trial 4 to 5, only base self-efficacy ($\beta = .49$, $p < .001$) was a unique predictor of base collective performance.

Efficacy to objective dyad performance. Across all trials, a significant proportion of variance in objective performance was accounted for by past objective dyad performance and both partners' self-, other-, and collective efficacy beliefs ($R^2 = .20 - .38$). The raw and residual pathway coefficients are reported in Table 8. As expected, residual past objective dyad performance was a significant predictor of subsequent objective dyad performance in all three trials ($\beta s = .27 - .61$, $p < .001 - .05$). In regards to the hypothesized pathways, a different pattern of prediction from the efficacies resulted across the three trials. In trial 2 to 3, base residual other-efficacy ($\beta = .43$, $p < .01$) was the only unique predictor of objective dyad performance. In the remaining trials, none of the residual efficacy predictors were significant. In trial 4 to 5, however, flyer collective efficacy was trending towards significance ($\beta = .57$, $p = .056$).

Performance to self-efficacy. Across all trials, a significant proportion of variance in self-efficacy for bases ($R^2 = .66 - .77$) and flyers ($R^2 = .58 - .75$) was accounted for by both partners' past self-efficacies and self-, other-, and collective performances. The raw and residual pathway coefficients are reported in Table 9. Residual past self-efficacy was a significant predictor of self-efficacy in all three trials for both partners ($\beta s = .40 - .77$, $p < .001$). As expected, residual past self-performance was a significant predictor of self-efficacy in all three trials for the flyers ($\beta s = .29 - .67$, $p < .001 - .05$) and two of the trials for the bases ($\beta s = .46 - .78$, $p < .001$). In regards to the hypothesized pathways, a different pattern of prediction from the performances resulted across the three trials. In trial 2 to 3, base self-efficacy was predicted by base residual other-performance ($\beta = .39$, $p < .001$), base residual collective performance ($\beta = -.76$, $p < .001$), and flyer residual other-performance ($\beta = .66$, $p < .01$). Flyer self-efficacy was predicted by only partner effects; base residual self-performance ($\beta = .27$, $p < .05$), base residual other-performance ($\beta = .21$, $p < .05$), and base residual collective performance ($\beta = -.41$, $p < .01$). In trial 3 to 4, base self-efficacy was predicted by base residual other-performance ($\beta = -.27$, $p < .01$), base residual collective performance ($\beta = .34$, $p < .05$), and flyer residual other-performance ($\beta = .40$, $p < .05$). In trial 4 to 5, base self-efficacy was predicted by base residual other-performance ($\beta = -.29$,

Table 8. The objective dyad performance single-panel path models' effects (β) and explained variances (R2) with self-efficacy, other-efficacy, and collective efficacy within the same model.

		Effects (β)						R^2	
		Dyad		Base		Flyer			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual	Raw	Residual
Objective Dyad Performance 3									
	Objective Dyad Performance 2	.48***	.49***						
	Self-efficacy 3			.14	.19	.38*	.26		
	Other-efficacy 3			.43*	.43**	.20	.19		
	Collective efficacy 3			-.49	-.42	-.41	-.22	.35***	.31***
Objective Dyad Performance 4									
	Objective Dyad Performance 3	.17	.27*						
	Self-efficacy 4			-.10	-.12	-.36†	-.25		
	Other-efficacy 4			-.27	-.17	.19	.19		
	Collective efficacy 4			.46	.39	.27	.26	.23**	.20*
Objective Dyad Performance 5									
	Objective Dyad Performance 4	.43***	.61***						
	Self-efficacy 5			.13	.16	.13	-.04		
	Other-efficacy 5			.17	.15	-.45	-.31		
	Collective efficacy 5			-.09	-.05	.49	.57†	.39***	.38***

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

Table 9. The self-efficacy single-panel APIM path models' effects (β) and explained variances (R^2) with self-performance other-performance and collective performance within the same model.

		Effects (β)				R^2	
		Actor		Partner			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual
Base Self-Efficacy 3						*.75****	*.66****
	Efficacy 2	.70***	.65***	-.14	-.11		
	Self-performance 2	.56***	.78***	-.10	-.09		
	Other-performance 2	.39***	.39***	.33*	.66**		
	Collective performance 2	-.67***	-.76***	-.10	-.38		
Flyer Self-Efficacy 3						*.84****	*.78****
	Efficacy 2	.44***	.54***	-.05	.04		
	Self-performance 2	.60***	.67***	.15	.27*		
	Other-performance 2	.26*	.26	.13	.21*		
	Collective performance 2	-.22	-.25	-.29*	-.41**		
Base Self-Efficacy 4						*.85****	*.66****
	Efficacy 3	.64***	.55***	.01	.01		
	Self-performance 3	.31***	.46***	.06	-.08		
	Other-performance 3	-.22**	-.27**	.02	.40*		
	Collective performance 3	.20	.34*	.03	-.18		
Flyer Self-Efficacy 4						*.87****	*.75****
	Efficacy 3	.70***	.40***	-.10†	-.13		
	Self-performance 3	.20	.52*	.13	.26		
	Other-performance 3	-.18	.02	.12	.22		
	Collective performance 3	.23	-.10	-.06	-.09		
Base Self-Efficacy 5						*.82****	*.77****
	Efficacy 4	.77***	.64***	-.04	.10		
	Self-performance 4	-.02	.44	.24	.34*		
	Other-performance 4	-.09	-.29**	.29†	.04		
	Collective performance 4	.14	.17	-.20	-.04		
Flyer Self-Efficacy 5						*.79****	*.58****
	Efficacy 4	.57***	.51***	.03	.04		
	Self-performance 4	.15	.29*	-.11	.02		
	Other-performance 4	-.09	-.30	.01	.06		
	Collective performance 4	.26	.36	.17	.13		

Note. $*p < .05$. $**p < .01$. $***p < .001$. † $.050 \leq p \leq .064$.

p < .01) and flyer residual self-performance (*β* = .34, *p* < .05).

Performance to other-efficacy. Across all trials, a significant proportion of variance in other-efficacy for bases (R^2 = .67 - .70) and flyers (R^2 = .70 - .73) was accounted for by both partners' past other-efficacies and self-, other-, and collective performances. The raw and residual pathway coefficients are reported in Table 10. As expected, residual past other-performance was a significant predictor of other-efficacy in all three trials for the bases (*βs* = .53 - .63, *p* < .001) and two of the trials for the flyers (*βs* = .74 - .84, *p* < .001). In regards to the hypothesized pathways, a different pattern of prediction from the performances resulted across the three trials. In trial 2 to 3, base other-efficacy was predicted by base residual self-performance (*β* = .44, *p* < .01) and base residual collective performance (*β* = -.48, *p* < .05). Flyer other-efficacy was predicted by base residual other-performance (*β* = .28, *p* < .01) and base residual collective performance (*β* = -.56, *p* < .01). In trial 3 to 4, base other-efficacy was predicted by base residual self-performance (*β* = -.26, *p* < .05). Flyer other-efficacy was predicted by base residual self-performance (*β* = .30, *p* < .05). In trial 4 to 5, base other-efficacy was predicted by base residual self-performance (*β* = -.67, *p* < .01), base residual collective performance (*β* = .83, *p* < .01), and flyer residual other-performance (*β* = -.44, *p* < .05).

Performance to collective efficacy. Across all trials, a significant proportion of variance in collective efficacy for bases (R^2 = .64 - .71) and flyers (R^2 = .63 - .76) was accounted for by both partners' past collective efficacies and self-, other-, and collective performances. The raw and residual pathway coefficients are reported in Table 11. Residual past collective efficacy was a significant predictor of collective efficacy in all three trials for both roles (*βs* = .34 – .51, *p* < .001). For the bases, residual past collective performance was a significant predictor of collective efficacy in all three trials (*βs* = -.53 – 1.14, *p* < .001 - .01). For the flyers, residual past collective efficacy was not a significant predictor of her subsequent collective efficacy. In regards to the hypothesized pathways, a different pattern of prediction from the performances resulted across the three trials. In trial 2 to 3, base collective efficacy was predicted by base residual self-performance (*β* = .72, *p* < .001) and base residual other-performance (*β* = .48, *p* < .001). Flyer collective efficacy was predicted by flyer residual other-performance (*β* = .73, *p* < .001), base residual other-performance (*β* = .36, *p* <

Table 10. The other-efficacy single-panel APIM path models' effects (β) and explained variances (R^2) with self-performance other-performance and collective performance within the same model.

		Effects (β)				R^2	
		Actor		Partner			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual
Base Other-Efficacy 3						*.80****	*.68****
	Efficacy 2	.57***	.59***	.00	.01		
	Self-performance 2	.25*	.44**	-.09	-.03		
	Other-performance 2	.48***	.53***	.05	.02		
	Collective performance 2	-.30*	-.48*	-.02	-.01		
Flyer Other-Efficacy 3						*.80****	*.73****
	Efficacy 2	.44***	.51***	.00	.15*		
	Self-performance 2	.19†	.16	.08	.32		
	Other-performance 2	.48**	.84***	.23†	.28**		
	Collective performance 2	.02	-.15	-.29	-.56**		
Base Other-Efficacy 4						*.87****	*.70****
	Efficacy 3	.66***	.40***	-.02	.01		
	Self-performance 3	-.22**	-.26*	.00	-.16		
	Other-performance 3	.28***	.64***	.14	.43*		
	Collective performance 3	.21*	.21	-.07	-.20		
Flyer Other-Efficacy 4						*.89****	*.73****
	Efficacy 3	.56***	.44***	.09	.05		
	Self-performance 3	-.07	-.28	.22*	.30*		
	Other-performance 3	.10	.74***	-.05	.06		
	Collective performance 3	.37**	.09	-.02	.01		
Base Other-Efficacy 5						*.77****	*.67****
	Efficacy 4	.32***	.28***	.15†	-.02		
	Self-performance 4	-.66***	-.67**	.03	.07		
	Other-performance 4	.51***	.63***	-.34*	-.44*		
	Collective performance 4	.87***	.83**	.10	.22		
Flyer Other-Efficacy 5						*.88****	*.70****
	Efficacy 4	.61***	.59***	-.05	-.06		
	Self-performance 4	-.12	-.05	-.11	.27		
	Other-performance 4	.29*	.12	-.06	-.05		
	Collective performance 4	.11	.37	.29	.05		

Note. *$p < .05$. **$p < .01$. ***$p < .001$. † $.050 \leq p \leq .064$.

Table 11. The collective efficacy single-panel APIM path models' effects (β) and explained variances (R^2) with self-performance other-performance and collective performance within the same model.

		Effects (β)				R^2	
		Actor		Partner			
Outcome	Predictor	Raw	Residual	Raw	Residual	Raw	Residual
Base Collective Efficacy 3						.70***	.64***
	Efficacy 2	.35***	.47***	.07	.09		
	Self-performance 2	.52***	.72***	-.07	-.05		
	Other-performance 2	.46***	.48***	.00	.12		
	Collective performance 2	-.38*	-.53**	.03	-.09		
Flyer Collective Efficacy 3						*.82****	*.76****
	Efficacy 2	.47***	.51***	-.06	.05		
	Self-performance 2	.17	.16	.05	.30†		
	Other-performance 2	.49***	.73***	.26**	.36***		
	Collective performance 2	.03	-.07	-.29	-.56***		
Base Collective Efficacy 4						*.87****	*.71****
	Efficacy 3	.74***	.51***	-.05	-.03		
	Self-performance 3	-.40***	-.28*	-.14	-.31		
	Other-performance 3	-.06	.13	.33*	.73***		
	Collective performance 3	.56***	.70***	.02	-.27		
Flyer Collective Efficacy 4						*.91****	*.68****
	Efficacy 3	.68***	.45***	-.03	-.06		
	Self-performance 3	.21*	.12	.20**	.26		
	Other-performance 3	-.12	.53*	.10	.15		
	Collective performance 3	.24†	-.12	-.15	-.09		
Base Collective Efficacy 5						*.76****	*.68****
	Efficacy 4	.47***	.34***	.06	.13		
	Self-performance 4	-.55**	-.42	.02	.09		
	Other-performance 4	.07	.13	-.10	-.28		
	Collective performance 4	1.15***	1.14***	-.05	.09		
Flyer Collective Efficacy 5						*.81****	*.63****
	Efficacy 4	.47***	.43***	.13*	.13		
	Self-performance 4	-.14	-.04	-.05	.19		
	Other-performance 4	.22	.09	-.03	.04		
	Collective performance 4	.20	.36	.18	.05		

Note. **p* < .05. ***p* < .01. ****p* < .001. † .050 ≤ *p* ≤ .064.

.001), and base residual collective performance (β = -.56, p < .001), with the predictive effect of base residual self-performance trending towards significance (β = .30, p = .057). In trial 3 to 4, base collective efficacy was predicted by base residual self-performance (β = -.28, p < .05) and flyer residual other-performance (β = .73, p < .001). Flyer collective efficacy was predicted by flyer residual other-performance (β = .53, p < .05). In trial 4 to 5, none of the hypothesized pathways were significant.

Discussion

The purpose of this study was to examine the reciprocal relationships between actor and partner self-, other-, and collective efficacy and performance across multiple trials of a paired-cheerleading task. First, APIM path models were employed to replicate Feltz' (1982) path model and revealed the magnitudes of explained variance by self-, other-, and collective efficacy beliefs were similar. Single-panel APIMs in line with Feltz et al.'s (2008) RPPRSE model revealed unique actor and partner effects among the seemingly similar constructs. The findings were in general support of the hypotheses. First, other- and collective efficacy were unique predictors of subsequent performance, above and beyond previous performance and self-efficacy. Second, several significant partner effects emerged as predictors of subsequent performance, above and beyond the actor effects, with the partner effects being more salient for the flyers' outcomes. These hypotheses were also supported regarding effects in the performance to efficacy predictive direction. Overall, the findings inform the study of athlete performance relationships in regards to the measurement of actor and partner effects and the unique predictive effects of self-, other-, and collective perceptions.

The main rationale for this study was the need to evaluate partner influences within efficacy-performance relationships for athlete pairs (Jackson et al., 2015). As expected, the partner's efficacy beliefs explained unique variance in performance and efficacy, above and beyond that explained by actor effects. In line with Lent and Lopez' (2002) dependence hypothesis, the direction of dependence proposed in these dyads was supported by the magnitude, and number of significant partner effects for the high-dependence role (i.e., flyer) outcomes. 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. Partner effects were also significant in the performance to efficacy predictive direction supporting Jackson, Knapp, and Beauchamp's (2008) qualitative evidence for the partner's and dyad's previous performances being perceived by athletes as a source of information for self- and other-efficacy beliefs. Overall, it seems clear that partner effects are important to investigate in dyad studies of predictive relationships, even when only interested in actor effects within group contexts.

It was interesting that neither partner's self-efficacy belief was a significant predictor of dyad performance when all three types of efficacy were included in the model. This result is in line with Bandura's (1990) assertion that beliefs regarding factors beyond personal control are partially responsible for successful performance for team athletes. Base other-efficacy was the only significant predictor of objective dyad performance across the three trials, and this was in the expected direction. In the remaining trials, none of the residual efficacy predictors were significant, although flyer collective efficacy was trending towards significance in the expected direction. The increased magnitude of effects for path models involving collective performance compared to self-performance support arguments that agency in highly interdependent dyad performance is perceived to occur at an integrative and dyad level. The findings in this chapter emphasizes the importance of beliefs about specific others for the success of interdependent action; an important implication in the pursuit of a more integrated theory of efficacy beliefs in teams.

In line with previous findings about level of agency, the path models revealed other- and collective efficacy actor effects were stronger predictors of collective performance compared to self-performance (Gully et al., 2002). Examination of the unique actor effects revealed, for both partners, self-efficacy and previous self-performance were the only predictors of subsequent self-performance. This finding is in line with much of the self-efficacy literature (Moritz, Feltz, Fahrbach, & Mack, 2000). When examining the relationships to collective performance, however, collective efficacy did not emerge as a significant predictor which is contrary to most theorizing on collective efficacy (Bandura, 2006). Instead, the predictors of base collective performance did not change, but for flyers, other-efficacy, and not self-efficacy, emerged as a unique predictor of flyer collective performance. In regards to the unique actor effects in the performance to efficacy casual direction, for the flyers, each efficacy was typically only predicted by the performance source most congruent with the level of agency with flyers' self-efficacy only being predicted by her self-performance, and flyers' other- and collective efficacies only being predicted by her other-performance. In contrast, the bases' efficacy perceptions were informed by his self-, other-, and collective performance perceptions indicating multiple perspectives of the performance were unique sources of information used to form his efficacy beliefs. These role differences align to the findings in Chapters 3 and 4 of this thesis.

Several instances of a negative efficacy-performance relationship emerged in the current study. Negative effects of efficacy have been previously observed in repeated-measures designs like the one employed in the current study (e.g., Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001). Bandura and Locke (2003) argue that negative or nonsignificant relationships will emerge in these types of study designs because performance stabilizes and nothing causes one to reevaluate self-efficacy beliefs. In the current study, however, performance did not stabilize or increase linearly across all trials (i.e., performance trial 3, on average, earned the lowest performance scores by athletes and observers followed by increased scores for trials 4 and 5). According to theory, if a task is perceived as too challenging, then athletes will reduce effort towards task achievement (Bandura, 1977, 1997; Bandura & Locke, 2003). Vancouver and colleagues would posit, however, that diminished effort can also be explained by athletes' perceptions of personal performance approaching a desired level of performance achievement (i.e., feelings of complacency). Assertions of complacent efforts have plausibility in the current study in consideration of the task selection protocol rendering all tasks to be moderately challenging from a subjective perspective, and the dip in performance for trial 3 being followed by subsequent increases in performance. A stronger test of these assertions would certainly require further investigation, especially in an interdependent setting where multiple person's efforts are required for performance achievement.

This study extended previous studies of efficacy-performance relationships in teams with the use of dyadic methods. Although this study extends current literature, there are some limitations. First, the descriptive design of the study is associated with many factors not being controlled for. The level of task difficulty, found to have a significant effect in Chapter 4, could have influenced the inconsistency of findings across the trials. Performing a more novel task, as was performed in Feltz (1982) original path-analysis, might have provided more distinct information to draw upon. Bandura (1997) argues that persons will reflect on the pattern of performance information to make efficacy judgements. Perhaps participants were drawing on performance information that occurred before the study especially because most of these dyads had been already performing similar skills for an average of two months prior to the study. Nonetheless, this study provided initial evidence of partner effects in the efficacy-performance relationship, providing measurement and theoretical advantages over previous studies (Jackson et al., 2015).

To extend the current study, manipulations of performance conditions would indicate under what conditions efficacy effects emerge as unique predictors of performance. First, dyad experience may influence the extent perceptions about a partner are relied on upon (Jackson et al., 2008). Relatedly, if one dyad member has accumulated many years of personal experience and the partner is very inexperienced, then his/her efficacy beliefs may be the best predictor of team performance regardless of role (Gaudreau, Fecteau, et al., 2010). Finally, tasks differing in level of interdependence among members are unique from tasks more coactive in structure and these differences have implications for athletes' efficacy beliefs (Katz-Navon & Erez, 2005). Examining changes in the magnitude of actor and partner effects associated with changes in the levels of task interdependence would clarify the functions of task structure on athletes' psychological states.

A second area of future research includes more explicit testing of role differences. Future use of APIM modelling can be strengthened with the testing of a series of nested models whereby the actor and partner effects are constrained to be equal. This approach would provide a stronger test of hypotheses concerning role differences. In line with the APIM analyses of coach-athlete dyads, multilevel modelling revealed the effect of other-efficacy beliefs on personal commitment, was significantly greater in magnitude for athletes than for coaches (Jackson & Beauchamp, 2010). The APIM model would, therefore, be useful to test if efficacy-performance relationships differ significantly by role.

In conclusion, dyads include two persons who might not think and behave in the same way. Obtaining measurements from both partners has provided evidence of partner effects in efficacy-performance relationships in dyads. Further, perceptions about the partner and dyad are important predictors of one's own efficacy beliefs and performance. The findings in this chapter provide clarification to how partners influence the efficacy-performance relationship.

Chapter 6

Studies 4a and 4b: Examining Person-related Sources of Variance in Same-gender Dyads of Distinguishable Roles within Four-person Cheerleading Groups

The findings from the previous studies in this thesis (i.e., Chapters 4 and 5) have supported arguments for athletes' low- and high-dependence performance roles being associated with self- and other-orientations of attention, respectively. The interpretations of these findings, however, are currently tentative because the athletes' roles (i.e., base, flyer) and genders (i.e., male, female) are potentially confounded with one another. It was suggested in Chapter 4 that the findings using the Social Relations Model framework required replication with same-gender dyads of distinguishable roles. In line with the suggestion, the current chapter of the thesis includes two studies investigating athlete role within the performance of all-female cheerleading stunt-tasks.

All-female stunt-tasks are typically performed with three bases sharing responsibility for supporting the flyer's weight. Each base role is associated with unique responsibilities towards successful group performance that can be assessed separately or in combination with the other bases. The first purpose of this chapter, investigated in Study 4a, was to conduct a replication of Study 2 (Chapter 4) using same-gender distinguishable dyads. Participants performed their role in repeated performance trials with flyers switching across three different base-groups to investigate person-related sources of variance for low- (i.e., base) and high-dependence (i.e., flyer) roles. The second purpose, investigated in Study 4b, was to employ the Social Relations Model analysis with four-person groups of distinguishable roles. In this study, person-related sources of variance in team athletes' perceptions were examined across all possible dyadic combinations of the four members within a group. This second investigation compared variance partitioning profiles of dyads comprised of one low- and one high-dependence role (e.g., base-flyer) to dyads comprised of the same level of dependence (e.g., base-base).

Study 4a

Following Lenny's (1977) claim that females have less confidence in male-oriented and competitive situations, assertions about gender differences in athletes' efficacy beliefs have sometimes appeared in the literature (Martens, Burton, Vealey, Bump, & Smith, 1990; Woodman & Hardy, 2003). Lirgg's (1991) meta-analysis clarified that tasks perceived to be masculine-typed were more likely to be associated with males reporting higher levels of self-confidence than females, but the gender difference was not inherently implicated in competitive situations. As one might expect in feminine-typed sports (e.g., cheerleading), females tend to report higher levels of self-confidence than males (Clifton & Gill, 1994). Within a given sport, however, some subtasks can engender discrepancies between males and females while other subtasks do not. Clifton and Gill found that stunt-tasks (such as the ones performed by participants in this thesis) were perceived to be a more masculine-typed subtask relative to dance and motions, and in absolute terms a subtask that was equally appropriate for both genders. Interestingly, however, stunt tasks were not associated with gender differences in confidence perceptions in Clifton and Gill's study.

In recognition of Lirgg's (1991) findings, researchers have investigated the possibility of gender differences in the relational efficacies. Results of these studies, however, have indicated there is no significant difference across males and females for self-efficacy, other-efficacy, and RISE (defined below; Beauchamp & Whinton, 2005; Jackson, Beauchamp, & Knapp, 2007). Relatedly, Fransen et al., (2012) found no significant differences in males' and females' perceptions regarding collective efficacy sources. The results of these studies indicate gender is not associated with individual (i.e., between-persons) or dyad (i.e., between-dyads) differences.

In coach-athlete relationships, role has served to differentiate among individuals' self and relational efficacy beliefs. Jackson and Beauchamp (2010) found that role differences were observed in the variances of athletes' and coaches' self-efficacy, other-efficacy, and RISE beliefs. Within the same investigation, athletes rated higher levels of other-efficacy beliefs in their coaches, on average, compared to their coaches' other efficacy beliefs in their athletes. Role differences in efficacy beliefs for athlete dyads with distinguishable roles have yet to be investigated outside of this thesis. The effects of relational efficacies on personal outcomes, however, are argued to differ for a low- and high-dependence role (Lent & Lopez, 2002; Snyder & Stukas, 1999). Further, theorizing indicates that the formation and content of efficacy beliefs are argued to depend on one's role in an interdependent group (Bandura, 1997; Bray et al., 2002). Athletes performing tasks higher in interdependence report more similar self- and collective efficacy beliefs than when performing in coactive tasks (Katz-Navon & Erez, 2005). Although an investigation has not directly compared athletes’ roles within the same team, the emergence of overlapping constructs for high-interdependence tasks suggests those in high-dependence roles interpret abilities in the team differently than athletes performing in low-dependence roles.

Jackson, Bray, Beauchamp, and Howle (2015) indicated the Social Relations Model (SRM) would be useful in identifying variables (e.g., role) that predispose athletes’ perceptions of relational efficacies. Chapter 4 provided a response to Jackson et al.'s (2015) call for use of the SRM in sport psychology, but athlete’s relation-inferred self-efficacy (RISE) beliefs were not measured in that study. RISE is a metaperception within Lent and Lopez' (2002) original framework of relational efficacy beliefs regarding athletes’ estimates of the level of confidence their partner has in them. RISE perceptions directly, and indirectly through self-efficacy, predict effort, satisfaction, enjoyment, and personal performance (Jackson, Grove, & Beauchamp, 2010; Jackson, Myers, Taylor, & Beauchamp, 2012). Although RISE beliefs were originally theorized to be specific to a relationship partner, Jackson, Gucciardi, Lonsdale, Whipp, and Dimmock (2014) have provided initial validity evidence that athletes will also estimate the level of confidence an entire group has in oneself (i.e., teammate-focused RISE). Information about the self, other, and dyad are all unique sources of RISE beliefs, with partner-related sources being most commonly acknowledged by elite athletes (Jackson, Knapp, & Beauchamp, 2008, 2009). Finally, the effects of RISE are theorized to be more pronounced for athletes in a high-dependence role than for athletes in a low-dependence role (Jackson et al., 2015; Lent & Lopez, 2002).

The purpose of this study was to investigate the variance partitioning profiles of female bases and flyers performing stunt-tasks requiring distinguishable roles to address the potential gender/role confound limitation observed in Chapter 4. In line with previous findings that self-efficacy, other-efficacy, collective efficacy, and RISE beliefs do not differ by gender (Clifton & Gill, 1994; Fransen et al., 2012; Jackson et al., 2007), it was expected that the profile of variance partitioning for the female bases and flyers in the current study would be similar to the profile of variance partitioning previously observed in male bases and female flyers in Chapter 4. It was hypothesized that the actor variance component would be largest for the bases in self-efficacy, collective efficacy, and RISE, while the partner variance component would be largest for the flyers in other-efficacy and collective efficacy.

Method

Participants

Female (*n* = 196) cheerleaders aged 18-29 years (*M* = 19.8 years, *SD* = 1.66) from university teams within the United Kingdom participated in the study. Females in this study averaged 2.5 years (*SD* = 2.59) of general cheerleading experience, 2.2 years (*SD* = 2.49) of experience in four-person stunt-tasks, and 1.5 years (*SD* = 2.45) of experience with their respective university cheerleading team. Eight of the teams were from universities located in Scotland and three of the teams were from universities located in England.

Performance Tasks

Four-person stunt-tasks were performed in this study with the roles of a flyer, main base, side base, and back base. The *main base* is responsible for supporting the majority of the flyer's weight while lifted in the air. The *side base* is responsible for ensuring the platform of hands formed by her and the main base remains flat and sturdy. The *back base* is responsible for stabilizing the flyer's leg(s) by supporting her ankle(s). Tasks were performed at a standard pace requiring three to four full 8-counts for completion (i.e., approximately 9-12 seconds in duration). All tasks followed the same sequence including: (a) the flyer being lifted from her foot into the air by the bases, (b) the flyer's feet and ankles being supported by the base's hands in an overhead position, and (c) the bases releasing the flyer's feet to catch the flyer for her landing. Consistent with the American Association of Cheerleading Coaches and Administrators (2015) safety guidelines, respective team representatives automatically assigned spotters to athletes who were less experienced (*n* = 27 groups; 55%). These spotters were instructed to provide safety for the flyers with minimal task interference.

A wide variability in participants' experience and ability levels was evident from discussions with team representatives. As a consequence, tasks were selected relative to the highest competition level in which a team was qualified under the regulations outlined by the United Kingdom's Cheerleading Association (UKCA; 2017). Upon discussion with each team representative, moderately challenging performance tasks (in line with the procedures outlined in Chapter 5) were agreed upon so that each group (within a three-group rotation) performed the same tasks with the alternating flyers. As expected, on a scale ranging from 0 (*not experienced*) to 10 (*extensively experienced*), the average self-reported perceived experience with the performance tasks was 6.2 (SD = 2.40) for Task 1 and 5.6 (SD = 2.61) for Task 2.

Measures

Identical to Chapters 4 and 5, participants responded to single-items on: (a) self-, other-, collective, and relation-inferred self-efficacy beliefs and (b) self-, other-, and collective subjective performance evaluations relative to the six performances (i.e., one for each of the two task performances with each of three groups). Single-item measures of efficacy have been previously cited for use in studies outside this thesis (e.g., Bruton et al., 2016; LaForge-MacKenzie & Sullivan, 2014). The presentation order of items within each inventory was randomized within and between participants to manage potential order effects across response periods (questionnaire available in Appendix E).

Efficacy beliefs. Participants' self-efficacy, other-efficacy, collective efficacy, and RISE beliefs were assessed using eight target-specific, single-item measures. To assess self- and collective efficacy, participants responded to the questions, "To what extent are you confident in [YOUR/ your GROUP's collective] ability to perform the skill?" Participants responded to three other-efficacy items targeting each of the three group members. All flyers, for example, responded to each version of the question, "To what extent are you confident in your [MAIN BASE's/ SIDE BASE's/ BACK BASE's] ability to perform the skill?" Three items were also responded to for assessment of RISE beliefs about each of the group members. For example, all flyers responded to each version of the question, "To what extent is your [MAIN BASE/ SIDE BASE/ BACK BASE] confident in your 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 rated self-, other-, and collective performances in a similar format to the efficacy inventory. Participants were asked to rate the performance of each individual group member, including themselves, and the group's collective performance. For example, flyers responded to the questions, "To what extent was [YOUR/ your MAIN BASE's/ your SIDE BASE's/ your BACK BASE's/ your GROUP's collective] performance of the skill successful?" Each item was anchored at 0 (*not at all successful*), 5 (*moderately successful*), and 10 (*completely successful*).

Procedures

After obtaining approval from the Human Subjects Committee at the University of Stirling to conduct the study, 46 team representatives were contacted from respective team websites. Twenty-eight team representatives responded to the invitation, and 11 agreed to their athletes being involved in the study. A meeting was scheduled with each team to occur during a regularly scheduled practice for data acquisition.

At each scheduled meeting, participants first provided informed consent, and then completed personal information sheets on age and experience. The flyer from each four-person group was assigned a three-group rotation so that each flyer performed with three different base-groups, and each of those base-groups performed with each of the three flyers. The base-group members (i.e., main, side, and back bases) remained together throughout the performances so that only the flyer was an interchangeable person in the group. Each participant then received a questionnaire packet on efficacy beliefs completed immediately before each task performance and subjective performance completed immediately after each task performance. For the remainder of the study, participants were asked to refrain from any verbal and nonverbal communication related to the performance tasks. Participants performed two tasks with three different partners/groups (i.e., a total of six performances). For all performance tasks, the lead author counted off the sequence for all groups to perform simultaneously in front of a video camera. The video camera was used for motivational purposes. Objective performance data was not obtained as more than one camera angle would be required to view each bases' individual performance without obstruction.

Analyses

The hypotheses in this study concerned the variance partitioning associated with members of each subgroup (i.e., bases) being paired with members of the other subgroup (i.e., flyers) across repeated performance trials. The asymmetric half-block design, employed in this investigation, is appropriate when only interested in particular relationships (i.e., flyer-main base, flyer-side base, flyer-back base) within a larger group, because subgroups are divided by a meaningful variable (e.g., role, as occurred in this study; Kenny et al., 2006). Testing the hypotheses only required examination of base-flyer dyads; so, consequently, base-base dyad relationships were not considered in this analysis.

For each task performance, there were three members in the base subgroup and only one member in the flyer subgroup. Variance partitioning in the analyses occurred on scores for: (a) individual flyer-base dyads (i.e., flyer-main base, flyer-side base, and flyer-back base), and (b) a flyer-combined base dyad. To examine the flyer-combined based dyad, aggregation of the three bases' scores occurred for all efficacy and performance perceptions prior to the variance partitioning. Aggregation also occurred for the flyers' responses to other-efficacy, RISE, and other-performance. Responses relative to the individual flyer-base dyads were not aggregated or transformed in any way.

Data was analyzed using Kenny's (1990) BLOCKO program to allow for the required by-role analyses. The SRM is focused on partitioning observed variance into components with any variance not partitioned into the actor or partner components being automatically assigned to the relationship variance component (Kenny et al., 2001). The relationship variance component is, therefore, contaminated by error variance at the task-level. This is remedied when variance components are observed to be stable across two or more indicators of a single construct (Kenny et al., 2006; Kenny, 1994). In this study, tasks were used as indicators to generate a single construct to afford this end.

Actor, partner, relationship, and error variance component means were estimated at the three-group rotation level (i.e., $n = 16$) within BLOCKO. Separate variance partitioning was conducted for the individual flyer-base dyads and the flyer-combined base dyad. Absolute variance component values were used for hypothesis testing, but the more easily understood relative values were also calculated for informative purposes. A relative variance value is equal to a component's absolute variance value divided by the total absolute variance for that measured variable. Construct means computed within BLOCKO were then extracted for further hypothesis testing. One-sample Wilcoxon signed-rank tests were conducted within SPSS version 21 for inferential tests on each variance component because one-sample t-tests were inappropriate given the marked skewness of the distributions (i.e., normality was rejected based on Shapiro Wilk tests; Hollander, Wolfe, & Chicken, 2013). Tests on the variance components were one-tailed because a negative variance is theoretically impossible (Kenny, 1994). Rejection of the null hypothesis, therefore, indicated that an observed variance was significantly larger than zero.

Comparisons of the magnitude of variance components at the construct level were subsequently conducted using 2 x 4 mixed-model RM-ANOVAs to examine role (flyer, base) by variance component (actor, partner, relationship, error) interactions for efficacy and performance. The ANOVAs were conducted to examine differences within the flyer-main base, flyer-side base, flyer-back base, and flyer-combined base dyads. For significant role by variance component interactions, the simple main effects were examined. For any significant simple main effect, pairwise comparisons were conducted in accordance to the hypotheses with the referent category for self-, other-, collective, and RISE perceptions being, respectively, the actor, partner, relationship, and actor variance components. If the two-way interaction was nonsignificant, then significant main effects for component were examined. The partial eta-squared effect sizes were interpreted using Cohen's guidelines for small (.01), medium (.06), and large (.14) effects (Richardson, 2011).

Results

Descriptive statistics for efficacy beliefs and subjective performances are reported in Table 1. The estimated SRM variance component means are presented in Tables 2 and 3 for, respectively, the efficacy and performance variables. There were descriptively different profiles of variance partitioning patterns when comparing the bases and flyers, but the three bases' individual profiles were descriptively similar, albeit not identical, to one another. Role differences were also evident in the variance partitioning profiles of the flyer-combined base dyad. Inferentially, all variance components were significantly different than zero based on the Wilcoxon signed-rank tests, *Zs* = 2.02 - 3.52, *p*s $\leq$ .001 - .031, except for the components relating to the flyers' partner variance for RISE within the flyer-side base dyad, *Z* = 1.82, *p* = .063, and the flyer-combined base dyad, *Z* = 1.60, *p* = .125.

The results from the two-way mixed-model RM-ANOVAs conducted for the efficacy and performance variables are presented in Table 4 for the flyer-main base, flyer-side base, and flyer-back base dyads, and Table 5 for the flyer-combined base dyad. Mauchly's test indicated the assumption of sphericity was violated, $\chi^2(5)$ = 19.16 – 74.91, *p* $\leq$ .001 - .002, in all but three instances each regarding other-efficacy, $\chi^2(5)$ = 6.13 – 7.17, *p* = .209 - .296, so Greenhouse-

Table 1. Means and standard deviations for efficacy and subjective performance.

	Flyer		Bases	
	M	*SD*	*M*	*SD*
Self-Efficacy	6.16	2.49	7.04	1.58
Other-Efficacy	7.11	2.02	7.09	1.61
Collective Efficacy	6.27	2.28	6.66	1.59
RISE	6.30	2.13	6.58	1.49
Self-Performance	6.03	3.05	6.58	2.31
Other-Performance	7.00	2.59	6.64	2.48
Collective Performance	6.07	3.19	6.01	2.85

Note. The reported means are a product of the average of each role subgroup (n = 49 bases, 49 flyers) reporting three observations.

Table 2. Absolute and relative variance component means of self-, other-, collective efficacy, and RISE for the base and flyer roles.

		Bases' Variance Components				Flyers' Variance Components			
Variable	Base Role	Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Efficacy									
	Main Base	1.80 (.48)	.13 (.03)	.29 (.08)	1.52 (.41)	2.84 (.53)	.06 (.01)	.42 (.08)	2.02 (.38)
	Side Base	1.71 (.40)	.08 (.02)	.24 (.06)	2.27 (.53)				
	Back Base	2.83 (.59)	.05 (.01)	.24 (.05)	1.66 (.35)				
	Combined Bases	**.85 (.46)**	**.07 (.04)**	**.09 (.05)**	**.84 (.45)**				
Other-Efficacy									
	Main Base	.74 (.20)	.71 (.20)	.77 (.21)	1.41 (.39)	1.07 (.26)	.73 (.18)	.77 (.19)	1.58 (.38)
	Side Base	1.23(.24)	1.63 (.31)	.54 (.10)	1.83 (.35)	.94 (.25)	.26 (.07)	.80 (.21)	1.74 (.47)
	Back Base	.94 (.19)	.97 (.20)	1.09 (.22)	1.88 (.39)	1.09 (.27)	.58 (.14)	1.07 (.26)	1.37 (.33)
	Combined Bases	**.32 (.13)**	**1.12 (.44)**	**.33 (.13)**	**.79 (.31)**	**1.03 (.30)**	**.41 (.12)**	**.73 (.21)**	**1.26 (.37)**
Collective Efficacy									
	Main Base	1.02 (.33)	.40 (.13)	.41 (.13)	1.22 (.40)	1.84 (.41)	.24 (.05)	.85 (.19)	1.51 (.34)
	Side Base	1.95 (.46)	.29 (.07)	.33 (.08)	1.63 (.39)				
	Back Base	.98 (.25)	.31 (.08)	.76 (.19)	1.91 (.48)				
	Combined Bases	**.71 (.34)**	**.28 (.14)**	**.27 (.13)**	**.81 (.39)**				
RISE									
	Main Base	1.41 (.37)	.26 (.07)	.71 (.18)	1.46 (.38)	1.90 (.40)	.12 (.03)	.62 (.13)	2.09 (.44)
	Side Base	1.69 (.34)	.37 (.08)	.60 (.12)	2.24 (.46)	1.95 (.40)	.11 (.02)	.59 (.12)	2.17 (.45)
	Back Base	1.83 (.40)	.26 (.06)	.79 (.17)	1.75 (.38)	1.84 (.42)	.11 (.03)	.64 (.15)	1.79 (.41)
	Combined Bases	**.75 (.39)**	**.13 (.07)**	**.27 (.14)**	**.76 (.40)**	**1.84 (.43)**	**.08 (.02)**	**.52 (.12)**	**1.81 (.43)**

Note. The relative variances are reported in parentheses.

Table 3. Absolute and relative variance component means of self-, other, and collective performance for the base and flyer roles.

		Bases' Variance Components				Flyers' Variance Components			
Variable	Role	Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Performance									
	Main Base	1.15 (.14)	.67 (.08)	1.03 (.12)	5.63 (.66)	2.98 (.28)	.70 (.07)	.88 (.08)	6.17 (.58)
	Side Base	.67 (.08)	.86 (.11)	.53 (.07)	5.96 (.74)				
	Back Base	1.41 (.19)	.39 (.05)	.50 (.07)	5.06 (.69)				
	Combined Bases	**.48 (.09)**	**.56 (.11)**	**.40 (.08)**	**3.80 (.73)**				
Other-Performance									
	Main Base	.73 (.08)	1.09 (.13)	2.07 (.24)	4.74 (.55)	1.64 (.20)	.40 (.05)	1.00 (.12)	5.22 (.63)
	Side Base	.65 (.07)	1.69 (.19)	.82 (.09)	5.89 (.65)	1.33 (.17)	.38 (.05)	1.02 (.13)	5.02 (.65)
	Back Base	.60 (.07)	1.15 (.13)	1.17 (.13)	5.83 (.67)	1.94 (.22)	.71 (.08)	.80 (.09)	5.20 (.60)
	Combined Bases	**.27 (.04)**	**1.30 (.19)**	**1.05 (.15)**	**4.26 (.62)**	**1.60 (.21)**	**.48 (.06)**	**.84 (.11)**	**4.54 (.61)**
Collective Performance									
	Main Base	.56 (.05)	1.29 (.12)	1.19 (.11)	7.60 (.71)	2.84 (.25)	.59 (.05)	1.23 (.11)	6.85 (.60)
	Side Base	.86 (.08)	1.28 (.11)	.92 (.08)	8.21 (.73)				
	Back Base	.88 (.08)	.72 (.07)	1.54 (.14)	7.55 (.71)				
	Combined Bases	**.44 (.05)**	**1.08 (.12)**	**.99 (.11)**	**6.62 (.73)**				

Note. The relative variances are reported in parentheses.

Table 4. Results of the 2 (role) x 4 (components) repeated measures analysis of variances for efficacy and subjective performance variables for the individual flyer-base dyads.

		Efficacy					Performance				
Perception	Effect	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2
Flyer-Main Base											
Self	Role	1	30	4.01	.054	.12	1	30	2.21	.148	.07
	Component	1.61	48.34	18.66	<.001	.38	2.05	61.38	33.66	<.001	.53
	Role by Component	1.61	48.34	.952	.376	.03	2.05	62.38	1.15	.325	.04
Other	Role	1	30	.617	.438	.02	1	30	.08	.783	.00
	Component	2.69	80.80	3.42	.025	.10	2.16	64.83	28.78	<.001	.49
	Role by Component	2.69	80.80	.16	.910	.01	2.16	64.83	1.68	.193	.05
Collective	Role	1	30	4.22	.049	.12	1	30	.28	.599	.01
	Component	1.75	52.52	7.86	.002	.21	2.12	63.73	40.60	<.001	.58
	Role by Component	1.75	52.52	1.08	.340	.04	2.12	63.73	2.29	.106	.07
RISE	Role	1	30	1.49	.232	.05					
	Component	1.67	50.19	8.11	.002	.21					
	Role by Component	1.67	50.19	.53	.562	.02					
Flyer-Side Base											
Self	Role	1	30	1.24	.274	.04	1	30	3.22	.083	.10
	Component	1.76	52.79	18.78	<.001	.39	1.95	58.41	40.13	<.001	.57
	Role by Component	1.76	52.79	1.24	.293	.04	1.95	58.41	1.91	.158	.06
Other	Role	1	30	4.33	.046	.13	1	30	.65	.426	.02
	Component	2.59	77.74	5.48	.003	.15	1.99	59.77	30.14	<.001	.50
	Role by Component	2.59	77.74	3.04	.041	.09	1.99	59.77	1.27	.288	.04
Collective	Role	1	30	.07	.793	.00	1	30	.01	.912	.00
	Component	1.58	47.49	9.96	.001	.25	1.87	56.20	37.32	<.001	.55
	Role by Component	1.58	47.49	.40	.626	.01	1.87	56.20	1.98	.15	.06
RISE	Role	1	30	.01	.919	.00					
	Component	2.10	63.08	12.41	<.001	.29					
	Role by Component	2.10	63.08	.16	.864	.01					
Flyer-Back Base											
Self	Role	1	30	.28	.603	.01	1	30	4.95	.034	.14
	Component	1.46	43.72	17.93	<.001	.37	1.70	51.00	29.36	<.001	.50
	Role by Component	1.46	43.72	.07	.877	.00	1.70	51.00	.47	.594	.02
Other	Role	1	30	.85	.364	.03	1	30	.00	.953	.00
	Component	2.22	66.65	2.98	.053	.09	1.80	54.10	29.59	<.001	.50
	Role by Component	2.22	66.65	.55	.599	.02	1.80	54.10	1.24	.294	.04
Collective	Role	1	30	.41	.528	.01	1	30	.22	.644	.01
	Component	2.06	61.74	8.86	<.001	.23	1.87	56.21	39.70	<.001	.57
	Role by Component	2.06	61.74	1.56	.221	.05	1.87	56.21	1.58	.216	.05
RISE	Role	1	30	.07	.792	.00					
	Component	1.88	56.50	14.39	<.001	.32					
	Role by Component	1.88	56.50	.06	.939	.00					

Note. The degrees of freedom (df1, df2) are reported for the Greenhouse-Geisser adjustment.

Table 5. Results of the 2 (role) x 4 (components) repeated measures analysis of variances for efficacy and subjective performance variables for the flyer-combined base dyad.

		Efficacy					Performance				
Perception Target	Effect	df1	df2	*F*	*p*	η_p^2	df1	df2	*F*	*p*	η_p^2
Self											
	Role	1	30	27.59	<.001	.48	1	30	17.57	<.001	.13
	Component	1.68	50.39	17.53	<.001	.37	1.93	58.00	31.50	<.001	.58
	Role by Component	1.68	50.39	4.63	.019	.13	1.93	58.00	2.82	.070	.04
Other											
	Role	1	30	3.32	.079	.10	1	30	.18	.674	.01
	Component	2.55	76.58	2.00	.131	.06	1.96	58.67	26.37	<.001	.56
	Role by Component	2.55	76.58	4.66	.007	.13	1.96	58.67	1.80	.175	.04
Collective											
	Role	1	30	18.37	<.001	.38	1	30	2.19	.149	.01
	Component	1.94	58.13	7.54	<.001	.20	2.01	60.14	38.44	<.001	.60
	Role by Component	1.94	58.13	1.65	.200	.05	2.01	60.14	1.93	.153	.07
RISE											
	Role	1	30	13.62	.001	.31					
	Component	1.84	55.19	10.10	<.001	.25					
	Role by Component	1.84	55.19	2.21	.124	.07					

Note. The degrees of freedom (df1, df2) are reported for the Greenhouse-Geisser adjustment.

Geisser adjustments on the degrees of freedom were used for a more conservative test of the effects. Results of these analyses are subsequently reported within the self-perceptions, other-perceptions, collective perceptions, and RISE subsections.

Self-perceptions. It was expected that, within ratings of self-efficacy, the bases' actor variance components would be larger than all other variance components. Results of the two-way ANOVA pertaining to self-efficacy are presented in the left panel of Table 4 for the individual flyer-base dyads and left panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .37 - .39) across the flyer-main, flyer-side, and flyer-back dyads. Bonferroni-corrected multiple comparisons tests identified, regardless of role, the actor variance component (*M* = 2.28 – 2.84, *SE* = .39 – .52) was significantly greater ($p \leq .001$) than the partner variance component (*M* = .05 – .09, *SE* = .02 – .03) and relationship variance component (*M* = .33 – .45, *SE* = .11 – .12). For the flyer-combined base dyad, the two-way role by variance component interaction was significant with a large sized effect (η_p^2 = .13). Examination of the simple main effects for the flyer-combined base dyad revealed, the one-way variance component interaction was significant for the flyers, $F(1.66, 24.92) = 20.17$, $p < .001$, but not the combined bases, $F(1.85, 27.74) = 2.05$, $p = .151$. Pairwise comparisons indicated, for the flyers, the actor variance component was significantly greater than the partner variance component, $t(15) = 4.53$, $p < .001$, and relationship variance component, $t(15) = 3.79$, $p = .002$ (see Figure 1a).

The variance partitioning of self-performance evaluation ratings resulted in a profile similar to that of the self-efficacy ratings. Results of the two-way ANOVA pertaining to self-performance are presented in the right panel of Table 4 for the individual flyer-base dyads and right panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .50 - .58, $p < .001$) across the flyer-main, flyer-side, flyer-back, and flyer-combined base dyads. Bonferroni-corrected multiple comparisons tests identified significant differences among the variance components, but these differences were inconsistent across the dyads. Within the flyer-main base dyad, regardless of role, the actor variance component (*M* = 2.07, *SE* = .40) was significantly greater (p =.026) than the partner variance component (*M* = .69, *SE*

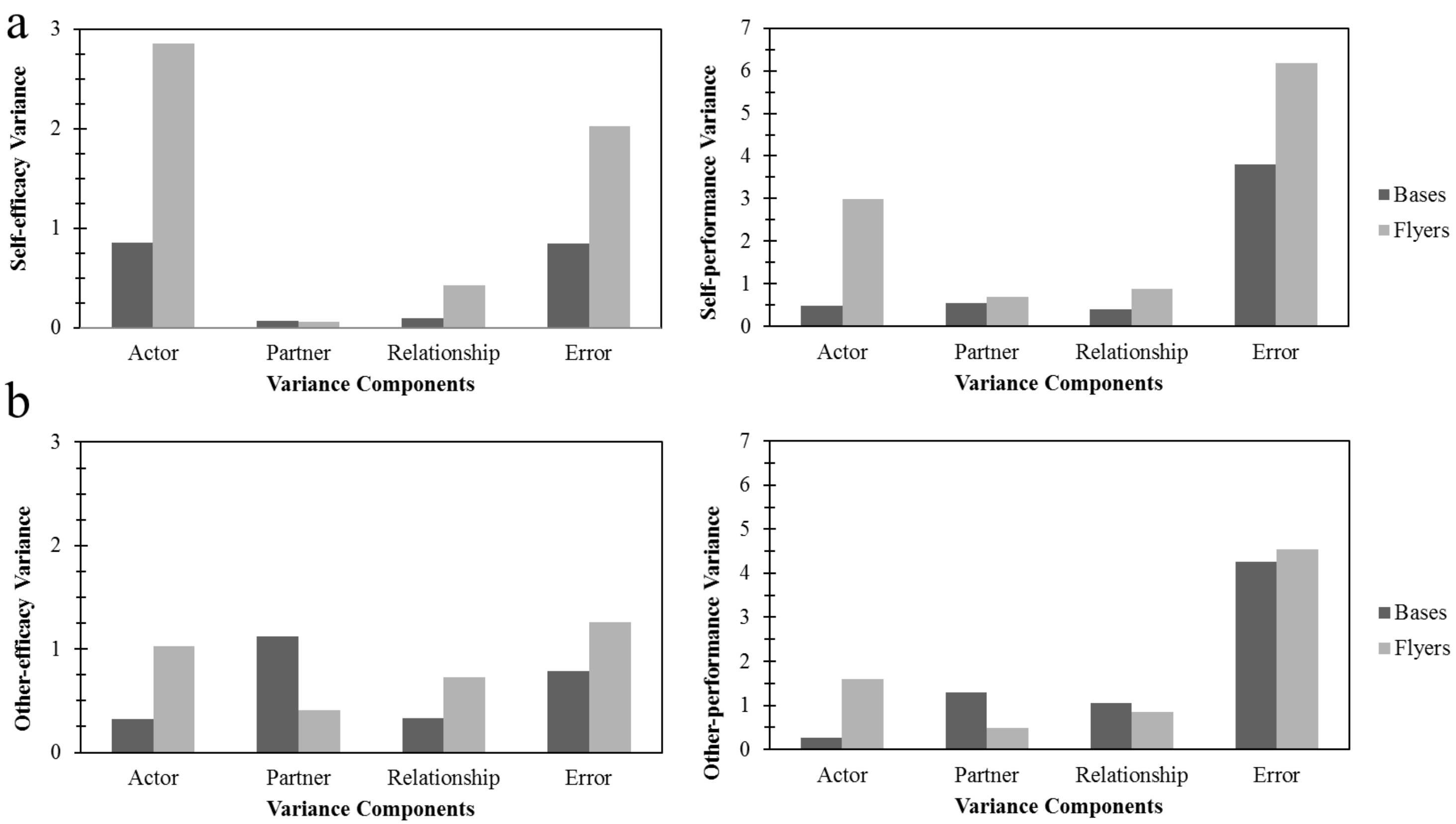

Figure 1. The bases' and flyers' variance components for self- and other-efficacy and performance for the flyer-combined base dyad.

= .18). Within the flyer-back base dyad, regardless of role, the actor variance component (*M* = 2.19, *SE* = .38) was significantly greater (*p* = .006) than the partner variance component (*M* = .55, *SE* = .15) and relationship variance component (*M* = .69, *SE* = .18; see Figure 1a). The actor variance component was not significantly different (*p* = .087 - .287) than the partner or relationship variance components within the other dyads. The main effect for role with large sized effects (η_p^2 = .13 - .14, $p \leq$ .001 - .034) was also significant for the flyer-back base and flyer-combined base dyads (see Figure 1a).

Other-perceptions. It was expected that, within ratings of other-efficacy, flyers' partner variance components would be larger than all other variance components. Results of the two-way ANOVA pertaining to other-efficacy are presented in the left panel of Table 4 for the individual flyer-base dyads and left panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .10-.15, *p* = .003 - .025) for the flyer-main base and flyer-side base dyads, and trended towards significance (i.e., *p* = .053; η_p^2 = .09) for the flyer-back base dyad. For the flyer-side base dyad, the two-way role by variance component interaction was significant with a medium sized effect (η_p^2 = .09, *p* = .041). Examination of the simple main effects for the flyer-side base dyad revealed the one-way variance component interactions were significant for the flyers, *F*(1.90, 28.54) = 6.22, *p* = .006, and the side bases, *F*(2.70, 40.45) = 3.80, *p* = .020. Pairwise comparisons indicated, for the flyers, the partner variance component was not significantly different than the actor variance component, *t*(15) = -1.79, *p* = .093, or relationship variance component, *t*(15) = -1.76, *p* = .098. In contrast, pairwise comparisons indicated, for the bases, the partner variance component was significantly greater than the relationship variance component, *t*(15) = 2.80, *p* = .014, but not the actor variance component, *t*(15) = .82, *p* = .426 (see Figure 1b). For the flyer-combined bases dyad, the two-way role by variance component interaction was significant with a large sized effect (η_p^2 = .13, *p* = .007). Examination of the simple main effects for the flyer-side base dyad revealed the one-way variance component interactions were significant for the flyers, *F*(1.90, 28.54) = 6.22, *p* = .006, and the side bases, *F*(2.70, 40.45) = 3.80, *p* = .020. Pairwise comparisons indicated, for the flyers, the partner variance component was not significantly different from the actor variance component, $t(15) = -1.68$, $p = .116$, and relationship variance component, $t(15) = -1.28$, $p = .221$. In contrast, pairwise comparisons indicated, for the bases, the partner variance component was significantly greater than the actor variance component, $t(15) = 3.47$, $p = .003$, and relationship variance component, $t(15) = 3.28$, $p = .005$ (see Figure 1b).

The variance partitioning of other-performance evaluation ratings resulted in a profile similar to that of the other-efficacy ratings. Results of the two-way ANOVA pertaining to other-performance are presented in the right panel of Table 4 for the individual flyer-base dyads and right panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .49 - .56, $p < .001$) across the flyer-main, flyer-side, flyer-back, and flyer-combined bases dyads. Bonferroni-corrected multiple comparisons tests identified, regardless of role, the partner variance component (M = .75 – 1.03, SE = .39 – .52) was not significantly greater (p = .457 – 1.00) than the actor variance component (M = .94 – 1.27, SE = .24 – .30) and relationship variance component (M = .92 – 1.53, SE = .23 – .32; see Figure 1b).

Collective perceptions. It was expected that, within ratings of collective efficacy, the bases' actor variance component and flyers' partner variance component would be the largest variance components. Results of the two-way ANOVA pertaining to collective efficacy are presented in the left panel of Table 4 for the individual flyer-base dyads and left panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .20 - .25, $p \leq$ .001-.002) across the flyer-main, flyer-side, flyer-back, and flyer-combined base dyads. Bonferroni-corrected multiple comparisons tests identified, regardless of role, the actor variance component (M = 1.22 – 1.89, SE = .24 – .42) was significantly greater (p = .003 - .007) than the partner variance component (M = .26 – .32, SE = .05 – .09), but the relationship variance component (M = .56 – .81, SE = .14 – .17) was not significantly different (p = .068 - .864) from the actor or partner variance components (see Figure 2a). The main effect for role with a large sized effect (η_p^2 = .12 - .20, $p \leq$ .001 - .049) was also significant for the flyer-main base and flyer-combined base dyads.

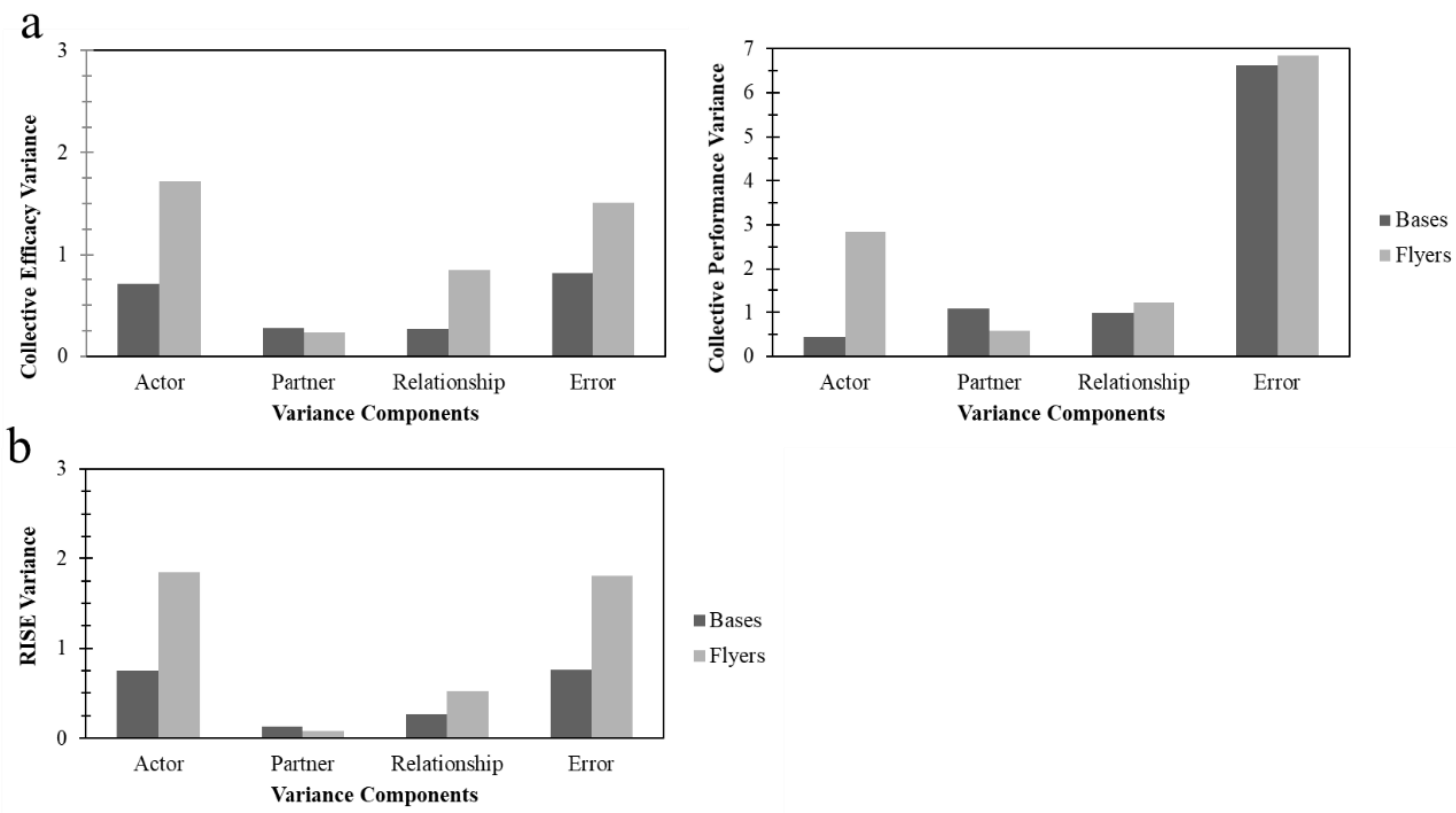

Figure 2. The bases' and flyers' variance components for collective efficacy and performance and RISE for the flyer-combined base dyad.

The variance partitioning of collective performance evaluation ratings resulted in a profile similar to that of the collective efficacy ratings. Results of the two-way ANOVA pertaining to collective performance are presented in the right panel of Table 4 for the individual flyer-base dyads and right panel of Table 5 for the flyer-combined base dyad. The main effect for component with large sized effects (η_p^2 = .55 - .60, $p < .001$) was significant across the flyer-main, flyer-side, flyer-back, and flyer-combined bases dyads. Bonferroni-corrected multiple comparisons tests identified, regardless of role, the actor variance component (*M* = 1.64 – 1.86, *SE* = .37 – .40), partner variance component (*M* = .65 – 94, *SE* = .17 – .32), and relationship variance component (*M* = 1.08 – 1.39, *SE* = .27 – .33) were not significantly different (*p* = .08 – 1.00) from one another (see Figure 2a).

RISE. It was expected that, within ratings of RISE, the bases' actor variance components would be larger than all other variance components. Results of the two-way ANOVA pertaining to RISE are presented in the left panel of Table 4 for the individual flyer-base dyads and left panel of Table 5 for the flyer-combined base dyad. The main effect for component was significant with large sized effects (η_p^2 = .21 - .32, $p \leq .001$ - .002) across the flyer-main, flyer-side, flyer-back, and flyer-combined base dyads. Bonferroni-corrected multiple comparisons tests identified, regardless of role, the actor variance component (*M* = 1.23 – 1.86, *SE* = .28 – .37) was significantly greater ($p \leq .001$ - .004) than the partner variance component (*M* = .10 – .24, *SE* = .04 – .09). Descriptively, the actor variance component was larger than the relationship variance component (*M* = .39 – .71, *SE* = .10 – .18), but this difference was significant for the flyer-combined base dyad (*p* = .030), trended towards significance for the flyer-side base (*p* = .050) and flyer-back base dyads (*p* = .053), but nonsignificant (*p* = .142) for the flyer-main base dyad (see Figure 2b). The main effect for role with a large sized effect (η_p^2 = .31, $p < .001$) was also significant for the flyer-combined base dyad.

Study 4a Discussion

The purpose of this study was to examine the person-related variance in all-female group athletes' self-, other-, and collective efficacy beliefs and performances, and RISE beliefs to address the potential gender/role confound limitation observed in Chapter 4. The findings, although inconsistent with what was hypothesized, provided evidence for role differences in the profiles of variance partitioning. First, the actor variance was largest for self-efficacy ratings by flyers (in the flyer-combined base dyad) indicating levels of self-efficacy for the flyers remained mostly consistent, and in line with a self-focus of attention. A different profile of variance partitioning was evident in self-efficacy ratings by the bases who appeared to rely upon multiple sources of person-related information. Second, the partner variance component was largest for other-efficacy ratings by bases (for the flyer-side base and flyer-combined base dyads) indicating levels of other-efficacy for the bases were mostly in line with an other-focus orientation. A different profile of variance partitioning was evident in other-perception ratings by the flyers. Third, the actor variance was largest for collective efficacy and RISE regardless of role (for all dyads), indicating levels of collective efficacy and RISE for all athletes were mostly consistent, and in line with a self-focus orientation. Finally, performance perceptions were largely attributed to error, with very few differences among the actor, partner, and relationship components within the profiles of variance partitioning, except for self-performance being largely attributed to the actor component, regardless of role. Overall, the findings provide further evidence that the person-related sources of efficacy vary by role suggesting role explains, in part, the extent to which one's self- or other-efficacy belief is guided by reference to information about the self and partner. Interestingly, the four-person task structure appears to have introduced group size and/or subgroup influences that may also influence athletes' perceptions of relational efficacy beliefs. The potentiality of these influences is subsequently discussed.

Role differences for self- and other-efficacy were observed in the current study's sample of same-gender dyads. The bases appeared to be more other-oriented while the flyers appeared to be more self-oriented, indicating both roles' perceptions were focused on the same member within the group. In the current study, perceptions of self- and other-efficacy were mostly determined by the characteristics of the flyers; opposite to what was hypothesized and observed in Chapter 4. To speculate, the dyads in the current study existed within a larger-sized group. Perhaps, by shifting the task to a three base-one flyer structure, it is plausible that shifts in athletes' perceptions could have occurred concomitantly.

Subgroups are, among other things, a group of team members that possess a level of interdependence that is unique to that of the total group (Carton & Cummings, 2012). Consequently, interactions between subgroup members differ from those of other group members. In the current study, the bases were interdependently working with one another to fulfil a general base role and these responsibilities were different to the flyer's responsibilities and group-level responsibilities. Importantly, subgroups are observable entities within a larger group and athletes are able to recognize subgroup membership (Carton & Cummings, 2012; Wagstaff, Martin, & Thelwell, in press). So perhaps a task structure comprised of (a) a subgroup of athletes and (b) an individual not in the subgroup has an influence on whom athletes orient their attention towards. In the current study, the flyers held a performance role most distinct from the other members in the group and were the main person-source of variance in base-flyer perceptions of abilities at the individual level.

In line with the literature suggesting interactions between subgroup members differ from those of other group members (Wagstaff et al., in press), it was necessary to investigate person-sources of variance in athletes' efficacy beliefs and performances within the base subgroup. Examining the perceptions across all possible dyadic combinations of the four-members allows for comparisons of the variance partitioning profiles associated with dyads comprised of one low- and one high-dependence role (e.g., back base-flyer) to dyads comprised of the same level of dependence (e.g., main base-back base)

Study 4b

Interpersonal relationships have a significant effect on the success of the larger group and breakdowns in dyadic performances can ultimately explain poor team performance (Bagozzi, Ascione, & Mannebach, 2005). Given the importance of dyad performance to teams of any size, athletes' perceptions of abilities within these dyadic relationships have implications on team performance. An important characteristic of dyads within a total group includes how roles of the actor *and* partner influence athlete perceptions. In this study, the person-related sources of variance in other-efficacy, RISE, and other-performance perceptions within four-person groups with distinguishable performance roles were investigated. The purpose of the study was to examine the variance partitioning profiles associated with dyads comprised of one low- and one high-dependence role (e.g., back base-flyer) compared to dyads comprised of two low-dependence roles (e.g., main base-back base).

Four-person Social Relations Model (SRM) with Roles

Using a round-robin design, the four-person SRM with roles (Kenny & La Voie, 1984) includes data obtained from each group member on perceptions relative to each of the other group members. Represented as arrows in Figure 3, each member of the group provides a perception rating relative to her three other group members which results in data on a total of 12 directed relationship perceptions. Using the abbreviations of "F" for flyer, "M" for main base, "S" for side base, and "B" for back base, and allowing the abbreviation for the actor (i.e., perceiver reporting the perception) to always come before the partner (i.e., target of the reported perception), the 12 relationships in this study are FM, FS, FB, MF, MS, MB, SF, SM, SB, BF, BM, BS. An observed measure for FM other-efficacy, for example, represents the flyer's rating of other-efficacy in relation to her main base.

As discussed in Study 4a, the four-person cheerleading group is comprised of a three-base subgroup (i.e., the three white circles labelled main, side, and back base in Figure 3) within the total group. This task structure shifted attention towards the flyer (i.e., the grey circle labelled flyer in Figure 3). It is suggested within some literature that this may have occurred because members' interactions within a subgroup differ from their interactions with other non-subgroup members within the total team (Wagstaff, et al., in press). Other literature suggests this occurred because the flyers' personal actions were most distinct and noticeable among the group members (Katz-Navon & Erez, 2005; Wagstaff et al., in press). Dyad members' perceptions involving two bases, as indicated in Figure 3 by the solid black lines, will differ from perceptions involving a base and a flyer, as indicated in Figure 3 by the dashed black lines, as a consequence.

In group SRM with roles designs, any member's perceptions can be decomposed into four components representing group, actor, partner, and relationship/residual effects (Kenny et al., 2006). Interpretations of the actor and partner effects do not differ from the asymmetric approach used in Chapter 4 or in Study 4a of the current chapter. The variance partitioning for the actor and partner effects, however, are associated with person-related sources of variance across relationship types, rather than relationship partners of the same role. Flyer

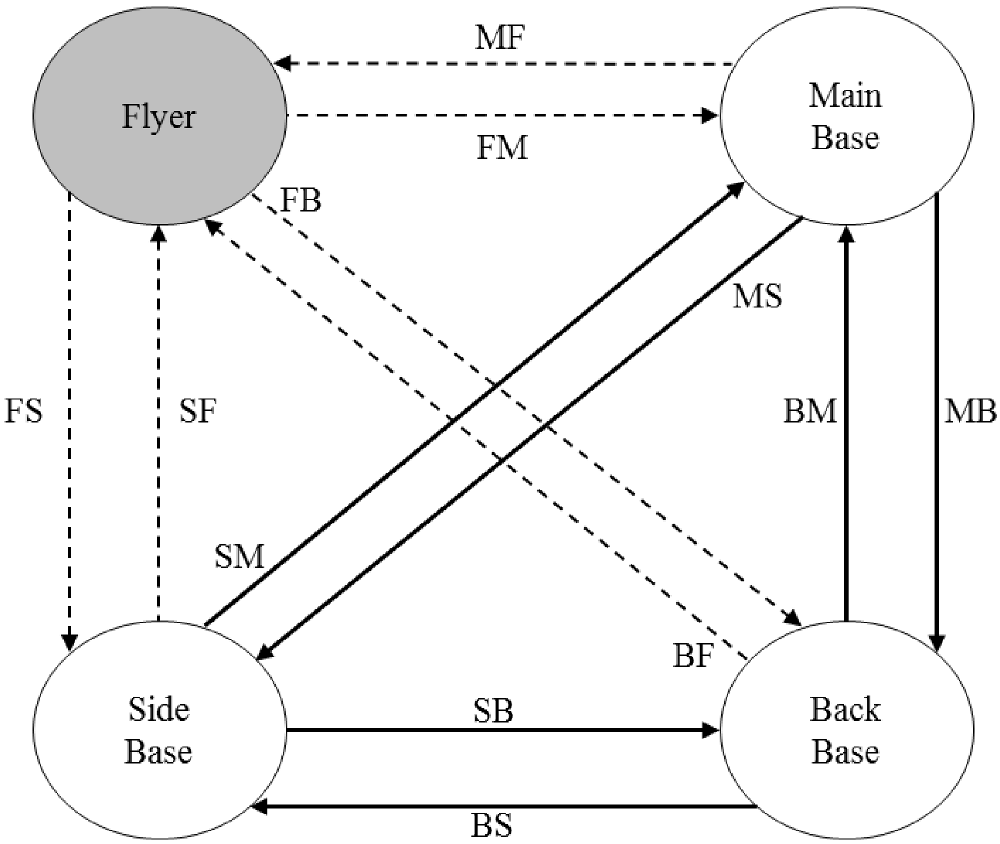

Figure 3. A conceptual model of the four-person group with 12 directed relationship perceptions. ***The grey-filled circle*** (i.e., flyer) indicates nonmembership of the base subgroup within the total group. ***Solid black lines*** indicate perceptions between members of the base subgroup (i.e., a dyad comprised of two low-dependence roles). ***Dashed black lines*** indicate perceptions between the flyer and a base subgroup member (i.e., a dyad comprised of one low-dependence role and one high-dependence role. See text

actor variance, for example, explains variance in her perceptions of the main, side, and back base and the flyer partner variance explains variance in the main, side, and back bases' perceptions about the flyer. The *group effect* represents the extent to which a perception varies across groups (i.e., some groups are higher in abilities than other groups). Altogether, the observed variances across components numerically represent the extent to which a relationship-directed efficacy or performance belief is guided by reference to the group, the self, and/or the other, with any unexplained variance being partitioned into a relationship/residual component (Kenny, 1994; Kenny et al., 2006).

The purpose of this study was to examine person-related sources of variance in perceptions of other-efficacy, RISE, and other-performance in dyads comprised of one low- and one high-dependence role compared to dyads comprised of two low-dependence roles to investigate how role within a larger-sized group might influence athlete perceptions. In line with Kenny et al.'s (2006) note on the general trends of variance partitioning profiles in the previous literature, it was hypothesized that the group effect would account for a relatively small amount of variance in all athletes' other-efficacy, RISE, and other-performance ratings. In line with findings from Study 4a, role differences were expected to occur for the actor and partner effects with relationships involving the flyer displaying different profiles of variance partitioning. It was hypothesized that the actor and partner variances would be largest for the flyers compared to the main, side, and back base roles in other-efficacy, RISE, and other-performance beliefs.

Method

Participants and Procedures

Participants included the sample of 196 female college cheerleaders from Study 4a and an additional 40 female college cheerleaders from the same university teams. Participants' data from Study 4a were obtained from the performances of Tasks 1 and 2 with their original group. Performance with the original group always occurred as the first group performance from the previous study's three-group rotation sequence. The additional participants performed two tasks of moderate difficulty with their original group. This permitted a single wave of data for 59 four-person groups.

Measures

Questionnaire data that was associated with a directed relationship perspective including RISE, other-efficacy, and other-performance for Tasks 1 and 2 were included in this within-group SRM analysis.

Analyses

Initial model specification. The SRM with four-person groups of distinguishable roles is employed by using a confirmatory factor analysis approach (Kenny et al., 2006). Six CFA models were conducted to investigate the variance partitioning for other-efficacy, RISE, and other-performance for Tasks 1 and 2. As depicted in Figure 4, there are 12 relationship-directed observed measures of each variable that are treated as the dependent variables (i.e., FM, FS, FB, MF, MS, MB, SF, SM, SB, BF, BM, BS) and 9 SRM effects treated as latent variables (i.e., group, F actor, M actor, S actor, B actor, F partner, M partner, S partner, B partner). The dependent variables are then specified to load onto the three relative latent variables representing the SRM effects that explain variance in that relationship-directed dependent variable (Cook, 1993; Kenny et al., 2006). For example, an FM measure is specified to load on the group effect, flyer actor effect, and main base partner effect latent variables, while an MF measure is specified to load on the group effect, main base actor effect, and the flyer partner effect latent variables. All factor loadings are set to 1, and the estimated variance of a latent variable is the amount of explanatory variance in the relationship-directed measure explained by that effect. The error variance (i.e., variance not explained by the group, actor, or partner effect) for each dependent variable is interpreted as a relationship/residual variance for that relationship-directed perception (Kenny et al., 2006). One-tailed z-tests are used to determine whether effects differ from zero because variance is, in principle, non-negative. When a latent variable has significant variance, it is interpreted as that component being a significant source of variance in any of the measured variables that load on it. Estimates of variance for each role are computed across groups with the absence of variance for a component identifying the effect is a constant across groups.

Tests of role differences. In line with Kenny et al. (2006), the chi-square difference test is used to test if an SRM effect differs by role. A sequence of equality-of-parameter tests were conducted on the actor and partner SRM effects by specifying the four actor variances or the four partner variances to be equal

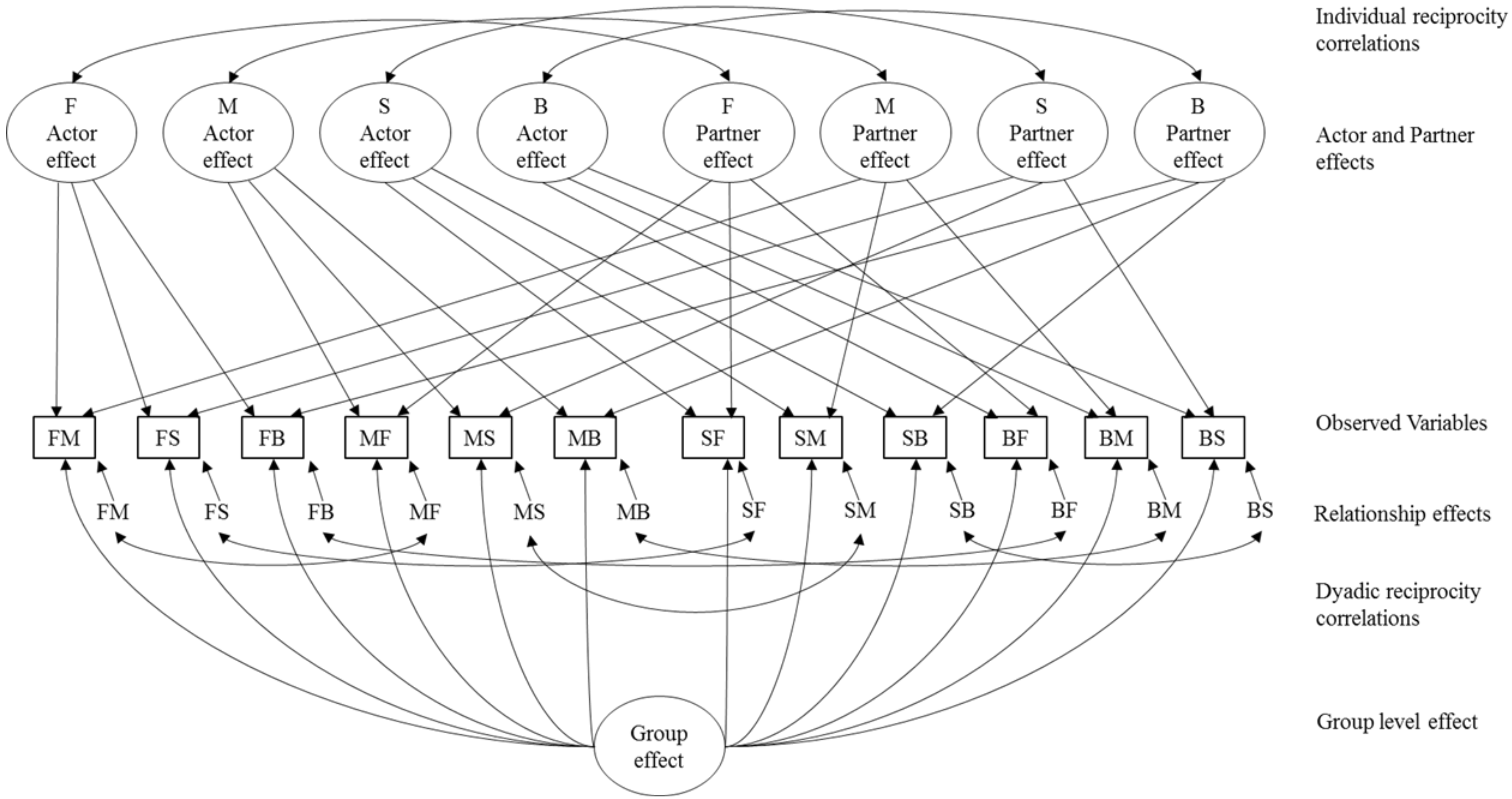

Figure 4. The confirmatory factor analysis model associated with the Social Relations Model for a four-person group. F = Flyer. M = Main Base. S = Side Base. B = Back Base. Abbreviations that come first represent the actor and abbreviations that comes second represent the partner.

and comparing the chi-square values of the restricted models with the initial model. Only one factor was tested at a time, with those constraints being released for tests of other factors. A significant chi-square difference test indicates the SRM effect significantly differs by role, while a nonsignificant test indicates the SRM effect does not differ by role. Several model fit indices were used to assess fit of the model to the data; Chi-square (χ^2), comparative fit index (CFI), Tucker-Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), and the standardized root mean square residual (SRMR). CFI/TLI values between .95 and 1.0 indicate an excellent model fit while values below .90 indicate poor fit, and RMSEA/SRMR values of .08 or less indicate good model fit (Hu & Bentler, 1999; Kenny et al., 2006; MacCallum, Browne & Sugawara, 1999).

Results

Other-efficacy

Task 1. The initial fit of the SRM to data on other-efficacy beliefs for Task 1 was χ^2 (47) = 53.01, p = .254, CFI = .986, TLI = .981, RMSEA = .047, SRMR = .138. The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 2.567, p = .463. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (50) = 55.579, p = .273, CFI = .987, TLI = .983, RMSEA = .043, SRMR = .153, and was retained. The chi-square difference test of four equal partner effects indicated a significantly worse fit of the model to the data, χ^2 (3) = 12.24, $p < .05$, and was not retained.

The estimates based on the final model for Task 1 other-efficacy are reported in the upper panel of Table 6. The group effect was associated with the largest-sized absolute variance for all roles, accounting for 28-52% of the relative variance in other-efficacy, except for the relationship/residual variance for BF other-efficacy. The actor effect, constrained to be equal across all four roles, accounted for 16-32% of the relative variance in other-efficacy. The partner effect significantly differed by role with the flyer role being associated with the largest-sized absolute partner variance. The flyer partner effect accounted for 24-29% of the variance in the main, side, and back bases' other-efficacy beliefs. Partner effects associated with the back, side, and main bases only accounted for, respectively, 15-19%, 9-19%, and 4-9% of the relative variance in other-efficacy. The relationship/residual effect accounted for 14-32% of relative variance in other-efficacy.

Table 6. Absolute and relative variance component means of other-efficacy for Tasks 1 and 2.

Task 1

Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	1.35 (.52)***	.78 (.30)***	.11 (.04)	.35 (.14)**
	Side Base	1.35 (.46)***	.78 (.27)***	.29 (.10)*	.49 (.17)**
	Back Base	1.35 (.43)***	.78 (.25)***	.56 (.18)**	.44 (.14)**
Main Base					
	Flyer	1.35 (.34)***	.78 (.20)***	1.13 (.29)***	.66 (.17)**
	Side Base	1.35 (.42)***	.78 (.24)***	.29 (.09)*	.80 (.25)***
	Back Base	1.35 (.36)***	.78 (.21)***	.56 (.15)**	1.02 (.28)***
Side Base					
	Flyer	1.35 (.32)***	.78 (.19)***	1.13 (.27)***	.89 (.21)**
	Main Base	1.35 (.41)***	.78 (.24)***	.11 (.03)	1.06 (.32)***
	Back Base	1.35 (.34)***	.78 (.20)***	.56 (.14)**	1.21 (.31)***
Back Base					
	Flyer	1.35 (.28)***	.78 (.16)***	1.13 (.24)***	1.50 (.32)***
	Main Base	1.35 (.50)***	.78 (.29)***	.11 (.04)	.46 (.17)**
	Side Base	1.35 (.43)***	.78 (.25)***	.29 (.19)*	.73 (.23)***

Task 2

Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	2.82 (.63)***	1.03 (.27)***	.01 (.00)	.41 (.09)**
	Side Base	2.82 (.64)***	1.03 (.27)***	.16 (.04)	.24 (.05) †
	Back Base	2.82 (.51)***	1.03 (.22)***	.80 (.15)***	.70 (.13)**
Main Base					
	Flyer	2.82 (.54)***	1.03 (.23)***	.47 (.09)**	.76 (.14)**
	Side Base	2.82 (.55)***	1.03 (.23)***	.16 (.03)	.94 (.18)***
	Back Base	2.82 (.51)***	1.03 (.22)***	.80 (.15)***	.68 (.13)**
Side Base					
	Flyer	2.82 (.58)***	1.03 (.19)***	.47 (.10)**	.65 (.13)**
	Main Base	2.82 (.63)***	1.03 (.21)***	.01 (.00)	.69 (.16)***
	Back Base	2.82 (.52)***	1.03 (.18)***	.80 (.15)***	.80 (.15)**
Back Base					
	Flyer	2.82 (.53)***	1.03 (.15)***	.47 (.09)**	1.18 (.23)***
	Main Base	2.82 (.65)***	1.03 (.19)***	.01 (.00)	.64 (.15)***
	Side Base	2.82 (.67)***	1.03 (.19)***	.16 (.04)	.40 (.10)**

Note. The relative variances are reported in parentheses. *p < .05. **p < .01. ***p < .001. † p = .054

Task 2. The initial fit of the SRM to data on other-efficacy beliefs for Task 2 was χ^2 (47) = 98.22, $p < .001$, CFI = .931, TLI = .904, RMSEA = .136, SRMR = .159. The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 1.145, $p = .766$. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (50) = 99.365, $p < .001$, CFI = .934, TLI = .913, RMSEA = .129, SRMR = .174, and was retained. A chi-square difference test of four equal partner effects indicated a significantly worse fit of the model to the data, χ^2 (3) = 14.32, $p < .01$, and was not retained.

The estimates based on the final model for Task 2 other-efficacy are reported in the lower panel of Table 6. The group effect was associated with the largest-sized absolute variance for all roles, accounting for 51-67% of the relative variance in other-efficacy. The actor effect, constrained to be equal across all four roles, accounted for 15-27% of the relative variance in other-efficacy. The partner effect significantly differed by role with the back base role being associated with the largest-sized absolute partner variance. The back base partner effect accounted for 15% of the variance in the flyer, side, and main bases' other-efficacy beliefs. Partner effects associated with the flyer, side, and main bases only accounted for, respectively, 9-10%, 3-4%, and none of the relative variance in other-efficacy. The relationship/residual effect accounted for 5-23% of relative variance in other-efficacy.

RISE

Task 1. The initial fit of the SRM to data on RISE beliefs for Task 1 was χ^2 (47) = 63.36, $p = .056$, CFI = .972, TLI = .96, RMSEA = .077, SRMR = .112. The results indicated, however, that the BM relationship effect was accounting for zero or negative variance; so, the model was respecified with the BM relationship effect and the dyadic correlation between BM relationship and MB relationship fixed to zero. The respecified model provided a similar fit of the model to the data, χ^2 (49) = 66.014, $p = .053$, CFI = .971, TLI = .96, RMSEA = .187, SRMR = .113.

The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 2.356, $p = .502$. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (52) = 68.371, $p = .064$, CFI = .972, TLI = .964, RMSEA = .073, SRMR = .131, and was retained. The chi-square difference test of four equal partner effects (compared to the respecified initial model) was nonsignificant, χ^2 (3) = 2.815, p = .421. A model with four constrained actor effects and four constrained partner effects exhibited a similar fit of the model to the data, χ^2 (55) = 71.399, p = .068, CFI = .972, TLI = .966, RMSEA = .071, SRMR = .142, and was retained.

The estimates based on the final model for Task 1 RISE are reported in the upper panel of Table 7. The group and actor effects were associated with the largest-sized variances and were very similar in size. The group effect accounted for 32-46% of the relative variance, and the actor effects, constrained to be equal across all four roles, accounted for 32-47% of the relative variance in RISE. The partner effect, constrained to be equal across all four roles, accounted for only 5-7% of the variance in RISE. The relationship/residual effect accounted for 0-31% of relative variance in RISE.

Task 2. The initial fit of the SRM to data on RISE beliefs for Task 2 was χ^2 (47) = 78.54, p = .003, CFI = .969, TLI = .957, RMSEA = .107, SRMR = .16. The results indicated, however, that the main base partner effect was accounting for zero or negative variance; so, the model was respecified with this effect and the correlation involving it fixed to zero. The respecified model provided a similar fit of the model to the data, χ^2 (49) = 91.05, $p < .005$, CFI = .959, TLI = .945, RMSEA = .121, SRMR = .17. The results indicated, however, that the flyer partner effect was accounting for zero or negative variance; so, the model was respecified with this effect and the correlation involving it fixed to zero. The respecified model provided a similar fit of the model to the data, χ^2 (51) = 104.83, $p < .001$, CFI = .948, TLI = .932, RMSEA = .134, SRMR = .172. The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 2.117, p = .548. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (54) = 106.947, $p < .001$, CFI = .949, TLI = .937, RMSEA = .129, SRMR = .138, and was retained. The chi-square difference test of four equal partner effects (compared to the respecified initial model) was nonsignificant, χ^2 (3) = 2.815, p = .421. A model with four constrained actor effects and four constrained partner effects exhibited a similar fit of the model to the data, χ^2 (55) = 106.996, $p < .001$, CFI = .947, TLI = .936, RMSEA = .13, SRMR = .138, and was retained.

The estimates based on the final model for Task 2 RISE are reported in the lower panel of Table 7. The group and actor effects were associated with the

Table 7. Absolute and relative variance component means of RISE for Tasks 1 and 2.

Task 1

Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	1.37 (.42)***	1.39 (.42)***	.22 (.07)***	.29 (.09)**
	Side Base	1.37 (.42)***	1.39 (.42)***	.22 (.07)***	.31 (.09)**
	Back Base	1.37 (.38)***	1.39 (.38)***	.22 (.06)***	.65 (.18)***
Main Base					
	Flyer	1.37 (.32)***	1.39 (.32)***	.22 (.05)***	1.33 (.31)***
	Side Base	1.37 (.40)***	1.39 (.41)***	.22 (.06)***	.45 (13)**
	Back Base	1.37 (.39)***	1.39 (.40)***	.22 (.06)***	.53 (.15)**
Side Base					
	Flyer	1.37 (.33)***	1.39 (.34)***	.22 (.05)***	1.17 (.28)***
	Main Base	1.37 (.33)***	1.39 (.33)***	.22 (.05)***	1.22 (.29)***
	Back Base	1.37 (.36)***	1.39 (.37)***	.22 (.06)***	.80 (.21)**
Back Base					
	Flyer	1.37 (.33)***	1.39 (.33)***	.22 (.05)***	1.22 (.29)***
	Main Base	1.37 (.46)***	1.39 (.47)***	.22 (.07)***	.00 (.00)
	Side Base	1.37 (.41)***	1.39 (.41)***	.22 (.07)***	.38 (.11)***

Task 2

Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	2.47 (.47)***	2.40 (.45)***	.00 (.00)	.44 (.08)***
	Side Base	2.47 (.48)***	2.40 (.47)***	.09 (.02)*	.15 (.03)†
	Back Base	2.47 (.45)***	2.40 (.43)***	.09 (.02)*	.60 (.11)***
Main Base					
	Flyer	2.47 (.43)***	2.40 (.42)***	.00 (.00)	.89 (.15)***
	Side Base	2.47 (.49)***	2.40 (.48)***	.09 (.02)*	.09 (.02)
	Back Base	2.47 (.47)***	2.40 (.46)***	.09 (.02)*	.26 (.05)*
Side Base					
	Flyer	2.47 (.46)***	2.40 (.45)***	.00 (.00)	.51 (.09)***
	Main Base	2.47 (.46)***	2.40 (.44)***	.00 (.00)	.54 (.10)***
	Back Base	2.47 (.46)***	2.40 (.44)***	.09 (.02)*	.44 (.08)
Back Base					
	Flyer	2.47 (.39)***	2.40 (.38)***	.00 (.00)	1.49 (.23)***
	Main Base	2.47 (.49)***	2.40 (.47)***	.00 (.00)	.22 (.04)*
	Side Base	2.47 (.47)***	2.40 (.46)***	.09 (.02)*	.26 (.05)*

Note. The relative variances are reported in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$. † $p = .051$

largest-sized variances and were very similar in size. The group effect accounted for 39-49% of the relative variance, and the actor effects, constrained to be equal across all four roles, accounted for 38-48% of the relative variance in RISE. The partner effect, constrained to be equal across all four roles, accounted for only 0-2% of the variance in RISE. The relationship/residual effect accounted for 2-15% of relative variance in RISE.

Other-performance

Task 1. The initial fit of the SRM to data on other-performance beliefs for Task 1 was χ^2 (47) = 83.42, $p < .001$, CFI = .96, TLI = .944, RMSEA = .115, SRMR = .116. The results indicated, however, that the side base partner effect and the BS relationship effect were accounting for zero or negative variance; so, the model was respecified with these effects and the correlations associated with these effects fixed to zero. The respecified model provided a similar fit of the model to the data, χ^2 (51) = 105.817, $p < .001$, CFI = .94, TLI = .922, RMSEA = .135, SRMR = .142.

The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 2.548, $p = .467$. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (54) = 108.365, $p < .001$, CFI = .94, TLI = .927, RMSEA = .131, SRMR = .127, and was retained. The chi-square difference test of four equal partner effects indicated a significantly worse fit of the model to the data, χ^2 (2) = 6.655, $p < .05$, and was not retained.

The estimates based on the final model for Task 1 other-performance are reported in the upper panel of Table 8. The group effect was associated with the largest-sized absolute variance for all roles, accounting for 57-81% of the relative variance in other-performance. The actor effect, constrained to be equal across all four roles, accounted for 14-19% of the relative variance in other-performance. The partner effect significantly differed by role with the back base and flyer roles being associated with the largest-sized absolute partner variances. The back base partner effect accounted for 9-11% of the variance in the flyer, main, and side bases' other-efficacy beliefs, and the flyer partner effect accounted for 6-7% of the variance in the main, side, and back bases' other-efficacy beliefs. Partner effects associated with the main and side bases only accounted for, respectively, 2% and none of the relative variance in other-efficacy. The relationship/residual effect accounted for 0-30% of relative variance in other-efficacy.

Table 8. Absolute and relative variance component means of other-performance for Tasks 1 and 2.

Task 1					
Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	5.04 (.71)***	1.20 (.17)***	.16 (.02)*	.66 (.09)**
	Side Base	5.04 (.68)***	1.20 (.16)***	.00 (.00)	1.15 (.15)***
	Back Base	5.04 (.65)***	1.20 (.16)***	.66 (.11)**	.83 (.11)**
Main Base					
	Flyer	5.04 (.68)***	1.20 (.16)***	.54 (.07)**	.59 (.08)*
	Side Base	5.04 (.57)***	1.20 (.14)***	.00 (.00)	2.62 (.30)***
	Back Base	5.04 (.66)***	1.20 (.16)***	.66 (.09)**	.78 (.10)**
Side Base					
	Flyer	5.04 (.66)***	1.20 (.16)***	.54 (.07)**	.87 (.11)***
	Main Base	5.04 (.72)***	1.20 (.17)***	.16 (.02)*	.64 (.09)**
	Back Base	5.04 (.70)***	1.20 (.17)***	.66 (.09)**	.31 (.04) †
Back Base					
	Flyer	5.04 (.60)***	1.20 (.14)***	.54 (.06)**	1.67 (.04)***
	Main Base	5.04 (.73)***	1.20 (.17)***	.16 (.02)*	.48 (.07)***
	Side Base	5.04 (.81)***	1.20 (.19)***	.00 (.00)	.00 (.00)

Task 2					
Rater	Target	Group	Actor	Partner	Relationship/Residual
Flyer					
	Main Base	4.39 (.69)***	1.80 (.28)***	.13 (.02)**	.00 (.00)
	Side Base	4.39 (.70)***	1.80 (.29)***	.00 (.00)	.09 (.01)**
	Back Base	4.39 (.60)***	1.80 (.24)***	.13 (.02)**	1.03 (.14)***
Main Base					
	Flyer	4.39 (.52)***	1.80 (.21)***	.13 (.02)**	2.15 (.25)***
	Side Base	4.39 (.57)***	1.80 (.23)***	.00 (.00)	1.52 (.20)***
	Back Base	4.39 (.58)***	1.80 (.24)***	.13 (.02)**	1.27 (.17)***
Side Base					
	Flyer	4.39 (.51)***	1.80 (.21)***	.13 (.02)**	2.37 (.27)***
	Main Base	4.39 (.58)***	1.80 (.24)***	.13 (.02)**	1.29 (.17)***
	Back Base	4.39 (.63)***	1.80 (.26)***	.13 (.02)**	.62 (.09)
Back Base					
	Flyer	4.39 (.57)***	1.80 (.23)***	.13 (.02)**	1.35 (.18)
	Main Base	4.39 (.66)***	1.80 (.27)***	.13 (.02)**	.37 (.06)
	Side Base	4.39 (.68)***	1.80 (.28)***	.00 (.00)	.26 (.04)

Note. The relative variances are reported in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$. † $p = .059$

Task 2. The initial fit of the SRM to data on other-performance beliefs for Task 2 was χ^2 (47) = 91.06, p < .001, CFI = .955, TLI = .937, RMSEA = .126, SRMR = .068. The results indicated, however, that the side base partner effect and the FM relationship effect were accounting for zero or negative variance; so, the model was respecified with these effects and the correlations associated with these effects fixed to zero. The respecified model provided a similar fit of the model to the data, χ^2 (51) = 101.762, p < .001, CFI = .948, TLI = .933, RMSEA = .130, SRMR = .069.

The chi-square difference test of four equal actor variances was nonsignificant, χ^2 (3) = 4.624, p = .201. The model with four constrained actor effects exhibited a similar fit of the model to the data, χ^2 (54) = 106.386, p < .001, CFI = .947, TLI = .935, RMSEA = .128, SRMR = .098, and was retained. The chi-square difference test of four equal partner effects (compared to the respecified initial model) was nonsignificant, χ^2 (3) = 2.815, p = .421. A model with four constrained actor effects and four constrained partner effects exhibited a similar fit of the model to the data, χ^2 (56) = 110.645, p < .001, CFI = .945, TLI = .935, RMSEA = .129, SRMR = .098, and was retained.

The estimates based on the final model for Task 2 other-performance are reported in the lower panel of Table 8. The group effect was associated with the largest-sized absolute variance for all roles, accounting for 52-70% of the relative variance in other-performance. The actor effect, constrained to be equal across all four roles, accounted for 21-29% of the relative variance in other-performance. The partner effect, constrained to be equal across all four roles, accounted for only 0-2% of the variance in RISE. The relationship/residual effect accounted for 0-27% of relative variance in RISE.

Study 4b Discussion

Four-person groups with distinguishable performance roles were used to investigate how role influences athlete perceptions in larger-sized groups. The purpose of this study was to compare the person-related variance in perceptions of other-efficacy, RISE, and other-performance in dyads comprised of one low- and one high-dependence role to dyads comprised of two low-dependence roles. The findings were in partial support of the hypotheses. First, the size of the actor variances did not differ by role for any of the perceptions. This can be interpreted as the extent to which personal tendencies influence within-group perceptions of other-efficacy, RISE, and other-performance is similar for all athletes. Second, the partner effect differed by role for other-efficacy and other-performance, but not for RISE. This can be interpreted as other-perceptions are influenced by characteristics of the partner to different extents depending on the partner's role. In contrast, RISE perceptions were influenced very little by the partner characteristics and this did not differ much by role. Finally, the group effect tended to account for most of the variance in athletes' perceptions of other-efficacy, RISE, and other-performance indicating that, regardless of role, athlete perceptions of ability were mostly influenced by group membership. The findings indicate that within a larger-sized group, athletes' abilities are perceived differently depending on their role in the group providing insight for the unexpected findings in Study 4a.

Interestingly, the group effect was the largest source of person-related variance in other-efficacy, RISE, and other-performance. This is a unique finding compared to previous research wherein the group effect has typically tended to account for very little of the variance in a perception (Kenny et al., 2006). A large amount of between-group variance, however, is typical of sports teams' efficacy beliefs (e.g., Myers, Feltz, & Short, 2004). So, from a theoretical perspective, this unique finding appears to be consistent with previous research specific to efficacy beliefs in sport. Moreover, a combination of the performance tasks varying across stunt-groups (due to differences in competitive levels) and the performance tasks being of high-interdependence likely inflated the between-group variance and attenuated the within-group variance. So, in hindsight, a large group effect was probably to be expected given the nuances of this study. Nonetheless, the findings support previous researchers' assertions about several multilevel influences existing within performing dyads including cross-level moderation, and top-down effects present within the hierarchy of a team comprised of dyad relations comprised of individuals with unique roles (Gaudreau, Fecteau, et al., 2010; Kenny et al., 2006; Travassos et al., 2013).

The findings related to other-efficacy align with the suggestion that members of a subgroup interact differently with other subgroup members compared to an athlete outside the subgroup (Carton & Cummings, 2012; Wagstaff et al., in press). This is evident from comparisons of the size of the partner effects. First, the partner effect for each base role was of similar magnitude indicating the bases were not perceived much different from any other base by their other group members. For example, the side base accounted for very little variance in the flyers', back bases', and main bases' perceptions of the side bases' abilities. The flyers' partner effect, however, was the largest indicating characteristics of the flyer explained a large proportion of the variance in the main, side, and back bases' perceptions of flyers' abilities. This indicates that the bases, who were not uniquely influenced by any of the other bases, viewed something unique about the flyer role. The theoretical implications of this finding are discussed further within the general discussion.

This study employed a SRM for a four-person group with distinguishable roles to explore how role may be associated with directed relationship perceptions within a group. The main finding that partner effects are significantly different by role for other-efficacy indicates that the extent this perception reflects the other's abilities is determined by the partners' role in the group.

General Discussion

This chapter of the thesis included two studies investigating the person-related sources of variance in same-gender dyads of distinguishable roles within four-person cheerleading groups. In line with previous research (Jackson & Beauchamp, 2010), role differences emerged in the variance partitioning of self- and other-efficacy. This suggests gender was not a confounding variable observed across bases and flyers in Chapter 4. Given the seemingly obvious dependence of flyers on their bases, the finding of bases' and flyers' focus-orientations being the opposite pattern to what was previously observed was unexpected. As discussed subsequently, this finding has implications for theoretical assertions of the sources of efficacy beliefs.

The employment of a wider Social Relations Model lens of dyadic perceptions in a group from Study 4b provided evidence that group-level determinants were largely contributing to athletes' perceptions of abilities, regardless of the actor or partner involved in the perception. Although Study 4a was designed to examine dyadic relationships between the base and flyer, team-level effects were likely implicating on the sources of variance. Collective efficacy beliefs by all athletes in the four-person group were mostly determined by self-abilities; a finding only relevant to the bases in the two-person groups examined in Chapter 4. Perhaps, the distinction between self-action and collaborative action is less clear when more athletes are involved (Katz-Navon & Erez, 2005), so it may be difficult for athletes in larger groups to report on these differences.

There was some evidence, at least for the flyers and back bases, that collective efficacy beliefs were a relational perception (i.e., had a large relationship variance). In Study 4a, the relationship variance accounted for 19% of the variance in flyers' and back bases' collective efficacy beliefs. Relationship variance indicates a unique relationship in the group occurs between the flyer and the back base (Kenny, 1994). Anecdotally, the relationship between the flyer and back base is an important one regarding the flyer's safety. The back base's position, being completely behind the flyer, places responsibility for protecting the flyer's head and neck, quite literally, in the arms of the back base. As a consequence, flyers tend to be very aware of their back bases' abilities to provide safety from serious injury. The relational aspect of this dyad relationship demonstrates that within a larger group the complexities of interdependence have numerous effects on each athlete with some effects being a result of special bonds integrated in the task structure.

Shifting the base role to a subgroup of three athletes, had implications on the dynamics within the total group. First, the likelihood of complete failures from the base role is minimized when three athletes are assigned to the role than compared to when one athlete fulfils the base role responsibilities single-handedly. In fact, compared to when performing in their dyads, athletes report their perceptions of responsibility towards a group performance are lessened when performing in larger-sized teams (Wickwire et al., 2004). Second, each athletes' personal contributions within a base role are less distinct when there are three athletes sharing responsibilities for that role while the flyer's contributions within the collaborative actions are entirely distinct from each of the bases. If an athlete in the base role fails, from the flyer's perspective, she has less knowledge of which base may be at fault for a failed performance because she is not a direct part of their interactions. From the bases' perspectives, they may be limited in their abilities to attribute failure among themselves because their responsibilities overlap greatly. For both roles, then, it is easiest to attribute any quality of the group's performance to the flyer's performance qualities because her contributions are simply more noticeable than anyone else's contributions.

Relatedly, being the only athlete performing in the flyer role, engenders whomever fulfils the flyer role to be considered a key group member. Efficacy beliefs, at least at the collective level, are argued to be determined in part by the key members of the group (Bandura, 1997; Damato et al., 2008). Nonetheless, more evidence is needed to systematically define what characteristics of a group task structure influence whom athletes place their efficacy beliefs on.

Personal characteristics, regardless of role, explained a large part of the variance in athletes' RISE beliefs. Similar RISE perceptions across partners suggests athletes estimate that their teammates have similar beliefs in their own abilities. RISE is a metaperception that requires interpretation of what others believe (Lent & Lopez, 2002). So, it may be equally plausible that reporting a similar RISE rating across multiple others is the true reflection of the other members being in agreement. That is, instead of the flyer thinking she has provided the same impression of her abilities to each base, the flyer is accurately perceiving that the bases believe similarly in her abilities. Evidence suggests, however, that people tend to have inaccurate metaperceptions and believe they convey consistent impressions on those they interact with even if they do not (Kenny & Depaulo, 1993). Regardless, if people believe everyone has the same impression of them, as this study suggests, perhaps future studies should rely upon metaperceptions about a generalized other. As found by Jackson et al., (2014), athletes can form teammate-focused RISE perceptions that reflect one's perception of the extent to which the group in whole believes in one's abilities.

Although in this study role differences in same-gender dyads were investigated, limitations are still present. First, the two studies in this chapter did not directly test for the full range of gender effects because males were not included in the investigation. It would be a stronger argument that role was not confounded by gender, if a role (low-, high-dependence) by gender (male, female) full factorial design was implemented. Second, the participants in the current studies were not elite level (i.e., athletes averaged only 2.5 years of experience in the sport) and their abilities to meaningfully attribute the group's performance quality to one of the members' performance qualities may be uninformed. Evidence suggests that theorized sources of collective efficacy (e.g., imagery) are not as predictive of collective efficacy among novice athletes as they are among elite athletes (Shearer, Thomson, Mellalieu, & Shearer, 2007). So perhaps, experience and not the increase in group-size or the presence of a base subgroup, could explain the observation that the variance partitioning for all athletes identified perceptions were oriented towards the flyer role. More controlled tests of the effects are required with experimental designs to eradicate possible confounds associated with intact interdependent teams.

Several of the findings in this chapter provide potential directions for future investigations. First, group size and subgroups introduced in this study provide myriad potential lines of enquiry. In-group and out-group perceptions, for example, offer an extension of the SRM with roles in which members of both subgroups interact with their own and the other subgroup to investigate if partner effects are unique to group-membership (Kenny et al., 2006). Second, the investigation of new member integration is possible using the SRM used in Study 4a, where only one member of the group is interchangeable and perceptions of new members can be measured and investigated for perceptions of new team members. It may even be useful to replicate Study 4a with the interchangeable member being a base to examine if role of the interchangeable member has any effect on the profiles of variance partitioning. Finally, it would advance theory if studies continue to investigate the multiple levels of agency in an interpersonal relationship to provide more explicit assertions about the link between task structure, dyad relations, and athlete roles and athletes' attention of self, relational, and collective abilities.

In conclusion, this chapter provided an extension of the SRM to four-person groups demonstrating that role remains an integral aspect influencing athlete's self- and other-efficacy beliefs. This chapter also provided evidence that both partners' roles have implications for dyadic relations and that the group-level effects cannot be overlooked for dyads functioning within a larger team. In all, task structure, dyadic relations, and athlete role have implications for athletes' self, relational, and collective perceptions of abilities within and across teams.

Chapter 7

General Discussion

Summary of Thesis

The purpose of this thesis was, on the broadest level, to investigate how partners influence one another in athlete pairs with a specific focus on the efficacy-performance relationship. The commentary within Chapter 1 indicated most of the current knowledge of the dynamics of interdependent athlete performance has generally been concluded from a broad (i.e., team-level) or narrow (i.e., individual-level) perspective. The literature review in Chapter 2 provided the conceptual background and key empirical research related to self, relational, and collective efficacy beliefs that parallel the levels of agency present in dyads of high interdependence with distinguishable roles. Based on several limitations of the current literature, this thesis included dyads with distinguishable roles to examine the research problem concerning the implications of interdependent performance and performance role on athletes' psychological and behavioral functioning. The findings across the studies in this thesis (Chapter 3-6) supported conclusions that task structure, dyadic relations, and athlete role have implications for athletes' efficacy beliefs, performance outcomes, and magnitude of efficacy-performance relationships. The key empirical findings that support these conclusions are summarized for each chapter. The theoretical and applied implications of these findings are discussed subsequently.

Chapter 3: Study 1

In Study 1 relationships among the base, flyer, and dyad performances of cheerleading pairs (n = 66 dyads) competing at a national-level competition were assessed to provide a measurement tool for dyadic performance settings in which athletes have distinguishable roles. The examined relationships between the three performance types were indicative of partners' individual-level performances being unique, but nonindependent performances nested within a dyad-level performance interaction. The findings in this chapter indicated that assessments of lower-level units provide contextual meaning to observed collective performance behaviors (McGarry, 2009; Travassos et al., 2013). The multi-level performance framework provided a conceptually grounded and reliable measure of performing dyads with distinguishable roles.

Chapter 4: Study 2

In Study 2 person-related sources of variance in athletes' efficacy beliefs and performances were examined during repeated performance trials of a paired-task with distinguishable roles (i.e., base, flyer). Participants (*n* = 102 persons) performed their role (e.g., base) in repeated performance trials of two low- and two high-difficulty paired-stunt tasks with three different partners performing in the other role (e.g. flyers). Using the Social Relations Model framework, profiles of variance partitioning were determined for the bases and flyers. RM-ANOVAs revealed the largest person-related variance component differed by athlete role and increased in size in high-difficulty tasks for self, other, and collective efficacy beliefs and performances, and objective performances. The extent athlete performance was dependent on a partner, an aspect of one's performance role, related to the extent a partner was a source of self-, other-, and collective efficacy beliefs. Findings from this study provided evidence that role differences emerged in line with theoretical assertions of dependence and orientation of attention (Snyder & Stukas, 1999).

Chapter 5: Study 3

The purpose of Study 3 was to examine the extent to which both partners' efficacy beliefs (i.e., self-, other-, collective) predict successive performances of an athletic dyad task and, in turn, the extent to which both partners' athletic performances predict each partner's efficacy beliefs. The chapter included an investigation that extended Feltz' (1982) efficacy-performance path analysis in an individual sporting context, and Feltz et al.'s (2008) Residualized Past Performance-Residualized Self-Efficacy (RPPRSE) model in conjunction with the Actor-Partner Interdependence Model appropriate for dyads. Intact dyads (*n* = 74 dyads) performed a moderately challenging stunt-task for five trials while rating self, other, and collective efficacy beliefs and performances. The findings indicated that other- and collective efficacy were unique predictors of subsequent subjective and objective performance, and these actor effects were above and beyond previous performance and self-efficacy. Several significant partner effects also emerged as predictors of subsequent performance, above and beyond the actor effects. Interestingly, the partner effects were more salient for the flyers' outcomes providing evidence that the flow of influence observed in coach-athlete relationships is also observed in athlete dyads of distinguishable roles within efficacy-performance relationships.

Chapter 6: Studies 4a and 4b

A limitation common to the first three studies of this thesis was the potential for athletes' roles and genders being confounded. The purpose of Study 4a was to conduct a replication of Study 2 using same-gender distinguishable dyads. Female participants (*n* = 196 persons) performed their role in repeated performance trials to investigate person-related sources of variance for low- (i.e., base) and high-dependence (i.e., flyer) roles in self-, other-, and collective efficacy, and RISE. Overall, the findings provided further evidence that the person-related sources of efficacy vary by role. Interestingly, the four-person task structure appeared to have introduced group size and/or subgroup influences on athletes' perceptions of relational efficacy beliefs that was then investigated in Study 4b.

The purpose of Study 4b was to use the Social Relations Model analysis of four-person groups with distinguishable roles. In this study, person-related sources of variance in team athletes' perceptions of other-efficacy, RISE, and other-performance were examined across all possible dyadic combinations of the four members within a group (*n* = 59 four-person groups). The findings indicated that both partners' roles have implications for dyadic relations and that membership to a subgroup has potential implications for athletes' perceptions as speculated in Study 4a. Specifically, the flyers' partner effects were greater in size compared to the bases' partner effects. A large part of the variance in dyadic perceptions was also associated with a group-level effect indicating members of a group had similar ratings of one another. In all, task structure, dyadic relations, and athlete role have implications for athletes' self, relational, and collective perceptions of abilities within and across groups comprised of four members with some parallels to these effects observed in two-person groups.

Theoretical Implications

The dyadic perspective employed throughout this thesis has theoretical implications for conceptualizations of interdependence and efficacy theories in the field of sport psychology.

Interdependence: Task Structures and Athletes' Roles

A major limitation of the previous literature included a lack of investigation of athlete dyads of distinguishable roles, despite the potential implications distinguishable roles might have on athletes' behavioral and psychological functioning (Bray et al., 2002). The findings from this thesis regarding individual's objective performances help to clarify for the field that athlete dyads can indeed be meaningfully defined as having distinguishable roles as argued by Gaudreau, et al. (2010). Study 1 provided evidence that each athletes' individual performances can differentially relate to the overall team outcomes, indicating athlete roles are not equivalent. This is in line with Snyder and Stukas' (1999) contentions that one member is largely in control of the action in a dyad. Study 2 clarified how distinguishable roles are implicated in objective performance in the group with the finding of variance partitioning indicative of one partner's performance being more dependent on the other partner's performance. Bases' performances were mostly consistent across partners indicating their performances were least dependent on a partner whereas flyers' performances mostly varied with each partner indicating their performances were most dependent on a partner. In combination, this informs how athlete dyads might be conceptualized in the literature with a stronger concentration on the task structure and role responsibilities than on formal leader-subordinate roles.

The findings from this thesis also inform conceptualizations of larger-sized teams. The finding in Studies 4a and 4b, indicated that subgroups have a potential influence on athletes' perceptions of others' abilities. Significant role differences in the partner effects in Study 4b indicated that the bases' perceptions were influenced by the flyer to a greater extent than any of the other bases. This aligns with the previous literature demonstrating that members of a subgroup interact differently with other subgroup members compared to non-subgroup members (Carton & Cummings, 2012; Wagstaff et al., in press).

Self-efficacy Beliefs

Perhaps the most interesting finding was that self-efficacy was not always based on the self. This extends Bandura's (1977, 1997) assertions about the impact personal information about others has on self-efficacy beliefs. Katz-Navon & Erez (2005) highlighted that in tasks of high-interdependence, it may be more difficult to differentiate individual contributions to performance among conjointly accomplished performances. So, in effect, perceptions of individual and collective abilities may be intertwined. The findings in Study 2 and 4a demonstrated that perceptions across self-, other-, and collective efficacy may be intertwined in small group tasks of high interdependence because the efficacy beliefs are all based on the same partner's performance abilities. According to Damato et al. (2008), the loss of a pivotal member in a team has a significant negative effect on collective efficacy beliefs regarding perseverance, but not collective efficacy beliefs regarding skills. The efficacy measures in this thesis were not specific to a subset of performance abilities. In line with Bandura's (2006) guide to constructing efficacy measures, providing more specific items might clarify what characteristics of other teammates (e.g., physical skills, cognitive skills, effort) are most informative of one's own abilities to perform in that group.

Relational Efficacy Beliefs

Other-efficacy was the only significant predictor of objective dyad performance in Study 3. This is an interesting finding compared to Beauchamp and Whinton (2005). Their investigation revealed both self- and other-efficacy were unique predictors of performance (i.e., horse-rider collective performance), but the riders' self-efficacy explained the most unique variance in equestrian performance. The different findings are most likely explained by Study 3 including both members' perceptions in the dyad while Beauchamp and Whinton were only able to measure one member's perception in the dyad. Some argue against utilizing individual-level analyses to represent interpersonal relationships (Kenny, Kashy, & Cook, 2006; Laursen, 2005), but without being able to measure the horses' confidence (although the horse likely has a perception of abilities in some form), it is difficult know if Beauchamp and Whinton's findings would differ if a dyad-level analysis were employed. Nonetheless, the findings in Study 3 are in line with Dunlop et al.'s (2011) findings that other-efficacy supersedes the effects of self-efficacy, at least for personal performance.

The original sources of other-efficacy beliefs, as proposed by Lent and Lopez (2002), include perceptions of a partner's previous performances, beliefs about similar others, third party views, and social stereotypes. Jackson et al. (2008, 2009) supplemented these sources with including characteristics of the partner (e.g., verbal and nonverbal communications from the partner, partner's mood) and dyad (e.g., previous success, experience as a dyad). The findings from the studies in this thesis suggest that the extent these sources will be attended to will depend to a great extent on the role of the athlete making the perceptions and the role of the athlete being perceived. These findings suggest that athletes of distinguishable roles may be more similar to coach-athlete dyads than to the athlete dyads with exchangeable roles.

The previous literature has included strong support for the importance of RISE beliefs for personal functioning in settings including physical education, group-exercise, exercise rehabilitation, and sport performance (Bray et al., 2013; Jackson, et al., 2012; Jackson, et al., 2010; Jackson, et al., 2012; Jackson, et al., 2013). It was interesting that the findings in Study 4a and 4b revealed RISE, the only metaperceptions examined in this thesis, did not differ by role. Relatedly, the RISE actor variance component was larger than the partner or relationship variance component for all athletes. Although RISE beliefs were originally theorized to be specific to a relationship partner (Lent & Lopez, 2002), sometimes individuals may reflect on the extent to which members of their team, as a whole, believe them to be capable (Jackson et al., 2014). The findings in the current studies in conjunction with Jackson et al. can be interpreted as the RISE perceptions may be group-focused for athletes performing in highly interdependent teams because unique partner-specific cues may not exist.

Collective Efficacy Beliefs

The findings that inform collective efficacy appeared to have been dependent on the size of the group. In line with previous literature, differences in collective efficacy for small- compared to large-sized groups have been observed (e.g., Seijts, Latham, & Whyte, 2000). In Study 2, the results indicated that the sources of collective efficacy were different across athletes in two-person tasks and that perceptions of the collective abilities appeared to be akin to perceptions of individuals' abilities. Although there was not a formal leader in the dyads, the characteristics of the athlete controlling the performance seemed to reflect both partners' perceptions of the collective's performance abilities. When the group size was increased to four members, however, collective efficacy was mostly rated based on group membership and one's own abilities. Regarding group membership, this is typical of the literature to find members in high agreement of their group's collective abilities with variance being observed across groups (e.g., Myers et al., 2004, Myers et al., 2004). The finding that self-abilities were most utilized to make inferences about collective efficacy, provides support for previous arguments made about conceptual overlap between the self- and collective being prevalent in tasks of high interdependence (Katz-Navon & Erez, 2005).

Applied Implications

The findings of this thesis offer several implications for enhancing team sport performance. First, a catchall approach to athlete support within a team is not appropriate because, as the findings in this thesis indicate, athletes relate to the group in different ways. Second, it is important to identify the direction of influence in a task structure and how athletes relate to one another. Third, findings of this thesis have potentially identified a focus for effective interventions on efficacy beliefs. The identification that both partner's efficacy beliefs depend on the base (in two-person groups at least) point towards the provision of performance feedback that indicates the quality of the base's performance would be most effective at changing efficacy beliefs in the entire. This can be accomplished by training coaches to phrase their feedback to reflect the low-dependence (i.e., base) role more often. In consideration that completely ignoring the other athletes is likely associated with other negative outcomes, some balance is still warranted to have the most potential value to enhance the team's efficacy beliefs.

It may also be of use to have athletes indicate their awareness and perceptions of dependencies. For those in a high-dependence role, it may be frustrating to receive criticism when there is very little that athlete can actually do because of his/her role on the team. As seen in this thesis, the quality of the flyer's performance was most indicative of the how the dyad performed from an observer's perspective. This might cause increased criticism of the flyer from outside observers (e.g., coach, teammates). The role most in control of the performance, however was the base. So, the situation invites an increase in feedback to the flyer even though her partner (i.e., the base) is likely the one who's performance is in most control of her and the group's performance quality. This could be combated by increasing athlete and coach discussions about dependencies and role relations. Providing role clarity for coaches and athletes would be useful to decrease the likelihood of blaming an athlete for an uncontrollable part of her or her performance role. Relatedly, Gibson and Vermeulen (2003) found that subgroups can be facilitative for performance. The presence of subgroups is common to larger sized teams (e.g., American football, soccer, etc.) so future investigation into perceptions within and across subgroups would have wide application for team sport performance.

Strengths

There were several strengths of this thesis. Three of these are discussed below. First, the use of dyadic statistical analyses was novel and advanced, requiring the integration of several measurement strategies. In Study 2, the use of the Social Relations Model was followed up with three-way mixed-model ANOVAs. In Study 3, the Actor-Partner Interdependence path models were followed up with analyses of residualized scores within those path models. Study 4a, then examined base-flyer dyads in which the bases were examined separately and as an aggregated unit. Study 4b, extended the Social Relations Model to examine a group of four persons.

Second, the assertions of athlete role and task structure were examined with intact athlete groups and meaningful performance tasks. The ecological validity of these findings provides a strength in the applications of these findings and the understanding of dependence in real-world settings. The studies were also designed to replicate athletic performance situations. The switching of partners and repeated performances are regular occurrences for athletes working with others. Relatedly, the samples of these studies were befitting of the research questions. Specifically, the cheerleaders' performance roles were well-suited for an investigation into performance roles in interdependent tasks, especially for Studies 1-3 that included elite-level competitive cheerleaders.

Third, objective measures of performance were a strength for an investigation of efficacy and performance. Often studies using psychological measures have measurement biases such as common-method variance and problems of endogeneity biases. Some researchers (e.g., Arthur, Bastardoz, & Eklund, 2017) suggest that this impedes current understanding of the relationships among variables. Objective measures, such as those employed in this thesis, are required to meaningfully advance theoretical contentions.

Limitations

There were several limitations to the studies in this thesis and the three most imperative to theory are discussed. First, a limitation that requires further attention is the potential confound between athlete gender and role that occurred in these studies. Study 4 was designed to tease apart this potential confound by examining all-female cheerleading groups. However, the all-female stunt tasks were not an identical replication task. Potential group influences introduced in the four-person tasks made the conclusions about role across two and our person tasks ambiguous (i.e., the opposite profiles that were presented for bases in a two-person versus a four-person group). Relatedly, there are likely many personal and dyad characteristics that likely impact on efficacy beliefs and it is difficult to account for everything. Two of these characteristics, task difficulty and larger group size, did in fact influence how athletes related to one another through efficacy beliefs. Future research is needed to clarify the individual and team characteristics that influence athletes' perceptions.

Second, these studies have provided some evidence that examining the partner has important implications, but the findings are limited to descriptive inferences. The link between dependence and efficacy perceptions has not been tested as a causal relationship. These studies being of a descriptive design, have only demonstrated that dependence is worth further investigation. Finally, none of these studies were experimental so the implications of role can only be inferred.

Third, although single-item measures were appropriate given the practical considerations of these studies designs, there are no available reliability statistics to report about the psychological measures. The use of single-item measures is often viewed by researchers as an inadequate measure because without evidence for a psychological measure's reliability, the validity of the measure may be questioned. Use of single-item measures, however, has gained some popularity with emerging evidence supporting the use of single-item measures when appropriate. In fact, a single-item stem for measuring collective efficacy has been recently validated by Bruton et al. (2016). Participant burden in repeated measures designs is an important concern, but there should be some steps to provide more substantial measures of efficacy beliefs to help contextualize the findings in the future.

Future Research Directions

This section includes a list of future research directions that stem from the findings in this thesis. Before presenting these directions, it is first important to note that there are endless opportunities to utilize dyad statistical models in sport psychology given that athletes are hardly ever in isolation from others. Not only are there many types of dyads (e.g., parent-athlete, consultant-athlete, athletenonathlete peers, coaching pairs) and small groups (e.g., family with athlete/mother/father/sibling, support team with athlete/coach/trainer, coaching team with head coach/assistant coach/strength coach) available for study but there are many relational perceptions worth investigation (e.g., cooperation, conflict, sympathy). The following list, however, remains specific to clarifying the findings on efficacy beliefs in interdependent settings from these studies.

1. Failure is an inevitable part of a goalie's role in a soccer team. It would be interesting to investigate the goalie's RISE perceptions subsequent to giving up a goal because RISE is argued to augment self-efficacy and have especially positive outcomes during negative experiences of low-self-efficacy. Such an investigation would provide context for which RISE can be examined in failure.
2. Dunlop et al. (2011) provided experimental evidence of the effects of other-efficacy on personal performance accomplishments. Their feedback manipulation, however included collective performance feedback without measurements of collective efficacy. In line with the findings that collective beliefs are simultaneously formed alongside relational beliefs, a simple extension/replication of Dunlop et al.'s (2011) coactive paired-dancing task experiment can be directed towards adding collective efficacy beliefs.
3. Communication was only briefly examined in Study 3, with the results indicating communication increased athletes' efficacy beliefs. As suggested by athletes (Jackson et al., 2008), strong beliefs in a partner's abilities will to some extent determine how much you might listen to you partner. To extend the findings in Study 3, where no restrictions on communication content were implemented, future studies with more controlled communications and/or content manipulations on agency level in attributions, decision making, communication patterns provide a wealth of research with applied implications for team athletes.
4. Social loafing, has negative effects on individual effort in a group. The effects of other-efficacy on personal effort suggest that believing highly in a partner can be motivating (e.g., Köhler effect). An investigation of efficacy beliefs could potentially provide avenues for

minimizing effects of social loafing.

5. Other behavioral outcomes would provide clarification in the way perceptions may affect behaviors within a relationship because efficacy beliefs are a driver or motivation, effort, and thought patterns.
6. Performances in this study were associated with aesthetic qualities of the performers. Other performance measures/outcomes that are less subject to personal biases would support the current findings. Time in a boat race, for example, is an unambiguous performance criterion that could be measured across repeated performances of different two-person crew combinations in line with a Social Relations Model analysis. This group-level determinant could then be linked to the extent boat race-times change with new partners.
7. Subgroups of various size will exist within a team. Group size effects and effects of sub-groups within groups would provide clarity in the initial assertions of the effects subgroup membership has on one's perceptions of others.
8. Manipulations of task structure, dyadic relations, and athlete role would designate the generalizability of the current findings and indicate nuances across different contexts. This direction would refine implications for efficacy theory initially observed in this thesis.
9. Finally, there are potential links to other domains such as health, military, and police that broaden the scope of potential future research to areas beyond sport.

Significance and Contribution

This thesis has provided several contributions to the field of sport psychology. Broadly, there was a contribution of knowledge regarding methodological approaches appropriate for investigating dyads. Most obvious perhaps, is providing the first documented answer to Jackson et al.'s (2015) call for use of the Social Relations Model in sport psychology (Chapters 4 and 6). Employing the Social Relations Model has provided knowledge about what this model does, how it can be employed in groups of two and four persons, and the value of the types of conclusions that can be made from this model for theory-testing.

Relatedly, the performance measure provided a new solution to a known problem of measuring athletes' individual-level performances within a highly interdependent task. The value of the dual-level solution was evidenced by comparing it to aggregation scores. This performance measurement not only contributes a reliable performance measure, but a provides a conceptual framework for examining dyadic performance.

It is relatively well-known that there is conceptual overlap and parallels across efficacy constructs. So, this thesis was not the first investigation to include multiple efficacies in the same performance setting. Previous investigations have examined (a) self-efficacy and collective efficacy (e.g., Feltz & Lirgg, 1998) and (b) the relational efficacy framework incorporating self-efficacy, other-efficacy, and RISE (e.g., Jackson et al., 2007). This thesis was, however, novel in that self, relational, and collective efficacy beliefs were investigated simultaneously. This provided new knowledge about all three levels of agency, which is significant to the updating and integrating of efficacy theories.

This thesis was also not the first to examine efficacy beliefs in relation to athlete role and task structure (e.g., Bray, et al., 2002). In sport psychology, however, it has been mostly assumed that athletes cannot be distinguishable members of a dyad because there lacks a formal leader-subordinate structure, as is observed in coach-athlete relationships. Gaudreau et al. (2010) indicated that performance roles can distinguish athletes from one another. This thesis contributed to that argument with new evidence for the implications of dependence, a feature of athletes' performance roles, on athlete performance and efficacy beliefs.

Conclusions

The findings in this thesis extend previous understanding of interdependent teams. Dyadic perspectives employed throughout the four studies provided clarification to the research problem of how structured interactions regulate athletes' behavioral and psychological functioning (Snyder & Stukas, 1999). The findings of this thesis can be reduced to two key take-away messages. First, structure of a team-task and one's role in the team-task influence how athletes perceive and are perceived relative to self, relational, and collective abilities. Second, the extent athletes' perceptions relate to personal and team outcomes is determined, at least in part, by the structures, dependencies, and roles within their team.

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APPENDIX A

INDIVIDUAL PERFORMANCE CRITERIA FOR STUDY 1

FLYERS

During Entrance:

Arms- arms should be fully extended down, next to body during the toss

(-1) arms did not fully extend for flick, flick was not straight down

(-2) spinning stunts were initiated early/ using shoulders, early flick

(-3) flick immediately off the ground

Core- core should be tight and the body line should not be broken, shoulders and hips in line

(-1) shoulders/chest comes forward in the dip, flyer is not lifting through flick

(-2) the flick occurs with her shoulders forward or backward

(-3) her hips are not spinning with her shoulders, shoulders are forward through entire toss

Legs- jump should be explosive (fast, fully extended legs) and powerful off the ground

(-1) slow off the ground

(-2) dips, but does not jump with power (change in direction is not fluid)

(-3) no power and/or slow, does not dip with legs and does not explode from bottom

During Middle Position:

Arms- weight should be lifted through the shoulders to the center and shoulders should be rolled back, parallel to ground, arms should not be used to balance

(-1) wrong motion, late motion, shoulders are not lifted but they are tight

(-2) balance check with arms placement jerking briefly

(-3) swinging around, used for constant balance

Core- core should be engaged and hips should remain parallel to floor, no arching of back, hips in line

(-1) correct body position but not lifting through core

(-2) hip check, arch of back, brief loss of core control

(-3) hips are never even or tight, she appears to be balancing herself

Legs-legs should be straight and not placed wider than shoulder width apart in two legged stunt, and should be placed in the center for one legged stunts

(-1) legs are not exactly straight but have tension in them, relaxed

(-2) obvious bend of the legs, leg bends when a one leg position is pulled, and stability is impaired briefly, brief kick of leg

(-3) collapses, feet are placed too wide or not in the center

During Dismount:

Arms- clean straight arms by her side that then catch the partner's wrists to support her weight/speed to the floor

(-1) shoulders are not used to lift off base, arms are not cleanly to sides before catching wrists of base

(-2) sloppy clean, barely getting to wrists, not resisting weight/speed to floor, initiates spin before pop-off

(-3) never cleans or lifts through pop-off, misses wrists completely, uses shoulders to spin causing her to come down at an angle

Core- remain tight with even hips, toes should be slightly in front of line on the way to the floor

(-1) comes down in "L" position, or straight down (toes not in front of her)

(-2) hip jolts out of line during initiation of dismount, spinning is in two parts, crank for spin

(-3) loose on the way down, spins are not completed

Legs- legs should be straight and together, used to absorb weight once on the floor

(-1) legs are apart, relaxed

(-2) legs bend during dip/pop-off, does not absorb weight

(-3) jumps off base, bottoms out and falls on floor

BASES:

During Entrance:

Arms- arms should be fully extended when the flick occurs and arms should remain above head ready for catch

(-1) does not toss at top, tosses in front of face, does not keep hands up ready for the catch

(-2) flicks early, hands flick out

(-3) flicks extremely early, or outward so as to catch feet before throwing (cuts off jump/power)

Core- should be engaged and hips should not come in front of toes

(-1) bends forward for dip at waist (drops chest)

(-2) uses back to throw

(-3) only depends on back to throw, arches through toss

Legs- knees should face forward, legs are explosive and powerful, jumping through toss

(-1) legs are not utilized to full potential, does not jump through toss

(-2) knees are facing out, legs are slow

(-3) legs are not powerful or fully extended

During Middle Position:

Arms- locked out and driving up, shoulders shrugging up and pushing towards ceiling

(-1) does not continue to drive up with arms, arms may bend but straighten

(-2) shoulders settle, arms remain slightly bent, but stable, grip is bad (half foot is covered with hand/s), arms go super wide briefly

(-3) stunt comes below eye level, or distinct level change, gives out, unstable, grip is awful (less than half the foot is covered with hand/s)

Core- engaged with straight line, hips and core should be in line, lifting up

(-1) relaxed, loose, settled position, not lifting up towards ceiling, can hold a stable arch or uneven weight (bad form but doesn't move)

(-2) briefly arched but return to center line

(-3) back arched through entire stunt (moves around in bad form)

Legs-absorb as needed, placement of legs should be just outside of shoulders with knees forward, staying in same spot

(-1) stance is too wide or narrow, legs are not utilized to absorb, one step, briefly unstable ,

(-2) small, unnecessary steps are taken and stunt remains in air (3-5 steps), unstable

(-3) lots of unnecessary steps are taken, does not save stunt (6+ steps), never in one place

During Dismount:

Arms- should remain locked until top of pop-off, catches partner's hips with extended arms, and slows down her weight/speed with arms

(-1) shoulders are not shrugged for high pop-off, not fully extended

(-2) does not slow down partner's speed/weight, arms bend slightly for pop-off, very little pop

(-3) uses arms to pop-off, sweeping feet off, no pop that leads to swept feet

Core- stays in line and engaged, shoulders do not come in front of hips

(-1) weight is not evenly dispersed from left and right hips

(-2) catches flyer and bends at waist to slow her down

(-3) uses back to pop-off (arches)

Legs- legs are used to initiate dismount and to absorb weight/speed of partner to the ground

(-1) legs are slow during dip, no explosive drive through top, uneven weight

(-2) legs bend but there is no up, speed, direction change is slow, steps forward a lot to catch

(-3) legs never bend for the pop-off, or the catch

APPENDIX B

STUDY 2 EXAMPLE QUESTIONNAIRE PACKET

CONSENT BY PATIENT/VOLUNTEER TO PARTICIPATE IN:

...

Name of Patient/Volunteer:
..

Name of Study: **One-with-many partners: An investigation of efficacy and performance**

Principal Investigator: **Christine Habeeb**

I have read the patient/volunteer information sheet on the above study and have had the opportunity to discuss the details with Christine Habeeb and ask questions. The principal investigator has explained to me the nature and purpose of the tests to be undertaken. I understand fully what is proposed to be done.

I have agreed to take part in the study as it has been outlined to me, but I understand that I am completely free to withdraw from the study or any part of the study at any time I wish. I understand and agree that my participation in the study is entirely at my own risk.

I understand that these trials are part of a research project designed to promote scientific knowledge, which has been approved by the Sports Studies Ethics Committee, and may be of no benefit to me personally. The Sports Studies Ethics Committee may wish to inspect the data collected at any time as part of its monitoring activities.

I hereby fully and freely consent to participate in the study which has been fully explained to me.

Signature of Patient/Volunteer:
...

Date: ....

I confirm that I have explained to the patient/volunteer named above, the nature and purpose of the tests to be undertaken.

Signature of Investigator:
..

Date : ....

INFORMATION SHEET
One-with-many partners: An investigation of efficacy and performance

Background Information:
The purpose of this study is to understand how confidence is related to performance with different partners.

Procedures:
If you agree to be in this study, we ask that you do the following:

- Perform 12 basic skills
- Complete simple questions about your confidence in yourself and your partners
- Self-appraise each performance
- Agree to have your skills video recorded for later analyses

Risk and Benefits:
The study introduces no additional risks to a typical practice. By participating, you will be asked to rate your confidence level and performance quality for yourself and your partner. Some may find this difficult to do but the likelihood of this being detrimental to performance is very small.

There are no direct benefits to participation.

Compensation:
There is no compensation for participation.

Confidentiality:
The records of this study will be kept private and confidential to the extent permitted by law. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. All video used for data analyses will be kept confidential to the same standards as responses to the questionnaires.

Partner: _________

Skill: ______________________________

Please rate the following:

	Not At All					Moderately					Completely
To what extent are you confident in **YOUR** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in your **PARTNER's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in **YOU AND YOUR PARTNER's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10

Partner: _________

Skill: ______________________________

Please describe the performance:

____

____

____

Please rate the following:

	Not At All					Moderately					Completely
To what extent was **YOUR** performance successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **PARTNER's** performance successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was **YOU AND YOUR PARTNER's** performance successful?	0	1	2	3	4	5	6	7	8	9	10

APPENDIX C

SUPPLEMENTAL MATERIALS FOR STUDY 2:

Table S1. Means, standard deviations, range, and skewness values for efficacy beliefs, subjective performance, and objective performance variables.

	Base				Flyer			
	M	SD	Range	Skew	M	SD	Range	Skew
Self-Efficacy								
Task 1	9.59	1.04	4-10	-3.20	9.69	0.72	6-10	-2.69
Task 2	9.00	1.72	3-10	-1.91	9.37	1.19	4-10	-2.16
Task 3	8.56	2.28	0-10	-1.96	9.13	1.30	3-10	-1.83
Task 4	8.02	2.93	0-10	-1.60	8.82	1.79	1-10	-2.09
Other-Efficacy								
Task 1	9.50	1.10	5-10	-2.40	9.29	1.43	1-10	-2.74
Task 2	9.03	1.61	2-10	-1.80	8.81	1.83	0-10	-2.20
Task 3	9.00	1.80	2-10	-2.13	8.48	1.94	0-10	-1.61
Task 4	8.64	2.23	0-10	-2.08	8.05	2.58	0-10	-1.52
Collective Efficacy								
Task 1	9.46	1.15	3-10	-2.79	9.09	1.44	2-10	-2.02
Task 2	8.69	1.74	2-10	-1.45	8.58	1.93	1-10	-1.94
Task 3	8.40	2.20	0-10	-1.84	8.25	1.90	0-10	-1.37
Task 4	7.82	2.78	0-10	-1.36	7.75	2.55	0-10	-1.24
Self-Performance								
Task 1	9.16	2.03	0-10	-3.44	9.39	1.16	1-10	-3.61
Task 2	8.29	2.43	0-10	-1.72	8.99	1.89	0-10	-2.91
Task 3	7.61	3.21	0-10	-1.31	8.53	2.30	0-10	-2.14
Task 4	7.43	3.43	0-10	-1.05	8.32	2.55	0-10	-1.92
Other-Performance								
Task 1	9.51	1.42	0-10	-4.69	8.99	1.89	0-10	-2.89
Task 2	8.92	1.88	2-10	-1.81	8.61	2.15	0-10	-2.12
Task 3	8.70	2.33	0-10	-2.16	8.13	2.58	0-10	-1.55
Task 4	8.55	2.45	0-10	-1.84	7.80	3.07	0-10	-1.38
Collective Performance								
Task 1	9.22	2.02	0-10	-3.58	9.01	2.06	0-10	-3.31
Task 2	8.31	2.44	0-10	-1.68	8.41	2.53	0-10	-2.05
Task 3	7.67	3.14	0-10	-1.34	8.05	2.70	0-10	-1.64
Task 4	7.46	3.49	0-10	-1.10	7.56	3.34	0-10	-1.28
Objective Performance								
Task 1	-7.42	3.87	-23--1	-1.43	-4.09	3.58	-23-0	-3.04
Task 2	-8.90	4.33	-24-0	-0.76	-4.63	3.45	-23-0	-2.40
Task 3	-11.10	5.35	-25--1	-0.72	-5.85	4.24	-21-0	-1.15
Task 4	-12.10	5.84	-24-0	-0.39	-6.41	4.41	-21-0	-0.99

Note. The reported means are a product of each participant (n = 51 bases, 51 flyers) reporting three observations (n = 153 bases, 153 flyers).

Table S2. Absolute and relative variance component means of efficacy beliefs for the bases and flyers.

		Bases' Variance Components				Flyers' Variance Components			
Variable	Task(s)	Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Efficacy									
	Task 1	.32 (.30)	.23 (.22)	.50 (.48)		.41 (.79)	.01 (.02)	.10 (.19)	
	Task 2	2.60 (.83)	.08 (.03)	.45 (.14)		.79 (.62)	.06 (.05)	.42 (.33)	
	Low-difficulty	**.78 (.36)**	**.10 (.05)**	**.09 (.04)**	**1.22 (.56)**	**.47 (.52)**	**.00 (.00)**	**.06 (.07)**	**.37 (.41)**
	Task 3	4.43 (.87)	.01 (.00)	.66 (.13)		1.27 (.78)	.03 (.02)	.33 (.20)	
	Task 4	7.94 (.87)	.20 (.02)	1.01 (.11)		1.54 (.50)	.30 (.10)	1.26 (.41)	
	High-difficulty	**5.54 (.75)**	**.07 (.01)**	**.29 (.04)**	**1.49 (.20)**	**1.27 (.52)**	**.08 (.03)**	**.30 (.12)**	**.81 (.33)**
Other-Efficacy									
	Task 1	.29 (.24)	.45 (.38)	.46 (.38)		.22 (.10)	1.28 (.55)	.81 (.35)	
	Task 2	.57 (.26)	.83 (.38)	.80 (.36)		.61 (.17)	2.01 (.57)	.89 (.25)	
	Low-difficulty	**.39 (.21)**	**.54 (.29)**	**.21 (.11)**	**.73 (.39)**	**.34 (.11)**	**1.54 (.51)**	**.42 (.14)**	**.72 (.24)**
	Task 3	1.14 (.37)	.67 (.22)	1.26 (.41)		.24 (.06)	2.65 (.64)	1.24 (.30)	
	Task 4	2.40 (.53)	1.06 (.23)	1.08 (.24)		.40 (.06)	5.14 (.71)	1.67 (.23)	
	High-difficulty	**1.63 (.41)**	**.92 (.23)**	**.61 (.15)**	**.84 (.21)**	**.47 (.08)**	**3.65 (.60)**	**.68 (.11)**	**1.32 (.22)**
Collective Efficacy									
	Task 1	.47 (.34)	.18 (.13)	.73 (.53)		.44 (.21)	.82 (.38)	.87 (.41)	
	Task 2	1.32 (.47)	.69 (.25)	.80 (.28)		.61 (.18)	1.33 (.39)	1.48 (.43)	
	Low-difficulty	**.62 (.27)**	**.36 (.16)**	**.26 (.11)**	**1.04 (.46)**	**.40 (.13)**	**1.08 (.36)**	**.41 (.13)**	**1.15 (.38)**
	Task 3	2.91 (.64)	.65 (.14)	.96 (.21)		.65 (.19)	1.63 (.47)	1.20 (.34)	
	Task 4	5.44 (.72)	.92 (.12)	1.22 (.16)		1.24 (.18)	3.92 (.58)	1.56 (.23)	
	High-difficulty	**3.70 (.60)**	**.63 (.10)**	**.58 (.09)**	**1.28 (.21)**	**.91 (.17)**	**2.59 (.48)**	**.61 (.11)**	**1.32 (.24)**

Note. The relative variances are reported in parentheses. Low-difficulty = Tasks 1, 2. High-difficulty = Tasks 3, 4.

Table S3. Absolute and relative variance component means of subjective and objective performances for base and flyer.

		Bases' Variance Components				Flyers' Variance Components			
Variable	Task(s)	Actor	Partner	Relationship	Error	Actor	Partner	Relationship	Error
Self-Performance									
	Task 1	.52 (.14)	.00 (.00)	3.32 (.86)		.17 (.18)	.08 (.08)	.72 (.74)	
	Task 2	2.35 (.41)	.90 (.16)	2.54 (.44)		.30 (.09)	.34 (.11)	2.57 (.80)	
	Low-difficulty	**1.22 (.22)**	**.49 (.09)**	**.89 (.16)**	**2.99 (.53)**	**.27 (.10)**	**.28 (.11)**	**.17 (.06)**	**1.94 (.73)**
	Task 3	6.23 (.62)	.46 (.05)	3.41 (.34)		.75 (.14)	1.24 (.23)	3.29 (.62)	
	Task 4	8.74 (.73)	.00 (.00)	3.29 (.27)		.26 (.04)	2.73 (.40)	3.88 (.56)	
	High-difficulty	**7.74 (.61)**	**.67 (.05)**	**.96 (.08)**	**3.37 (.26)**	**.62 (.09)**	**1.97 (.29)**	**1.89 (.28)**	**2.21 (.33)**
Other-Performance									
	Task 1	.02 (.01)	.00 (.00)	2.11 (.99)		.00 (.00)	.65 (.19)	2.82 (.81)	
	Task 2	.83 (.23)	.95 (.26)	1.82 (.51)		.64 (.17)	1.27 (.33)	1.90 (.50)	
	Low-difficulty	**.37 (.11)**	**.37 (.11)**	**.73 (.22)**	**1.83 (.55)**	**.29 (.07)**	**1.11 (.27)**	**.52 (.12)**	**2.25 (.54)**
	Task 3	1.29 (.25)	1.26 (.24)	2.64 (.51)		.32 (.04)	3.96 (.53)	3.23 (.43)	
	Task 4	2.88 (.48)	.47 (.08)	2.60 (.44)		.88 (.08)	6.60 (.61)	3.32 (.31)	
	High-difficulty	**2.02 (.32)**	**.87 (.14)**	**1.20 (.19)**	**2.14 (.34)**	**.59 (.06)**	**4.96 (.51)**	**2.00 (.20)**	**2.23 (.23)**
Collective Performance									
	Task 1	.20 (.05)	.00 (.00)	4.13 (.95)		.00 (.00)	.90 (.20)	3.56 (.79)	
	Task 2	2.15 (.37)	1.20 (.21)	2.50 (.43)		.13 (.02)	1.96 (.37)	3.27 (.61)	
	Low-difficulty	**.96 (.17)**	**.49 (.09)**	**1.10 (.20)**	**3.09 (.55)**	**.23 (.04)**	**.91 (.17)**	**1.18 (.21)**	**3.19 (.58)**
	Task 3	3.96 (.41)	.87 (.09)	4.93 (.51)		.46 (.06)	3.36 (.43)	3.92 (.51)	
	Task 4	7.77 (.62)	.53 (.04)	4.25 (.34)		1.06 (.09)	6.31 (.53)	4.47 (.38)	
	High-difficulty	**5.92 (.45)**	**1.09 (.08)**	**1.26 (.10)**	**4.79 (.37)**	**.54 (.05)**	**4.63 (.43)**	**1.89 (.18)**	**3.73 (.35)**
Objective Performance									
	Task 1	7.49 (.49)	.00 (.00)	7.79 (.51)		.74 (.06)	3.49 (.28)	8.31 (.66)	
	Task 2	7.07 (.40)	2.36 (.13)	8.19 (.46)		.74 (.07)	3.00 (.27)	7.31 (.66)	
	Low-difficulty	**5.32 (.25)**	**.89 (.04)**	**1.20 (.06)**	**13.48 (.65)**	**.53 (.04)**	**2.66 (.21)**	**1.93 (.16)**	**7.31 (.59)**
	Task 3	10.37 (.44)	.74 (.03)	12.62 (.53)		2.09 (.12)	6.04 (.36)	8.80 (.52)	
	Task 4	15.52 (.54)	1.24 (.04)	11.91 (.42)		.46 (.03)	5.76 (.33)	11.17 (.64)	
	High-difficulty	**13.75 (.43)**	**2.53 (.08)**	**5.27 (.17)**	**10.22 (.32)**	**2.21 (.10)**	**6.88 (.32)**	**2.75 (.13)**	**9.77 (.45)**

Note. The relative variances are reported in parentheses. Low-difficulty = Tasks 1, 2. High-difficulty = Tasks 3, 4.

APPENDIX D

STUDY 3 EXAMPLE QUESTIONNAIRE PACKET

CONSENT BY PATIENT/VOLUNTEER TO PARTICIPATE IN:

...

Name of Patient/Volunteer:
...

Name of Study: **A point-by-point analysis of efficacy and performance**

Principal Investigator: **Christine Habeeb**

I have read the patient/volunteer information sheet on the above study and have had the opportunity to discuss the details with Christine Habeeb and ask questions. The principal investigator has explained to me the nature and purpose of the tests to be undertaken. I understand fully what is proposed to be done.

I have agreed to take part in the study as it has been outlined to me, but I understand that I am completely free to withdraw from the study or any part of the study at any time I wish. I understand and agree that my participation in the study is entirely at my own risk.

I understand that these trials are part of a research project designed to promote scientific knowledge, which has been approved by the Sports Studies Ethics Committee, and may be of no benefit to me personally. The Sports Studies Ethics Committee may wish to inspect the data collected at any time as part of its monitoring activities.

I hereby fully and freely consent to participate in the study which has been fully explained to me.

Signature of Patient/Volunteer:
...

Date: ....

I confirm that I have explained to the patient/volunteer named above, the nature and purpose of the tests to be undertaken.

Signature of Investigator:
...

Date : ....

INFORMATION SHEET
A point-by-point analysis of efficacy and performance

Background Information:
The purpose of this study is to understand how confidence is related to performance with different partners.

Procedures:
If you agree to be in this study, we ask that you do the following:

- Perform 5 skills
- Complete simple questions about your confidence in yourself and your partners
- Self-appraise each performance
- Agree to have your skills video recorded for later analyses

Risk and Benefits:
The study introduces no additional risks to a typical practice. By participating, you will be asked to rate your confidence level and performance quality for yourself and your partner. Some may find this difficult to do but the likelihood of this being detrimental to performance is very small.

There are no direct benefits to participation.

Compensation:
There is no compensation for participation.

Confidentiality:
The records of this study will be kept private and confidential to the extent permitted by law. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. All video used for data analyses will be kept confidential to the same standards as responses to the questionnaires.

Skill: ______________________________

Please rate the following:

	Not At All				Moderately					Completely	
To what extent are you confident in **YOUR** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in your **PARTNER's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in **YOU AND YOUR PARTNER's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10

Skill: ______________________________

Please rate the following:

	Not At All				Moderately					Completely	
To what extent was **YOUR** performance successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **PARTNER's** performance successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was **YOU AND YOUR PARTNER's** performance successful?	0	1	2	3	4	5	6	7	8	9	10

APPENDIX E

STUDY 4 EXAMPLE QUESTIONNAIRE PACKET (BACK BASE)

INFORMATION SHEET
One-with-many partners: An investigation of efficacy and performance

Background Information:
The purpose of this study is to understand how confidence is related to performance with different partners.

Procedures:
If you agree to be in this study, we ask that you do the following:

- Perform 6 basic stunts
- Complete simple questions about your confidence in yourself and your partners
- Self-appraise each performance
- Agree to have your skills video recorded for later analyses

Risk and Benefits:
The study has little risk. By completing the survey, you will be asked to rate your confidence level in yourself and your partner. Some may find this difficult to do but the likelihood of this being detrimental to performance is very small.

There are no direct benefits to participation.

Compensation:
There is no compensation for participation.

Confidentiality:
The records of this study will be kept private and confidential to the extent permitted by law. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. All video used for data analyses will be kept confidential to the same standards as responses to the questionnaires.

CONSENT BY PATIENT/VOLUNTEER TO PARTICIPATE IN:

..

Name of Study: **One-with-many partners: An investigation of efficacy and performance**

Principal Investigator: **Christine Habeeb**

I have read the patient/volunteer information sheet on the above study and have had the opportunity to discuss the details with Christine Habeeb and ask questions. The principal investigator has explained to me the nature and purpose of the tests to be undertaken. I understand fully what is proposed to be done.

I have agreed to take part in the study as it has been outlined to me, but I understand that I am completely free to withdraw from the study or any part of the study at any time I wish. I understand and agree that my participation in the study is entirely at my own risk.

I understand that these trials are part of a research project designed to promote scientific knowledge, which has been approved by the Sports Studies Ethics Committee, and may be of no benefit to me personally. The Sports Studies Ethics Committee may wish to inspect the data collected at any time as part of its monitoring activities.

I hereby fully and freely consent to participate in the study which has been fully explained to me.

Signature of
Patient/Volunteer:...

Print Name of
Patient/Volunteer:...

Date: ....

I confirm that I have explained to the patient/volunteer named above, the nature and purpose of the tests to be undertaken.

Signature of
Investigator:...

Date :
...

1. Age:

I am ______ years of age

2. Experience with sport:

I have ______ years of experience in cheerleading (approximately).
I have ______ years of experience with all-girl stunting (approximately).
I have ______ years of experience on this team (approximately).

3. For the remaining questions, please circle a number to indicate your choice.

Take into account all your experiences with Skill 1 (________________):

A. To what extent are you experienced with this skill?

0	1	2	3	4	5	6	7	8	9	10
Not Experienced					**Moderately Experienced**					**Extensively Experienced**

B. For this study, you will attempt this skill 3 times with the flyer rotating across the groups. With this in mind, how many of the attempts (out of 3) will you perform *successfully* in this study?

Successful attempts = 0 1 2 3

Take into account all your experiences with Skill 2 (________________):

A. To what extent are you experienced with this skill?

0	1	2	3	4	5	6	7	8	9	10
Not Experienced					**Moderately Experienced**					**Extensively Experienced**

B. You will attempt this skill 3 times with the flyer rotating across the groups. With this in mind, how many of the attempts (out of 3) do you believe you will perform *successfully* in this study?

Successful attempts = 0 1 2 3

4. For the remaining questions, please circle a number to indicate your response to each question…

*Take into account all your stunting experiences with the **Flyer**:*

A. To what extent are you experienced in stunting with this person?

0	1	2	3	4	5	6	7	8	9	10
Not Experienced					**Moderately Experienced**					**Extensively Experienced**

B. To what extent do you believe your experiences with this person will impact your performance of the skills in this study?

0	1	2	3	4	5	6	7	8	9	10
Will Not Impact					**Will Moderately Impact**					**Will Completely Impact**

*Take into account all your stunting experiences with the **Main Base**:*

A. To what extent are you experienced in stunting with this person?

0	1	2	3	4	5	6	7	8	9	10
Not Experienced					**Moderately Experienced**					**Extensively Experienced**

B. To what extent do you believe your experiences with this person will impact your performance of the skills in this study?

0	1	2	3	4	5	6	7	8	9	10
Will Not Impact					**Will Moderately Impact**					**Will Completely Impact**

*Take into account all your stunting experiences with the **Side Base**:*

A. To what extent are you experienced in stunting with this person?

0	1	2	3	4	5	6	7	8	9	10
Not Experienced					**Moderately Experienced**					**Extensively Experienced**

B. To what extent do you believe your experiences with this person will impact your performance of the skills in this study?

0	1	2	3	4	5	6	7	8	9	10
Will Not Impact					**Will Moderately Impact**					**Will Completely Impact**

Rotation 1, Stunt 1: Flyer ____with Base Group ___

A. Please rate how confident you are in each person's ability to perform the skill:

	Not At All Confident					*Moderately Confident*					*Completely Confident*
To what extent are you confident in **YOUR** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in your **FLYER's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in your **MAIN BASE's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent are you confident in your **SIDE BASE's** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10

B. Please rate how confident each person is in your ability to perform the skill:

	Not At All Confident					*Moderately Confident*					*Completely Confident*
To what extent is your **FLYER** confident in ***your*** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent is your **MAIN BASE** confident in ***your*** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10
To what extent is your **SIDE BASE** confident in ***your*** ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10

C. Please rate how confident you are in the group's collective ability to perform the skill:

	Not At All Confident					*Moderately Confident*					*Completely Confident*
To what extent are you confident in your **GROUP's** collective ability to perform the skill?	0	1	2	3	4	5	6	7	8	9	10

Rotation 1, Stunt 1: Flyer ____with Base Group ___

Please rate the performance:

	Not At All Successful					*Moderately Successful*					*Completely Successful*
To what extent was **YOUR** performance of the skill successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **FLYER's** performance of the skill successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **MAIN BASE's** performance of the skill successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **SIDE BASE's** performance of the skill successful?	0	1	2	3	4	5	6	7	8	9	10
To what extent was your **GROUP's** collective performance of the skill successful?	0	1	2	3	4	5	6	7	8	9	10