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**AN INVESTIGATION OF THE  
PREDICTORS OF COLLECTIVE EFFICACY  
IN ELITE FEMALE ATHLETES:  
A MULTILEVEL ANALYSIS**

A thesis presented in partial fulfilment  
of the requirements for the degree of

Master of Science

in

Psychology

at Massey University, Albany,  
New Zealand.

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2000

## **Abstract**

The aim of the study was to investigate potential predictors of collective efficacy using Hierarchical Linear Modelling (HLM). HLM analyses both individual and player level effect simultaneously, and thus addresses the ongoing issue in collective efficacy research, namely the unit of analysis. The participants were 318 female elite level netball players from 31 teams. Participants were asked to complete a questionnaire within 24 hours of the start of one of two national level competitions. The questionnaire included a demographic section and four measures (i.e. Perceptions of Success, Sources of Sport Confidence, Group Environment Questionnaire, and a Collective Efficacy measure developed for the present study). The analysis consisted of building three different models, in which each conformed to the procedure suggested by Bryk and Raudenbush (1992). Results suggest that the team level predictors (mean team meetings and GEQ subscales) accounted for approximately 73 % of the variance in collective efficacy. Overall, mastery orientations of the POS (at the player level), length of time spent in team meetings, and team cohesion (GI-Task subscale) (at the team level) were found to be significant predictors of collective efficacy. The results do not support Spink (1990b) who found the social aspects of team cohesion to be related to collective efficacy, although these results may have been due to Type I error. However, the results support previous research by Paskevich, Brawley, Dorsch and Widmeyer (1999) who found task related aspects of team cohesion to be related to collective efficacy. In the present study, collective efficacy was found to be a team level characteristic, and psychologists should keep this in mind when developing and training sports teams.

## **Acknowledgements.**

I would first like to thank my supervisor, Dr Richard Fletcher, for his invaluable knowledge, support and enthusiasm over the last year. I would also like to thank my close friends and family, whose love, support and patience to listen encouraged me to continue trying when the going got tough. I would like to thank my parents especially for their efforts which enabled me to travel to the competitions to collect data.

A big thanks to Netball New Zealand who gave me access to the national level netball teams. Finally, I would like to thank Murray Armstrong, Frances Robinson and Lynnette Marchant for their unpaid help as data collectors.

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# Chapter One

## *Introduction.*

Over the last decade, researchers have investigated a group phenomenon known as collective efficacy, and have found it to be related to many other variables, with one in particular, group performance (e.g. Feltz & Lirgg, 1998; Prussia & Kinicki, 1996). The relationship between collective efficacy and group performance is of particular interest to psychologists in the sports domain, as high athlete performance is of major concern. As many sports become professional, and athletes are paid for their ability to perform, high performance and factors that lead to increases in performance becomes particularly important to all involved, including coaches, managers and athletes. Poor performance of a team can result in serious financial loss to the many people involved with that team, so it is very important for coaches and athletes to understand what factors can hinder or enhance team performance.

Bandura proposed the concept of collective efficacy as an extension of self-efficacy theory, which concerns peoples' beliefs about their capabilities to exercise control over events that affect their lives (Bandura, 1990). Collective efficacy differs in the level of organisation (i.e. is a group attribute), but both have similar sources, functions and operate through similar processes (Bandura, 1997). Collective efficacy can be defined as "a group's shared belief in its conjoint capabilities to organise and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 477). In other words, collective efficacy is the beliefs a group has about their combined capabilities in coordinating and performing specific tasks or abilities. Collective efficacy focuses on shared beliefs of competence, and thus there is a significant degree of interdependence among team member judgements (Zaccaro, Blair, Peterson & Zazanis, 1995). Therefore, measures of collective efficacy must also reflect this focus on shared beliefs (e.g. Short & Feltz, 2000).

In the sport context, collective efficacy has been found to be related to team performance (e.g. Bandura, 1997; Feltz & Lirgg, 1998; Spink, 1990b), increased level of team effort (Bandura, 1997), perseverance (Bandura, 1997), and goal achievement (e.g. Prussia & Kinicki, 1996). If teams with a high sense of collective efficacy perform better, then understanding what factors contribute to collective efficacy will have implications for development and training for all levels of team sports.

The research to date investigating the predictors of collective efficacy has found that prior performance and vicarious experiences (e.g. Bandura, 1997; Hodges & Carron, 1992), positive and negative team feedback (Prussia & Kinicki, 1996), goal setting (Spink, 1990a), and goal commitment (Bandura, 1997) all influence collective efficacy of a team to varying degrees. Although these constructs have all been found to be related to collective efficacy, the researchers have not addressed the key issue in group and collective efficacy research, that is, unit of analysis.

In many sports, athletes are nested within teams, thus forming a hierarchical structure. The issue surrounding this hierarchical structure is which level of analysis (player or team) to employ. Two statistical techniques that have been posited to take the hierarchical structure into account, have now been questioned (de Leeuw, 1992). The first of these techniques was to disaggregate all team level variables to the individual level. The problem with this approach is that we know players in the same team have the same value for each of the team level variables. Therefore, the assumption of independence of observations that is applied in classical statistical techniques cannot be used (de Leeuw, 1992). The second technique was to carry out the analysis on the higher level by aggregating the player level variables to the team level. The main concern with this is that all within-group variation is thrown away. This could be as much as 80 to 90 % of the total variation before the analysis has even begun (de Leeuw, 1992). The outcome of aggregating player level variables is that relationships between aggregated variables are often much stronger and could also be very different from the relationships between the non-aggregated variables (de Leeuw, 1992). In other words, information is wasted and relationships are distorted in the attempt to interpret the aggregate

analysis on the player level. Therefore, aggregation and disaggregation are both unsatisfactory techniques for analysing hierarchical data (de Leeuw, 1992).

Collective efficacy research in the past has tended to analyse data at the individual (player) level, and then aggregate to the group (team) level (Moritz & Watson, 1998), resulting in loss of information, distorted information, and violations of the assumption of independence of observations (de Leeuw, 1992). Kenny and LaVoie (1985) proposed one method that can be used to simultaneously assess individual and team level effects. This method involves estimating correlations at the two levels of analysis, and testing these correlations for evidence of nonindependence. If independence was indicated (i.e. non-significant F value), then there was no evidence for group level effects. Thus correlations should be computed and analysed at the individual level, and vice versa for situations where nonindependence was indicated (Kenny & LaVoie, 1985). However, there are several limitations of this technique. One limitation is the assumption of random assignment to groups, and the ability to control other variables (Moritz & Watson, 1998). In true teams, random assignment and controlling for differences within teams is not possible, thus violates this assumption. A second limitation is that the Kenny and LaVoie (1985) method does not allow for the measurement and statistical testing of the interrelations between variables simultaneously at both levels (Moritz & Watson, 1998).

One other way of addressing the level of analysis issue is to adopt the use of multilevel models (Bryk & Raudenbush, 1992; Moritz & Watson, 1998). An advantage of multilevel models is that they acknowledge that individuals, groups, and organisations are not separate conceptual categories, but parts of a whole, affecting and being affected by the others (Lindsley, Brass, & Thomas, 1995), and therefore take all of this information into account in the analysis. Moritz and Watson (1998) suggest Hierarchical Linear Modeling (HLM) as one appropriate multilevel model for investigating collective efficacy. HLM takes into account the nested (hierarchical) nature of the data (i.e. players within teams) and analyses player and team level data simultaneously, and investigating player level, team level, and cross level effects (Zhu, 1997). Although researchers (e.g. Moritz & Watson, 1998) suggest HLM as an appropriate

method for investigating collective efficacy, no applications of this statistical method have been found in the sport psychology literature.

The justification for the present study is that it fills a gap in collective efficacy research by using a multilevel model to address the level of analysis issue. It therefore extends previous knowledge about collective efficacy through a more appropriate method of analysis. The study focuses on shared beliefs in the measurement of collective efficacy, thus addressing another concern in collective efficacy literature (i.e. aggregation of individual perceptions). The present study will thus provide information about different predictors of collective efficacy, and will be useful to sport psychologists and coaches for team development and training purposes.

# Chapter Two

## *Literature Review.*

### **2.1 Self-efficacy Theory.**

Self-efficacy theory, first proposed by Bandura (1977), is one of the more recent theories of personal competence. It has generated more research in clinical, personality, and social psychology in the past two decades than any other efficacy model and theory (Maddux, 1995). Self-efficacy theory is an aspect of a more general social cognitive theory, which is an approach to understanding human action, motivation, cognition, and emotion (Maddux, 1995). Social cognitive theory assumes the people are capable of self-reflection and regulation, and that can actively mould their environments rather than being passive reactors to them (Maddux, 1995). People tend to make causal contributions to their own psychosocial functioning through mechanisms of personal agency (Bandura, 1990). Bandura (1990) stated that one of the most central and important mechanisms of personal agency is that of peoples' beliefs about their capabilities to exercise control over events that affect their lives, or namely, self-efficacy beliefs. Self-efficacy beliefs can influence factors such as the courses of actions people seek to pursue, the effort they put forth, how long people will persevere in the face of obstacles and failures, and their resilience to adversity (Bandura, 1982, 1990), the level of accomplishments they realise, whether their thought patterns are self-aiding or self-hindering, and how much stress and depression they experience in coping with difficult environmental demands (Bandura, 1997). Therefore, self-efficacy beliefs influence how people feel, think, and act (Bandura, 1990).

Self-efficacy was originally defined as a more specific type of expectancy concerned with one's beliefs in one's ability to perform a specific behaviour required to produce an outcome (Bandura, 1977; Maddux, 1995). However, Bandura (1989) expanded the definition of self-efficacy to refer to "peoples' beliefs about their capabilities to exercise control over events that

affect their lives” (p.1175). Recently, Bandura (1997) further defined perceived self-efficacy as “beliefs in one’s capabilities to organise and execute the courses of action required to produce given attainments” (p.3).

The main point of self-efficacy theory is that the initiation of and persistence at behaviours and courses of action are determined primarily by judgments and expectations concerning behavioural skills (Maddux, 1995). These behaviours and actions are also determined by the likelihood of being able to successfully cope with environmental demands and challenges (Maddux, 1995). Bandura (1997) posited that self-efficacy is a generative capability where cognitive, social, emotional, and behavioural sub-skills must be organised and effectively executed to serve a huge number of purposes. Bandura (1997) also suggested that there is a definite difference between possessing sub-skills and being able to integrate them into appropriate courses of action and to execute them successfully under difficult conditions. People often fail to perform optimally even when they know what to do and possess the necessary skills to do it. In more simple terms, perceived self-efficacy is not concerned with the number of skills a person has, but with what a person believes they can do with what they have in a variety of circumstances (Bandura, 1997).

Self-efficacy beliefs regulate human functioning through four major processes, namely, cognitive, motivational, affective and selection processes (Bandura, 1990). Self-efficacy beliefs affect thought patterns that can enhance or undermine performance, and these cognitive effects can take various forms (Bandura, 1997). For example, Wood and Bandura (1989) reported that personal goal setting is influenced by self-appraisals of capabilities. Therefore, the stronger the perceived self-efficacy, the higher the goals people set for themselves and the stronger the commitment to them (Wood & Bandura, 1989; Locke & Latham, 1990). Peoples’ self-efficacy beliefs also influence the types of anticipatory scenarios they construct (Bandura, 1986; Maddux, 1995). Thus, people who have a high sense of self-efficacy visualise success scenarios that provide positive guides for performance, and enhance subsequent performance (Bandura, 1986). On the other hand, those that judge themselves to have a low sense of efficacy are more inclined to visualise failure scenarios, thus undermining performance by dwelling on how things will go wrong (Bandura, 1990; Krueger & Dickson, 1994).

Self-efficacy beliefs also play a central role in the self-regulation of motivation (Bandura, 1990). Bandura (1997) stated that most human motivation is cognitively generated, as people tend to motivate themselves and guide their actions through the exercise of forethought. That is, people form beliefs about what they can do, anticipate likely outcomes of future actions, and set goals for themselves, and plan courses of action designed to accomplish valued goals (Bandura, 1990, 1997). The three different forms of cognitive motivators around which different theories have been built are: causal attributions (attribution theory), outcome expectancies (expectancy-value theory), and cognised goals (goal theory), and self-efficacy mechanisms which operate in all three forms of cognitive motivation (Bandura, 1990). Bandura (1997) also suggested outcome expectancies and goal motivators operate through the anticipation mechanism, and causal attributions or reasons are conceived retrospectively from prior attainments, and can also affect future actions by altering judgments of personal abilities and perceptions of task demands. Perceived self-efficacy contributes to motivation in such ways that people choose what challenges to undertake, how much effort to expend in the endeavour, and how long to persevere in the face of difficulties (Bandura, 1986).

Bandura (1997) stated that the self-efficacy mechanism also plays a crucial role in the self-regulation of affective states. Self-efficacy beliefs affect the nature and intensity of emotional experiences in three principle ways, that is, through the exercise of control over thought, action and affect (Bandura, 1997). Bandura (1990) reported that people who believe they can exercise control over potential threats do not create apprehensive thoughts, and therefore are not perturbed by them. However, people who believe they cannot manage potential threats experience high levels of anxiety arousal, and tend to dwell on their coping deficiencies (Bandura, 1990), thus self-efficacy beliefs decrease.

Bandura (1997) argued that people are partly the product of their environment, and that by selecting their environment people can have some input into what they become. However, these choices are influenced by beliefs concerning personal capabilities. Therefore, self-efficacy beliefs can play an important part in shaping the courses lives take by influencing the environments and activities they choose to participate in (Bandura, 1997). People with a high

sense of efficacy prefer more challenging activities, and also display stronger perseverance in those pursuits (Bandura, 1997).

Efficacy beliefs operate as a key factor in a generative model of human competence, and so different people with similar skills, or the same person in different environments, may perform poorly, adequately, or exceptionally, depending on fluctuations in their beliefs of self-efficacy (Bandura, 1997). Wood and Bandura (1989) found that skills can be easily overruled by self-doubts, so that even highly talented individuals make poor use of their abilities under circumstances that undermine their beliefs in themselves. However, White (1982, cited in Bandura, 1997) reported that a resilient sense of self-efficacy enables individuals to do exceptional things through the productive use of their skills in the face of tough obstacles.

### **2.1.1 Predictors of Self-efficacy.**

Bandura (1997) proposed that self-efficacy beliefs are constructed from four main sources of information. First, enactive mastery experiences serve as indicators of capability. Enactive mastery experiences, most commonly in the form of prior performance accomplishments, are the most influential source of efficacy information (Bandura, 1997). Bandura (1997) posited that this is because they provide the most authentic evidence of whether a person can do whatever it takes to succeed. It seems obvious that successes will build on a person's sense of self-efficacy, or vice versa, especially when failures occur before a sense of efficacy is firmly established (Bandura, 1997). It appears that a resilient sense of self-efficacy requires experience in overcoming obstacles through perseverance, and difficulties also provide opportunities to learn how to turn failure into success by enhancing a person's capabilities to exercise better control over events (Bandura, 1997). Once a person becomes convinced that they have what it takes to succeed, they will then persevere in the face of adversity, and rebound more quickly from setbacks (Bandura, 1997).

Second, Bandura (1997) suggested that vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others. Efficacy appraisals are partly influenced by vicarious (or observational) experiences, though to

a lesser extent than enactive mastery experiences, and so modelling serves as another effective tool for promoting a strong sense of self-efficacy (Bandura, 1997). Vicarious experiences most often take on the form of comparisons with others, and that this is because for most activities there are no absolute measures of adequacy (Bandura, 1997; Schunk, 1995). Therefore, people must appraise their capabilities in relation to the performance of others. Efficacy beliefs are heightened by perceived superiority in performance, for example surpassing competitors or associates (Bandura, 1997). Efficacy beliefs are lowered by being outperformed by others (Bandura, 1997). Schunk (1995) stated that seeing people similar to oneself, in terms of level of ability, perform successfully can also raise a person's efficacy beliefs, in the way that if others can do it, then they too have the abilities to perform successfully. On the other hand, seeing other people similar to oneself fail at the task can have negative effects on one's efficacy beliefs. It should also be noted that the greater the assumed similarity of the model (i.e. person performing the task or skill), the more persuasive the model's successes and failures (Bandura, 1997; Schunk, 1995). One condition that is especially sensitive to this is when a person is lacking direct knowledge of their own capabilities (through little prior experience) (Schunk, 1995). In this case, the person then relies more heavily on the modelled indicators (Bandura, 1997). That is, the person's efficacy beliefs about the task are based more on the other person's (e.g. teammate) success or failure performing the task, than on knowledge of their own personal capabilities.

Third, verbal persuasion and other types of social influences can enhance or decrease the confidence in a person's capabilities or skills. Bandura (1997) posited that social persuasion serves as a further means of strengthening a person's beliefs that they have the capabilities to achieve what they wish. Bandura argued that self-efficacy beliefs are sustained, especially when facing difficulties, if significant others express confidence in that person's abilities, rather than expressing doubts. People who are persuaded verbally that they possess the capabilities to master certain tasks are likely to produce greater effort, and sustain the effort for longer than if they dwell on personal deficiencies and have self-doubts (Bandura, 1997). The most common form of persuasive efficacy information is that of evaluative feedback given to performers, and it can be given in ways that undermine or enhance a sense of self-efficacy (Bandura, 1997; Schunk, 1984b).

Fourth, physiological and affective states, from which people partly judge their ability, strength and vulnerability to dysfunction, are also sources of a person's efficacy beliefs (Bandura, 1997; Schunk, 1995). Bandura (1997) reported that in judging their capability, people rely somewhat on somatic information given by physiological and emotional states. Somatic indicators are especially relevant in areas that involve physical accomplishments, such as sports, health functioning, and coping with stressors. Mood, or affective, states also affect a person's judgements of their own efficacy. Thus the fourth major way of enhancing efficacy beliefs is to increase physical status, reduce stress levels and negative affective states (moods), and correct misinterpretations of bodily states (Bandura, 1997).

As self-efficacy beliefs play a major role in peoples' lives, it is therefore useful for people to be able to manipulate their efficacy beliefs to their own advantage. Due to the large impact efficacy beliefs have on peoples' lives there has been much research into the antecedents of self-efficacy beliefs, and how they affect peoples' behaviour and performance in several different areas of psychological research (for example, academic, work, and sports research). In the academic arena, Schunk (e.g 1981, 1983a) carried out a series of studies that investigated modelling and verbal persuasion with academic self-efficacy. Schunk (1981) provided children with either cognitive modelling or didactic instruction for long-division problems in mathematics. Schunk found that cognitive modelling and didactic instruction both raised self-efficacy, however, modelling led to greater gains in long-division skill and more accurate perceptions of capabilities. Therefore, self-efficacy related positively to persistence and achievement (both theoretical outcomes of self-efficacy). Schunk (1983a) carried out a study where children periodically received verbal feedback about mathematics problems, linking performance with ability, effort, and a combination of ability and effort. Schunk found that ability feedback enhanced post-instructional self-efficacy and performance better than effort feedback or the combination of the two.

Multon, Brown and Lent (1991) carried out a meta-analytic investigation of self-efficacy beliefs in relation to academic outcomes (persistence and performance). They analysed thirty six studies, and found that self-efficacy beliefs accounted for fourteen percent of the variance

in students' academic persistence. Their results also suggested that the self-efficacy enhancing methods used in the experimental studies (for example, guided mastery, modelling, and verbal feedback) may not only be associated with changes in efficacy beliefs, but may also serve to enhance self-efficacy-performance relationships. Multon et al. (1991) acknowledged that the effect size may vary across subjects, and may be moderated by types of students (e.g. age) and study characteristics.

### **2.1.2 Predictors of Self-efficacy in sport.**

However, of more relevance to the present study is the research on self-efficacy beliefs in sports. There has been much research to date investigating the self-efficacy-performance relationship as it is obviously an area of great importance to sport psychologists and coaches wanting to improve athletes' performance. McAuley (1992a) discussed the relationship between self-efficacy, sport and physical activity, and reported past performance or mastery accomplishments as being the most dependable and influential sources of efficacy information. He suggested that a history of previous successes in sport will enhance efficacy beliefs, where as failures will result in lowered perceptions of personal capabilities in that domain. Brody, Hatfield and Spalding (1988) supported this proposition with their research which concluded that performance based treatment modalities or techniques appeared to be the most robust source of information for enhancing self-efficacy beliefs. George (1994) investigated causal relationships (using path analytic techniques) of self-efficacy in a baseball field setting. The results of this study, which examined self-efficacy over the course of nine games, found that higher performances predicted higher self-efficacy beliefs for six out of the nine games. Other results of this study included lower levels of somatic and cognitive anxiety being associated with stronger self-efficacy in seven out of nine games, and that a higher sense of self-efficacy predicted greater effort and higher performance for over half of the games (George, 1994).

Several other researchers have investigated other antecedents of self-efficacy. For example, Feltz and Riessinger (1990) examined the effects of in vivo emotive imagery, in the form of visualising "holding out" longer than opponents, and performance feedback on self-efficacy

and performance on a competitive muscular endurance task. Results suggested that in vivo imagery was successful in increasing one's sense of self-efficacy, and to lesser extent, actual performance time, and thus cognitive strategy was an influential factor of self-efficacy. However, Feltz and Riessinger also found that for this type of task, feedback by itself did not raise self-efficacy beliefs. Weinberg, Gould and Jackson (1979, cited in McAuley, 1992a) reported that vicarious experiences and techniques also influence efficacy beliefs, but to a lesser extent than prior performance accomplishments. McAuley (1992a) also reported that the empirical trials that have tested the effectiveness of emotional arousal and verbal persuasion have been less than convincing. For example, Kavanagh and Hausfeld (1986) attempted to determine whether positive and negative mood states influenced self-efficacy beliefs for performance of a physical task, and although mood states and self-efficacy were found to be related, no clear picture emerged about the mediational role self-efficacy was theorized to play between arousal and performance. However, Feltz (1982) found perceived autonomic arousal to be a significant predictor of self-efficacy, although less so than previous performance.

### **2.1.3 Outcomes of Self-efficacy in sport.**

Many researchers (e.g. George, 1994; Poag & McAuley, 1992; Martin & Gill, 1991) have also studied the outcomes or consequences of self-efficacy beliefs in the sport and exercise area, as this is of most concern to coaches and sport psychologists. If self-efficacy beliefs influence an athlete's performance and persistence, then coaches and the athletes themselves need to find methods for enhancing and maintaining self-efficacy. One such study is that by Martin and Gill (1991) who investigated relationships between state and trait psychological variables and performance in male high school long distance runners. Martin and Gill found that state sport confidence and self-efficacy predicted higher performance. Lerner and Locke (1995) investigated the effects of goal setting, self-efficacy, competition, and personality on performance of a physical strength task (a sit-up task). They found that self-efficacy and goal setting mediated the effects of personality on performance, and thus influencing physical performance.

Several studies by McAuley and his colleagues investigated perceptions of effort, intensity of exercise and self-efficacy. For example, Poag and McAuley (1992) examined relationships among perceived importance of exercise, goals, self-efficacy and the frequency and intensity of exercise behaviour in adult females. Their results indicated that although exercise self-efficacy did not influence percentage of class attendance, perceptions of perceived exertion during activity was related to exercise self-efficacy appraisals. They also found that the more efficacious participants perceived themselves to be under less physical stress and strain than the less efficacious participants (Poag and McAuley, 1992). Rudolph and McAuley (1996) examined the relationship between self-efficacy and participants' perceptions of effort during acute exercise (treadmill running). They found that participants who possessed high pre- and post- exercise efficacy reported lower perceptions of effort and physical strain. These results provided support for Bandura's (1986) proposal that affective states and physiological responses act as sources of efficacy information as the efficacy scores increased significantly pre- to post-exercise. McAuley (1992b) reviewed several studies which investigated self-efficacy beliefs and adoption of and adherence to exercise regimes. He concluded that the relationship between self-efficacy beliefs and adherence to exercise regimes (that is, persistence), although modest, remained fairly consistent. This result was found in spite of diverse populations being studied, often inadequate operational definitions of exercise behaviour, and varied methods of assessing self-efficacy beliefs.

## **2.2 Collective Efficacy Theory.**

Bandura (1997) suggested that people do not live in social isolation, and can not exercise control over major aspects of their lives entirely on their own. Many of the challenges of life centre around common problems that require people to work together in a collective effort to make positive life changes (Bandura, 1997). The strength of families, teams, communities, organisations, and even nations lies partly in peoples' sense of collective efficacy that they can solve problems and improve their lives through combined effort (Bandura, 1997).

The sport context may be seen as one example of such a situation. In many sports, athletes are placed within teams, and teams within competitions. Athletes must work together in a collective effort in order to succeed at their sport. Much of the research concerning efficacy and its predictors and outcomes has not addressed the fact that many athletes are often part of sports teams. It is acknowledged that many sports are individually based and therefore self-efficacy research would be most appropriate and beneficial. However some sports are team based, and so efficacy research must also reflect the group nature, and the group processes involved (e.g. Paskevich, Brawley, Dorsch & Widmeyer, 1999; Spink, 1990a).

Self-efficacy theory can be extended to the concept of collective or team efficacy (Feltz & Chase, 1998). However, collective efficacy is a new concept, and few studies and corresponding measures have been developed to investigate it (Feltz & Chase, 1998; Paskevich et al., 1999). Perceived personal and collective efficacy differ in the unit of agency (individual and group perceptions), but both forms have similar sources, similar functions, and operate through similar processes (Bandura, 1997). Bandura (1997) defined perceived collective efficacy as “a group’s shared belief in its conjoint capabilities to organise and execute the courses of action required to produce given levels of attainments” (p. 477). Bandura (1997) expanded on this definition stating that group functioning is the product of the interactive and coordinative dynamics of its members, and that these interactive dynamics create an emergent property (collective efficacy) that is more than the sum of the individual attributes. Thus, from a measurement and data analysis perspective this can be problematic (Kenny & LaVoie, 1985; Moritz & Watson, 1998).

Bandura (1997) further argued that many different factors can contribute to the interactive effects. These factors include: how the group is structured; how the group coordinates activities; the mix of knowledge and competencies in the group; how well the group is led; the strategies the group adopts; and whether members interact with each other in mutually beneficial or undermining ways (Bandura, 1997). A group’s capability to perform as a whole can vary widely under different combinations of interactive dynamics, and therefore collective efficacy can be conceptualised and examined at a group level (that is, it is a group attribute,

rather than the sum of the group members' personal efficacies), which centres on the group's capabilities of working together as a collective (Bandura, 1997).

An alternative definition of collective efficacy is one by Zaccaro, Blair, Peterson, and Zazanis (1995), who defined collective or team efficacy as "a sense of collective competence shared among individuals when allocating, coordinating, and integrating their resources in a successful concerted response to specific situational demands" (p. 309). Zaccaro et al. posited that this definition includes several key elements, namely that collective efficacy is based on (a) collective efficacy as shared beliefs, (b) shared beliefs of competence in a group's coordination activities, (c) consideration of other group members' resources or abilities, and (d) reflects situational or behavioural group task specificity. Zaccaro et al. (1995) further note that "shared beliefs" means there is a significant degree of interdependence among member judgments. The perceptions of collective competence are influenced not only by the actual conditions within the group, but also on how other group members perceive and convey their interpretations of the conditions. Kenny and La Voie (1985) suggested that therefore collective efficacy may have both individual and group-level components. If there is little or no variability (that is, homogeneity amongst team members) among group members in regards to collective efficacy, and this homogeneity can not be attributed to external factors, then these efficacy beliefs should be considered a group-level phenomenon (Zaccaro et al., 1995). Alternatively, if there is considerable variability or heterogeneity in members' perceptions of the group, then a significant amount of variance of collective efficacy is attributed to individual-level processes (Zaccaro et al., 1995).

Zaccaro et al. (1995) suggested that a second key element in collective efficacy is its emphasis on group coordination capabilities. *Self-efficacy* refers to beliefs about how well individuals can bring together their knowledge, skills and abilities to perform a certain task. *Collective efficacy* refers to a group member's beliefs about how well each and every other group member can bring together individual resources to accomplish the task, as well as how well group members can coordinate and combine their resources (Zaccaro et al., 1995). These perceptions or beliefs are formed from an individual's judgments of the resources held by other members of the group, and the willingness of other group members to contribute their

skills, knowledge and abilities towards a collective effort (Zaccaro et al, 1995). Zaccaro et al. (1995) argued that another key element of collective efficacy is the situational specificity of judgments concerning group capabilities. Bandura (1977) proposed a micro-analytic approach to self-efficacy judgments which emphasised competence beliefs in a specific performance domain that may or may not generalise to other domains. Accordingly, collective efficacy judgments must also reflect this situational specificity, and so collective efficacy beliefs include the aggregated ability to achieve the purpose or goal for which the group was formed (Zaccaro et al., 1995). For example, a netball team forms perceptions or beliefs about its collective capabilities to play netball. Thus, collective efficacy in netball teams must also reflect this sport specificity.

Bandura (1997) also described several ways in which collective efficacy can affect different group processes. For example, a group or team members' beliefs in their collective efficacy influence the type of future they seek to achieve, how they manage their resources, the plans and strategies they form, how much effort they put into the group endeavour, their persistence when collective efforts fail to produce quick results or encounter strong opposition, and their vulnerability to discouragement (Bandura, 1997). These processes, activated by shared efficacy beliefs, affect how well group members work together and how the group performs. Thus for sports teams, the issue here is understanding how collective efficacy beliefs affect team processes, or how a team works together by making use of this information in order to enhance team efficacy and increase team performance.

### **2.2.1 Outcomes of Collective Efficacy in sport.**

An important factor concerning researchers, psychologists and coaches in the sport setting is team performance, especially for elite or high level teams. Professional sport and successful team performance have become important, with implications concerning the future of the team, the individual players, and financial aspects such as athletes earnings, club or team earnings, sponsorship and so on. The task of sport psychologists and researchers is to investigate what factors affect team performance, and how these factors can be manipulated to enhance team performance. In relation to collective efficacy then, researchers need to

investigate both predictors and outcomes of collective efficacy, as well as possible ways to enhance collective efficacy for future high performance.

Research has noted that teams with a high sense of team efficacy will perform better than teams with a low sense of team efficacy (Bandura, 1997; Feltz & Lirgg, 1998; Prussia & Kinicki, 1996; Spink, 1990b; Zaccaro et al., 1995). Bandura (1997) proposed that like self-efficacy, collective efficacy will also affect sports performance, as it is likely to influence how much effort the players contribute collectively, their ability to persist, remain task oriented during periods when the team is struggling, and the team's capability to bounce back from defeats. Spink (1990b) noted evidence to support this notion through investigating the relationships between type of group, team cohesion, collective efficacy, and team performance in recreational and elite volleyball teams. A sample of 92 recreational and elite volleyball players were split into high and low efficacy groups, and completed the Group Environment Questionnaire (GEQ) (Widmeyer, Brawley & Carron, 1985) and a two item collective efficacy scale concerning performance expectations. Stepwise discriminant analyses were used to assess these relationships. Results of the study showed that individual perceptions of team cohesiveness were positively related to collective efficacy for elite teams (but not for recreational teams), and that high collective efficacy teams were most successful in terms of end of competition ranking. Spink (1990b) acknowledged two limitations of the study, small sample size and problems concerning the administration of the questionnaire (unsupervised, in own homes, and teams were not together at time of questionnaire completion). This study supports Bandura's (1997) theory that collective efficacy is related to group performance, and how teams work together to attain certain goals.

Another study that supports Bandura's theory of efficacy influencing team performance is one by Hodges and Carron (1992) who examined the effects of different levels of collective efficacy on group performance in a muscular endurance task. Participants were assigned to high or low efficacy conditions in a 2(sex) x 2(collective efficacy) x 2(trials) design. Data was examined using analysis of variance (ANOVA). A significant main effect was obtained with the high collective efficacy groups having stronger expectations for performance success than low efficacy groups. Hodges and Carron also noted that collective efficacy decreased from

trial 1 to trial 2 indicating that lack of performance (dropping the ball) influenced the level of collective efficacy had in regards to that task. Small sample size, and approach to measurement of collective efficacy were the two main limitations of the study. A two item measure was used to assess the level of collective efficacy. However, this measure actually asked for a judgment about the team's performance, not their capabilities in regards to the task. Hodges and Carron (1992) also suggested that future research should examine collective efficacy in non-laboratory settings with intact teams.

Prussia and Kinicki (1996) also investigated team efficacy and team performance in a laboratory setting, which involved 324 university students that formed 81 four-person groups for a brainstorming task. The collective efficacy measure included nine items investigating nine levels of idea generation, and scores on this scale were averaged to get a group indicator of team efficacy. The results showed that collective efficacy influenced group effectiveness, through mediating relationships between performance feedback, vicarious experience and group effectiveness. One limitation of this study was the use of an average of individual perceptions to represent collective efficacy. That is, they asked participants to rate their own confidence in their team's capabilities. The wording in scales such as these reflects individual perceptions of a team's capabilities, and focuses on the individual rather than the team (Short & Feltz, 2000).

More recently, Feltz and Lirgg (1998) examined both team and player efficacy across a season of collegiate ice hockey competition, by investigating relationships among team efficacy, player efficacy, and team performance. The sample consisted of 159 players from six teams, and collective efficacy was measured using an eight item scale designed to assess the degree of confidence a player had in their team's ability to perform important game competencies. Data was analysed using regression analysis, and MANOVA (multivariate analysis of variance), therefore only analysing the data at the individual level, and does not account for the nested nature of the data. Their results supported the hypothesis that aggregated team efficacy beliefs are a stronger predictor of team performance than aggregated individual efficacy beliefs. The results also support the strong association between perceptions of collective efficacy and subsequent team performance, as theorised by Bandura (1997). As this

study was carried out over the course of a season with naturally occurring teams, it reduces the possibility this association was due to chance, and provides a reliable indication that collective efficacy does in fact predict team performance.

Other important consequences of teams with a high sense of collective efficacy are an increased level of effort (Bandura, 1997), maintenance of perseverance (Bandura, 1997), desire for success (George & Feltz, 1995); group goal level (Silver & Bufanio, 1996); and goal achievement (Bandura, 1997; Prussia & Kinicki, 1996). Cohesion is also an outcome of team efficacy, as it has been found that teams with a high sense of efficacy will tend to be more cohesive, and coordinate their activities more effectively (Spink, 1990a, 1990b). As collective efficacy appears to influence several important processes in teams, including team performance (e.g. Zaccaro et al., 1995), it is important that researchers understand the concept fully, and ensure that all sources of efficacy are included when assessing the level of collective efficacy beliefs of a team.

### **2.2.2 Predictors of Collective Efficacy in sport.**

If teams with high collective efficacy perform better (e.g. Feltz & Lirgg, 1998; Prussia & Kinicki, 1996), then understanding what factors contribute towards efficacy will have implications for developing high performing teams. The brief literature concerning collective efficacy in the sport setting has shown several predictors and correlates of collective efficacy. Bandura (1997) suggested that much like self-efficacy, there are four main contributors or predictors of collective efficacy, namely prior group performance, vicarious experience, verbal persuasion, and physiological states.

Recent research suggests that collective efficacy is correlated with prior group performance and vicarious experiences (i.e. observing others achieve success) (e.g. Bandura, 1997; Hodges & Carron, 1992; Prussia & Kinicki, 1996), level of interdependence and quality of teamwork (Bandura, 1997), positive and negative team feedback (Prussia & Kinicki, 1996), goal setting (Spink, 1990a), leadership behaviours (Weldon & Weingart, 1993), and goal commitment

(Bandura, 1997). Bandura (1982, 1986) proposed that personally experienced performance (enactive attainment) would be the strongest determinant of efficacy. Hodges and Carron (1992) provided empirical support for this proposal and demonstrated that experimental groups experiencing failure in competition with a confederate group indicated lower collective efficacy on subsequent performance trials. Other researchers have reported that the pattern of prior performance also determines the strength and nature of the association with collective efficacy (Zaccaro et al., 1995). For example, Feltz, Bandura, Albrecht, and Corcoran (1988, cited in Spink, 1990a) found that the collective efficacy of hockey teams at the start of a season appeared to be no different than the sum of the self-efficacies of individual members. However, results of a second study by Feltz, Corcoran, and Lirgg (1989, cited in Spink, 1990a) showed that over the length of a season, collective efficacy became more clearly differentiated from the aggregated sum of individual efficacies. Zaccaro et al. (1995) also proposed that prior performance patterns must be fairly consistent in order to enhance a team's sense of collective efficacy. That is, a steady pattern of success is more likely to result in perceptions of high capability, and corresponding beliefs about their team's future ability, than a performance pattern of mixed failures and successes (Zaccaro et al., 1995).

Lichacz and Partington (1996) carried out one study that examined how perceptions of collective efficacy mediated group performance, and also to examine performance differences between true and ad hoc groups. Not only did their results show that group performance was influenced by collective efficacy beliefs, they also reported that group history (prior performance history) influenced collective efficacy more so than performance feedback. Feltz and Lirgg (1998) investigated team efficacy in ice hockey players over an entire season and found that past team performance affected team efficacy beliefs to a greater extent than individual efficacy beliefs.

Another predictor of collective efficacy is vicarious experience, most commonly in the form of modelling influences (e.g. Bandura, 1997; Prussia & Kinicki, 1996). Groups can develop a belief regarding collective ability vicariously by observing the experiences of other similar groups in similar performance areas, for example people emulating the "All Black" rugby team or the "Silver-fern" netball team. These model groups provide important cues about

appropriate behaviours and capabilities in specific performance domains (Zaccaro et al., 1995). Prussia and Kinicki (1996), as discussed earlier, investigated collective efficacy and group affective evaluations as mediating influences on several different relationships between positive and negative feedback, vicarious experiences, prior group effectiveness and group effectiveness. Their results showed a moderate positive relationship between positive feedback and collective efficacy, and a smaller, moderate negative correlation between negative feedback and team efficacy. The results also demonstrated a small positive relationship between vicarious experiences and collective efficacy.

There were several limitations of this study. One of these limitations is that the study was carried out in a laboratory setting. The groups were formed for the specific purpose of this study, and they were made up of people who had volunteered to participate in the study. Thus, the study investigated teams that did not exist in reality. Another limitation was the use of an average of individual perceptions to represent group affective evaluations and collective efficacy. Prussia and Kinicki (1996) acknowledged that individual members' confidence may not truly capture the group-level phenomena of interest. However, Prussia and Kinicki did attempt to address this issue by the type of analyses used in the study. In this study, the measures used to derive individual perceptions pertained to group-level activities (e.g. collective efficacy, group effectiveness), and methodological analyses (e.g. ANOVA, Within entities And Between entities Analysis (WABA)) were used to provide support for a group-level interpretation.

Spink (1990a) reviewed several studies investigating self and collective efficacy in the sport setting, and discussed the findings of the studies in terms of predictors and outcomes of collective efficacy. Spink (1990a) stated that social influences may affect the development of collective efficacy of sports teams, as by their nature, they provide an inherent source of social influence in the form of teammates and coaches. Spink reasoned that if social influences can impact on self-efficacy, then it would be expected that the social influences of teammates and coaches might be an important source of information that would influence collective efficacy. Spink (1990a) suggested that social influences may take on the form of perceived attitudes or expectations of significant others. Most logically for sport, these significant others would be

coaches and teammates. However, this appears closely related that of vicarious experiences, namely, modelling attitudes by the coach or other team members, as suggested by Bandura (1997). Gould, Hodge, Peterson and Giannini (1989) supported this theory of modelling influences, as results showed that team-sport coaches more often developed team confidence through instruction, drilling, and modelling confidence themselves (i.e. coach acts confident in team's abilities to perform). Spink (1990a) also suggested that the focus of the athletes, past history of the team (for example, length of time team has been together), and goal setting may influence the development of a team's collective efficacy beliefs.

Greenlees, Graydon, and Maynard (1999) assessed the impact of failure information (negative feedback) on collective efficacy beliefs of individuals. Twenty-two triads performed a cycling task, after rating their collective efficacy about the task on a one-item measure. The analysis consisted of analysis of variance (ANOVA), and results showed that individuals high in collective efficacy will exert more effort in pursuit of a goal, than individuals with low collective efficacy. Results also showed that following the manipulation of feedback a significant decline in the performance time of those participants in the low efficacy condition occurred, and those in the high efficacy condition did not significantly improve their performance times. Greenlees et al. (1999) reported that these results provide strong evidence for the importance of previous performance on collective efficacy, as the bogus performance feedback produced significant changes in stated collective efficacy of those assigned to both low and high efficacy conditions. Once again, small sample size, laboratory setting, and lack of true teams (teams not formed for investigation purposes) affect how these results can be interpreted, and how reliable the results are. Greenlees et al. (1999) also failed to account for the multi-dimensional nature of collective efficacy with the single item measure, and this likely affects the validity of the results. The researchers also failed to address the level of analysis issue, that is, collective efficacy can also be conceived as a group-level phenomenon, and assessing individual efficacy in regards to the task does not represent the groups' efficacy beliefs.

Team cohesion is another construct that has been linked with team efficacy and team performance (e.g George & Feltz, 1995; Kozub & McDonnell, 2000; Paskevich et al., 1999;

Spink, 1990a, 1990b). Spink (1990a) proposed that team cohesion is linked to collective efficacy and team performance. Spink stated that both cohesion and collective efficacy have been linked to performance success, and also impact on persistence. Spink (1990b) provided empirical support for this proposal in his study investigating elite and recreational volleyball teams (described earlier). Spink (1990b) found that individual perceptions of group cohesiveness were positively related to collective efficacy for elite teams, but not for recreational teams. More specifically, Attention to Group–Task (ATG-Task) and Group Integration-Social (GI-Social) were found to differentiate significantly between high and low collective efficacy groups, with high collective efficacy groups rating these two factors higher than individuals on low efficacy teams.

Kozub and McDonnell (2000) also examined the relationship between perceived team cohesion and collective efficacy in rugby teams. The study consisted of 96 players from seven clubs, who were asked to complete the GEQ and a seven item collective efficacy scale that pertained to assess seven different areas important to rugby. An average collective efficacy score was calculated for each team and bivariate correlations and step-wise multiple regression analyses were carried out on the data. Their results showed a significant relationship between the four dimensions of team cohesion and collective efficacy. The two task dimensions appeared to be better predictors of collective efficacy than the social dimensions, with the GI-Task factor having the strongest relationship with collective efficacy. However, the correlational nature of this study prevents the drawing of conclusions in regard to the direction of the causal relationship between cohesion and team efficacy. This aspect of cohesion-collective efficacy investigations (i.e. correlational nature of collective efficacy research) is consistent throughout the research, and it still remains unclear as to the direction of the relationship. It should be noted however, that cohesion and collective efficacy do appear fairly strongly related and that the relationship may be a bi-causal one. Although this investigation was field based (i.e. non-laboratory), the researchers did not address the level of analysis issue concerned with collective efficacy. No attempt assess the degree of consensus at the individual level before using the aggregated collective efficacy scores as a representation of shared beliefs at the group level. As team cohesion appears to be a group

level construct also, the level of analysis should be the group as well (Gully, Devine, & Whitney, 1995).

One other study by Paskevich et al. (1999) aimed to develop a theory-based measure of collective efficacy, as well as to determine the nature of the relationship between collective efficacy and team cohesion. In this field study, in which the observation of natural groups was part of the purpose, 70 volleyball players (six teams) from both university and club level took part. The players were asked to complete the GEQ and a 58 item collective efficacy scale that purported to assess eight different aspects of group skills and abilities. Bivariate correlations were calculated to investigate the relationships between the four dimensions of team cohesion and the different aspects of collective efficacy. The results showed that, like other studies, the two task measures of the GEQ (GI-Task and ATG-Task) had the greatest number of significant bivariate relationships with the various aspects of collective efficacy, thus providing support for the predictive validity of the collective efficacy measure. The task related aspects of cohesion were also found to significantly differentiate between athletes who were high or low in their perceptions of their team's overall collective efficacy.

In order to help validate the collective efficacy measure, it was essential for the researchers to statistically demonstrate the sharing of beliefs occurred within the teams. Paskevich et al. (1999) employed the use of intraclass correlations (ICC), as suggested by Kenny and LaVoie (1985), to provide information about the degree of nonindependence (homogeneity) of responses. Their results showed significant ICCs for the majority of variables, thus there was a strong statistical indicant that for the majority of the group constructs assessed, there was a similarity of responses within teams. Results suggested that members of a team shared beliefs about their team's collective efficacy and cohesion. Paskevich et al. (1999) addressed the issue of level of analysis, and reported that although the intraclass correlations indicated that responses within teams were homogeneous and that therefore groups could be used as the unit of analysis, there were only seven teams to be analysed. This means that analysis at the group level was constrained by low statistical power.

Cohesion is an important construct that is related to collective efficacy, although this relationship tends to be reciprocal and shares common elements (e.g. Bandura, 1997; Spink, 1990a; Zaccaro et al., 1995). It is still unclear as to whether cohesion leads to collective efficacy or vice versa, however cohesion does appear to be significantly related to collective efficacy and team performance, and should not be left out of any future investigations of collective efficacy.

As outlined above there are several different sources of team efficacy, and although these sources have been identified, there has not been a significant amount of research investigating and validating these sources. In order to understand the concept of collective efficacy more fully there needs to be more research to confirm and validate these sources before they can be manipulated to enhance a group's sense of efficacy.

### **2.3 Collective efficacy issues.**

One issue of importance when analysing collective efficacy data is which level of analysis to employ (Feltz & Chase, 1998). Players are nested within teams, and teams are nested within competitions/leagues, demonstrating several different levels where analyses can be made, thus highlighting a problematic area when examining data. Typically in team efficacy and team cohesion research, researchers have measured the construct (team efficacy) at the individual level (i.e. player) and then have generalised to the group level (i.e. team). However, team efficacy is a group-level attribute (Bandura, 1997) and processes surrounding team efficacy therefore should be analysed at both group and individual levels (Feltz & Chase, 1998; Kenny & LaVoie, 1985). Gully et al. (1995) addressed the issue of individual and group level analysis, and strongly recommended that before group level analysis can occur, the level of group consensus should first be explored. Only when an acceptable degree of consensus exists can individual data be aggregated to form a group-level construct. Gully et al. (1995) add that failing to consider consensus when aggregating data at one level to represent a higher level of analysis may result in aggregation bias (a class of errors in which an observed relationship is an artefact of the data combination method (James, 1982)). Feltz and Chase (1998) argued that what is important in studying collective efficacy is to first consider the

research in relation to the level of analysis that should be used, and if group-level analysis is appropriate, then consensus within groups must be demonstrated before using the group as the unit of analysis.

Kenny and LaVoie (1985) suggested that there must be independence of observations in order to have interpretable data. Independence implies that two or more observations are no more likely to be the same, or different, than any other two observations. Kenny (1999) stated that the measurement of nonindependence is fairly simple when there is nesting (e.g. players nested in teams), and suggests the calculation of the intraclass correlation (ICC) can be used to measure the degree of nonindependence. An ICC (denoted as  $\rho$ ) measures the correlation between two peoples' outcomes who are both in the same group (Kenny, Kashy, & Bolger, 1998). For example, an ICC of 0.30 (for a collective efficacy measure) means that the correlation between efficacy scores of two players who are in the same team is 0.30. Alternatively, the ICC can be viewed as the amount of variance in a persons' scores that is due to the team (Kenny et al., 1998). If the ICC is statistically significant (thus have homogeneity of scores within teams), then one can use the higher level unit of analysis (e.g. teams), and if the ICC is not statistically significant (i.e. independence or scores within teams), then one should use the lower level of analysis (e.g. player) (Kenny, 1999).

Kenny and LaVoie (1985) also posited that both individual and group level processes may occur in group settings, and one unfortunate consequence of the use of most conventional analysis methods is an emphasis on only one of the two levels, to the exclusion of the other. Moritz and Watson (1998) support this contention and reported that the neglect to consider both levels of analysis in group research is unfortunate as single level research suffers from three main biases. Single level research underestimates cross-level effects, may overgeneralise (assume that a construct at one level will have the same relationships as a similar construct at another level), and may result in the reification of group structures (Rousseau & House, 1994). In other words, studies of individuals may underestimate the effects of groups on individual behaviour, and studies of groups may underestimate the effects that individuals have on their environment (i.e. cross level effects) (Moritz & Watson, 1998). Single level research at the group level may also result in creation of presumed groups

(alteration of traditional units) in order to justify preferred styles of research (Rousseau & House, 1994). Moritz and Watson (1998) argued that expanding group theory and research to include multilevel conceptualisations will provide a means for developing a more powerful and interpretable group research.

### **2.3.1 Method for separating individual and group level effects.**

Kenny and LaVoie (1985) proposed one method that could be used to examine individual and group level effects simultaneously. This method involved estimating correlations at the two levels of analysis (i.e. player and team) and testing the correlations for nonindependence. If the tests resulted in a non-significant  $F$  value, independence was indicated, thus there was no evidence for team level effects. If there was no evidence for team level effects, then correlations must be calculated and tested at the player level (i.e. individual scores must be used). Thus, the correlations would be interpreted and generalised only at the player level. Alternatively, if nonindependence was indicated (i.e. significant  $F$  value), then there was evidence for team level effects. Thus, correlations would be calculated and interpreted at the team level (Kenny & LaVoie, 1985).

However, there are several limitations of this technique (Moritz & Watson, 1998). One of these limitations is the assumption of random assignment to groups, and the ability to control for pre-existing differences (Moritz & Watson, 1998). In naturally occurring teams, random assignment and controlling for differences within teams is not possible, thus violating this assumption. The second limitation of Kenny and LaVoie's (1985) method is that it does not allow for examination and statistical testing of cross-level effects between variables simultaneously at both levels (Moritz & Watson, 1998).

### **2.3.2 Hierarchical Linear Modelling.**

One appropriate statistical method for analysing nested data, such as collective efficacy data, is Hierarchical Linear Modelling (HLM) or multilevel modelling (Bryk & Raudenbush, 1987, 1992; Moritz & Watson, 1998). Multilevel models such as HLM can distinguish between the

individual and group levels of data, and accounts for the possibility of aggregation bias by analysing the two levels (individual and group) simultaneously (e.g. Bryk & Raudenbush, 1987; Novy & Francis, 1989). Moritz and Watson (1998) proposed the use of HLM as one suitable method of analysing collective efficacy data, once the issue of within group agreement (homogeneity of responses) has been dealt with.

HLM is the statistical theory of estimating relationships occurring within and across levels (Arnold, 1992; Moritz & Watson, 1998). It simultaneously tests individual level, group level, and cross-level effects (Moritz & Watson, 1998). HLM also accounts for the fact that individuals are nested within groups (hierarchical nature of the data). Zhu (1997) stated that because individuals are nested in groups, the influence of groups should be considered in the data analysis.

In the present study, the term HLM refers to both the statistical theory of estimating hierarchical linear models and to the specific statistical computer programme. HLM involves performing regressions of regressions (Arnold, 1992). At the first level (Level 1), regression equations for each team predict player outcomes as a function of other player characteristics within each team, and the equations are called “within-unit” models (Arnold, 1992). There is one equation for each team (see Equation 1). The intercepts and coefficients are then used as the dependent variables in the second-level regression equations with teams as the unit of analysis (Arnold, 1992) (see Equation 2 to 4). Team characteristics are the independent variables in the Level 2 equations, which are called “between-unit” models (see Equation 5). Also in HLM the variance around each parameter from Level 1 is also taken into account in the regression analyses at Level 2 (Arnold, 1992). In more simple terms, the relationships between outcome variables (dependent variables) and explanatory variables (independent variables) are examined within the groups first (Level 1), and the regression slopes obtained for each group are then used as outcome variables as a function of group independent variables (Level 2) (Zhu, 1997). An example of a two level model is shown below ( see Equations 1-5).

The player-level equation models the relationships among different player-level characteristics (player-level predictors) and an outcome of interest (player-level outcome variable) (Zhu, 1997). In this example, Perceptions of Success (POS) and years playing netball (Netball Years) are player-level characteristics, and perceptions of collective efficacy is the player-level outcome variable (see Equation 1).

**Level 1 model:**

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{POS}) + \beta_{2j}(\text{Netball Years}) + r_{ij} \quad (1)$$

Where:

$Y_{ij}$  = collective efficacy score of player i in team j.

$\beta_{0j}$  = collective efficacy score mean for team j.

$\beta_{1j}$  = relationship between player perceptions of success and collective efficacy in team j.

$\beta_{2j}$  = relationship between players years spent playing netball and collective efficacy in team j.

$r_{ij}$  = residual (random error) in team j.

The coefficients in Equation 1 are further defined as a function of a grand mean of collective efficacy and a random error, for example:

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad (2)$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad (3)$$

$$\beta_{2j} = \gamma_{20} + u_{2j} \quad (4)$$

Where:

$\gamma_{00}$  = average of the team means of collective efficacy

$\gamma_{10}$  = average perceptions of success slopes across teams

$\gamma_{20}$  = average netball years across teams

$u_{0j}$  to  $u_{2j}$  = random errors (residual) at the team level

**Level 2 model:**

Defined exactly the same as equation one, but with team level predictors included in team level modelling. Equations two to four were explained by the team predictors:

$$\beta_{xj} = \gamma_{x0} + \gamma_{x1}(\text{team years}) + \gamma_{x2}(\text{time spent socialising}) +$$

$$\gamma_{x3}(\text{team cohesion}) + u_{xj} \quad (5)$$

Where:

$\beta_{xj}$  = player-level regression coefficients

$\gamma_{x0}$  = team level intercepts

$\gamma_{xx}$  = team level slopes

$u_{xj}$  = random errors

## **2.4 Aims of the study.**

The main aim of the study is to investigate predictors of collective efficacy using a statistical method appropriate for analysis at both player and team levels, thus addressing a limitation of previous collective efficacy research.

1. The concept of collective efficacy is still relatively new to sport psychology, and therefore still not completely understood. Few corresponding measures have been developed to investigate collective efficacy (Feltz & Chase, 1998), and research needs to be aimed at validating this construct. Thus, the development of appropriate measures that examine collective efficacy are required to further our understanding of this predictor of performance.
2. This study aims to investigate collective efficacy, validating a collective efficacy measure with a New Zealand elite sports population. The present study also to investigate several predictors of collective efficacy using Hierarchical Linear Modelling (HLM). This technique will address the level of analysis issue surrounding collective efficacy research by analysing the data at both the individual and group level simultaneously.
3. The present study acknowledges the issue of unit of analysis, and proposes to address this level of analysis problem (and therefore reduce possible aggregation bias) by first examining each team's degree of consensus, and then by analysing the nested data at both the individual and group level using HLM.

## Chapter Three

### *Method.*

#### **3.1 Participants.**

The participants in the present study were 318 female netball players, composing 31 teams (range = 9 to 12,  $M = 10.0$ ), from two national level netball competitions. The Age Group Championships (including Under 19 and Under 21 age groups) and the National Provincial Championships are two of three top level competitions in New Zealand, and therefore are representative of elite netball competition. The age of participants ranged from 14 years to 37 years, with a mean age of 20.34 years ( $SD = 4.29$  years). The mean length of career playing netball for these athletes was 11.65 years ( $SD = 4.13$  years), with a range of one year to 29 years. Participation was completely voluntary, with just over half of the teams in the two competitions taking part. Confidentiality of responses was ensured by the questionnaire containing no identifying numbers, codes, or names. Also consent forms were kept separate from questionnaires at all stages of the study so that identification was not possible. In the present study observation of natural groups was part of the purpose, thus random assignment and controlled selection was not possible. However, as a large part of the analysis was concerned with team level constructs, and team means were used to represent the group, any participant who left out 10% or more responses on any measure was removed from the analysis for that particular measure.

## **3.2 Materials.**

The present study aimed to investigate participants' attitudes and beliefs regarding netball, their own sport confidence, and their team's capabilities. Therefore, a questionnaire-based design was most appropriate (Furlong, Lovelace, & Lovelace, 2000).

The questionnaire had five sections, a demographic section, and four separate measures (see Appendix A). The four measures consisted of the Perceptions of Success questionnaire, Group Environment Questionnaire, Sources of Sport Confidence Questionnaire, and a collective efficacy measure, all of which are described in more detail below. The demographic section asked questions pertaining to age of players, playing status, years spent playing netball, years at elite level, length of time team had been together, practices (e.g. length of practices, focus on team or individual during practice), and amount of time spent socialising with teammates. The five sections were placed in the questionnaire in a random order to counterbalance any order effects that have occurred. Thus, each participant's questionnaire was a different order from their teammates, ensuring that each participant responded individually.

### **3.2.1 Perceptions of Success Questionnaire (POS).**

The POS was developed to reflect a sport-specific measure of task and ego goal motivation orientation (Roberts & Balague, 1991, cited in Roberts, Treasure, & Balague, 1998). The measure was initially derived from a large pool of items to form the current 12 item questionnaire, composed of two six item subscales that reflect the task and ego orientations. The task orientation (Mastery) subscales includes items such as "I work hard" and "I reach a goal". The ego orientation (Competitiveness) subscale includes items such as "I am the best" and "I outperform my opponents". Participants were asked to respond on a five point Likert scale (A = strongly agree, C = neutral, E = strongly disagree) to the 12 items beginning with the stem "When playing sport, I feel most successful when...", and followed by the item.

Factor analyses have supported the two factor structure of the measure. Factor loadings ranged from 0.71 to 0.86 for the ego orientation, and from 0.65 to 0.84 for the task orientation items (Roberts et al., 1998). The internal consistencies of the 12 item scale were  $\alpha = 0.82$  for task and 0.87 for ego goal orientation. Test-retest reliabilities were 0.80 and 0.78 for task and ego goal orientations respectively (Roberts et al., 1998). Concurrent validity of the POS was demonstrated by correlations with the Task and Ego Orientation in Sport Questionnaire (TEOSQ), where ego orientation correlated 0.80 and the task orientation correlated 0.71 to ego and task orientations of the TEOSQ respectively (Roberts et al., 1998).

Further confirmatory factor analyses (e.g. Marsh, 1994; Roberts et al., 1998) have provided support for the two factor structure of the POS, and also demonstrated that it has strong psychometric properties. Roberts et al. (1998) reported that the use of the questionnaire so far has shown that it is a reliable and valid instrument to measure ego and task orientations in sport. Treasure and Roberts (1994) also found that the task and ego orientations derived from the POS were related to different beliefs about the causes of sport success. That is, task orientation was related to the belief that motivation or effort resulted in success, and ego orientation was related to the belief that external factors and abilities resulted in success in sport (Treasure & Roberts, 1994). In the present study, the adult version of the 12 item measure was used, as the population of interest (elite netball teams) is predominantly adolescent and adult.

### **3.2.2 Group Environment Questionnaire (GEQ).**

The GEQ (Carron, Widmeyer, & Brawley, 1985) was used to assess team cohesion. The purpose of the GEQ was to assess the task and social aspects of an individual's perceptions of their netball team as a whole, as well as the individual's attraction to the team, related to the development and maintenance of team cohesion (Carron et al., 1985). The GEQ is an 18 item measure with four subscales: Individual Attractions to Group-Social (ATG-Social); Individual Attractions to Group-Task (ATG-Task); Group Integration-Task (GI-Task); and Group Integration-Social (GI-Social). Participants were asked to respond on a nine point Likert scale (1 = strongly disagree, 5 = neutral, 9 = strongly agree). Twelve out of the 18 items are

reversed scored, and an individual's score was calculated by summing relevant items to obtain a total scale score. A representative score for each team was gained by calculating the mean of all individuals in each team.

For ATG-Task, ATG-Social, GI-Task, and GI-Social the internal reliabilities for each subscale (n = 247) were 0.75, 0.64, 0.70, and 0.76 respectively, demonstrating the acceptable reliability and internal consistency of the GEQ (Carron et al., 1985). Carron, Brawley, and Widmeyer (1998) reported support for the concurrent validity of the GEQ with relation to the Sport Cohesion Questionnaire, Team Climate Questionnaire, and Bass Inventory. The predictive validity of the GEQ has also been demonstrated in several studies concerning adherence behaviour in exercise groups, attributions, social loafing, group size, leadership, team building, role involvement, communication, and collective efficacy. Exploratory factor analyses provided support for the hypothesised four factor structure of the GEQ (Widmeyer et al., 1985). Confirmatory factor analyses (e.g. Carron et al., 1985; Li & Harmer, 1996) have provided further support for the four factor structure of the GEQ. However, Schutz, Eom, Smoll, and Smith (1994) also examined the factor structure of the GEQ. Results showed lack of support for the four factors in the GEQ, and based on these results argued that researchers confirm the factor structure inherent in their own data, before computing any scale scores (Schutz et al., 1994). This questions the factor structure of the GEQ, and caution should be taken when interpreting findings (Schutz et al., 1994).

### **3.2.3 Sources of Sport Confidence Questionnaire (SSCQ).**

The SSCQ was developed to provide a reliable and valid measure that identifies sources of sport confidence in athletes, within the sport-confidence framework of Vealey (1986,1988) (Vealey, Hayashi, Garner-Holman, & Giacobbi, 1998). The sport confidence framework posits that sources of sport confidence predict sport confidence, which in turn predicts affect, behaviour, and cognition (Vealey, 1986, 1988). Over a series of four phases, Vealey et al. (1998) identified several sources of sport confidence, and developed a measure that assesses the degree of importance a particular source of sport confidence has for an athlete. The end result of the four developmental phases was that nine sources were supported within the sport

confidence framework, and evidence was found across the four phases to support the reliability and validity of the SSCQ as a multidimensional measure of sources of sport confidence (Vealey et al., 1998).

The SSCQ consists of 43 items representing nine subscales: mastery (five items), vicarious experience (five items) demonstration of ability (six items), physical/mental preparation (six items), physical self-presentation (three items), social support (six items), coach's leadership (five items), environmental comfort (four items), and situational favourableness (three items). Participants were asked to assign a level of importance to each item using a Likert scale (1 = not at all important, 4 = moderately important, 7 = of highest importance). All items are preceded by a common stem. An example of a mastery item is "I usually gain self-confidence in my sport when I (stem) master a new skill in my sport (mastery item)".

Internal reliability of the SSCQ was demonstrated with Cronbach's alpha coefficients for the nine subscales: environmental comfort (0.93), coach's leadership (0.92), vicarious experience (0.90), social support (0.88), mastery (0.88), demonstration of ability (0.86), physical/mental preparation (0.79), physical self-presentation (0.78), and situational favourableness (0.71) (Vealey et al., 1998). The results from phase four of the developmental studies provided initial support for the nine sources of sport confidence, with confirmatory factor analysis providing adequate support for the hypothesised nine factor structure of the SSCQ (Vealey et al., 1998). Factor loadings ranged from 0.41 to 0.97 over the 43 items. More specifically, the factor loading ranges for the nine subscales were: mastery (0.73 to 0.85), demonstration of ability (0.43 to 0.84), physical/mental preparation (0.50 to 0.88), physical self-presentation (0.81 to 0.95), social support (0.61 to 0.97), coach's leadership (0.71 to 0.91), vicarious experience (0.74 to 0.89), environmental comfort (0.41 to 0.95), and situational favourableness (0.60 to 0.73) (Vealey et al., 1998).

### 3.2.4 Collective Efficacy Questionnaire.

The scale to measure team efficacy of elite netball teams was developed primarily from existing collective efficacy literature, in particular following guidelines for different aspects of team efficacy from an existing measure (c.f. Paskevich et al., 1999). Paskevich et al. (1999) developed a multidimensional measure that purports to measure collective efficacy using a group-resources approach but is specific for volleyball. Paskevich et al. proposed that this group-resources approach is appropriate for research questions that examine the group as a whole. This measure consists of six scales pertaining to collective efficacy, namely: (a) task in offence, defence, and transition; (b) communication with team members/coaches; (c) motivation and willingness to contribute knowledge /skills to collective effort; (d) confidence in the face of obstacles; (e) obstacles in general practice/competition situations; and (f) general everyday functions within a context of a season. Due to sport specific nature of collective efficacy, the present study adapted this measure of collective efficacy to produce a netball specific measure of team efficacy (with several items provided by Dr H. Prapavessis).

The collective efficacy measure used in the present study was composed of six subscales, based on the six areas identified by Paskevich et al. (1999). The six subscales for the netball collective efficacy measure were: (1) attack (e.g. “feed the goal circle effectively”;  $n = 16$ ); (2) defence (e.g. “obtain possession by forcing a turnover”;  $n = 14$ ); (3) motivation (e.g. “remain motivated after losing the previous game”;  $n = 7$ ); (4) obstacles in general practice and competition situations (e.g. “play at the same level when our team is behind in a game”;  $n = 17$ ); (5) communication with teammates and coaches (e.g. “use feedback from the coach to increase our performance”;  $n = 7$ ); and (6) general everyday functions (e.g. “use our practices effectively”;  $n = 11$ ).

In order to develop items relevant to netball, the researcher invited four people (one present netball coach, and three ex-netball players) to share individually and informally their views and opinions concerning skill areas in netball. From this information, 42 items were developed to make up four of the six netball skills subscales (i.e. communication, obstacles, motivation and general). The attack and defence subscales were kindly provided by Dr H.

Prapavessis (Auckland University), which had been developed prior to this study as a netball specific collective efficacy measure. The complete collective efficacy measure contained 72 items representing many different skill areas in netball, thus fulfilling the microanalytic approach as suggested by Bandura (1997). Investigating many different skill areas gives an indication of generality of a team's collective efficacy beliefs (Bandura, 1997). In developing item content, care was taken to cover key collective skills of which netball players would be aware, and consider important and relevant.

A pilot study, was carried out with a group of six ex-netball players that were asked to fill out the questionnaire. The pilot study was carried out to obtain their reactions to items and to confirm clarity and meaningfulness. This process also aimed to identify any items not relevant, inappropriate, or poorly worded, as well as to check the length of the questionnaire and how long it would take to complete. The pilot study highlighted several items that were unclear, and examples were added to these items in order to enhance comprehension. No items were removed as a result of the pilot study, thus the collective efficacy scale retained all 72 items.

All items in the collective efficacy measure began with a stem, "Our team's confidence that we can...", in order to focus on the team level. Although this method still asks for an individual's perception or rating, it uses individuals as informants to estimate the team's collective efficacy (Lindsley et al., 1995; Short & Feltz, 2000). Using individuals as informants then allows for aggregation of responses to produce a shared belief of collective efficacy, and addresses the unit of analysis issue surrounding collective efficacy (Feltz & Chase, 1998; Lindsley et al., 1995; Short & Feltz, 2000).

Participants were asked to rate their team's confidence in relation to specific collective netball skills on a 11 point Likert scale from 0% (no confidence at all) to 100% (complete confidence). This type of scale measures the strength of the confidence, as suggested by Bandura (1997). Bandura (1997) also suggested the measurement of the level of confidence a team feels, that is, rate how confident the team feels in their ability to perform the task at increasing difficulty levels (e.g. clearing two out of ten centre passes up to clearing nine out of

ten centre passes). However in the present study this would have made the questionnaire too long because of the number of skills involved. In order to address this issue, the researcher included the 0% confidence rating so that players could express no confidence in a particular skill. This approach follows along similar lines of other previous studies (e.g. Feltz & Lirgg, 1997; Paskevich et al., 1999).

### **3.3 Procedure.**

In order to obtain a sufficient amount of group data, two different competitions, the Age Group Championships and the National Provincial Championship, were targeted. *All* netball players and teams from the two elite netball competitions were invited to participate in the research. This large sample size would allow for in depth comparison among teams, and the results of the study would be more likely to be representative of collective efficacy in elite netball teams. For the purposes of the present study, individual players represent level one units, and the netball teams represent the second level (higher order) units for the hierarchical (nested) structure of the data.

It was optimal for data to be collected on site, that is, at the competitions. This would lead to greater generalisability of the results as the researcher would be able to use the same procedure and conditions for each team, thus removing any data collection errors and biases that may have occurred otherwise. The procedure adopted in this study has been suggested as preferable to sending out questionnaires to individuals in past studies of team efficacy and performance (Spink, 1990b).

In order to collect data on site, potential participants were recruited by the researcher via the teams' coaches (coaches names were obtained with the permission of Netball New Zealand). Letters were sent out to all 52 coaches in the two competitions inviting their team to participate in the research. The letter contained information about the purpose of the study, what their team would be asked to do, how much time filling out the questionnaire would take, and the usefulness of the research for future netball teams. The letter emphasised the voluntary nature of the research, and the lack of harm to the players in participating in the research. The letter encouraged the coaches to discuss the research with their team, and a reply form and stamped envelope was included for the coach's and team's agreement or decline to participate in the research.

Each coach (and team) that agreed to participate received a phone call by the researcher to make a suitable appointment time for the team to complete the questionnaire. This time was

approved by the coach to ensure no interference with pre-competition training. All questionnaires were completed within 24 hours of the start the competitions, in order to have little effect on the performance of the teams during the competitions.

Participants were administered the questionnaire (containing demographic questions and the four sport measures) in their team's place of residence for the competition (i.e. motel). The researcher or one of five trained data collectors administered the questionnaires. Data collectors were provided with a questionnaire instruction sheet that was read to all participants before the questionnaires were distributed. Participants completed their questionnaires individually, and were verbally assured of the confidentiality of their responses. Data collectors were present at all times during questionnaire administration in order to answer any questions, and to make sure questionnaires were completed individually. The four measures were placed into the questionnaire in a random order, thus reducing any order effects that may have occurred otherwise. Having the data collector collect the questionnaires immediately after completion and placing them in a "team" envelope also emphasised confidentiality. Informed consent forms were also collected and placed in a separate from the questionnaires, so that identification was not possible. All participants completed the questionnaire in approximately 30 minutes.

### **3.3.1 Data Analysis**

Four analytical steps were used to examine data in the present study. First, descriptive statistics such as means, standard deviations, and ranges were calculated for demographic questions and total scale scores in order to describe the data set, as well as to examine the data for heterogeneity between teams. Second, factor analyses were carried out on the four measures (POS, SSCQ, GEQ, and Collective Efficacy) in order to obtain the cleanest possible factor structure for ease of interpretation. Items that cross-loaded with several factors or did not factor into proposed subscales were removed from the measure. Once items were removed to obtain the most interpretable measures, reliability analyses were carried out for the four measures and their respective subscales.

Third, one-way analysis of variance (ANOVA) were carried out for each of the team level variables (e.g. mean GEQ, practice time, time spent on team building skills). These ANOVAs were calculated in order to determine whether there was greater variance between groups rather than within groups (i.e. heterogeneity of responses between teams), and thus providing justification of aggregation of individual responses to represent group characteristics (Moritz & Watson, 1998; Zhu, 1997). A significant F value means that there was greater variance between groups, and thus have agreement within teams (homogeneity of responses within groups) (Moritz & Watson, 1998). This also means that aggregation of player responses to represent a team level variable is appropriate, and reduces any aggregation bias (Moritz & Watson, 1998). Intraclass correlations were also calculated for the team level variables to examine the strength of the relationship between two peoples' responses or outcomes who were both in the same group (Kenny et al., 1998) (see Equation 6). A significant ICC means that there was homogeneity of responses within groups, and also confirms the ability to analyse that variable at the team level.

Intraclass correlation:

$$\rho = \frac{MS_{\text{betweengroups}} - MS_{\text{withingroups}}}{MS_{\text{betweengroups}} + [n - 1]MS_{\text{withingroups}}} \quad (6)$$

Where:

$n$  = the number of persons per group

$MS$  = mean squares

(Source: Kenny, D.A., Kashy, D.A., & Bolger, N. (1998). Data analysis in social psychology. In D.T. Gilbert, S.T. Fiske, and G. Lindzey (Eds.), *The Handbook of Social Psychology* (4<sup>th</sup> ed., Vol. 1, pp.233- 265). Boston, MA: McGraw-Hill.)

Finally, the data was analysed using HLM (Bryk, Raudenbush, & Congdon, 1996). HLM analyses both the individual level and group level data simultaneously, thus accounting for the nested nature of the data. That is, it accounts for the possible influence of an individual on a team, as well the influence of a team environment on an individual.

HLM models were constructed on the basis of existing research. That is, predictors found to be significant in research were used to specify the various models. Research has identified several predictors of collective efficacy, which are outlined briefly below:

1. Vicarious experiences (e.g. Bandura, 1997; Hodges & Carron, 1992; Prussia & Kinicki, 1996)
2. Leadership behaviours (Weldon & Weingart, 1993)
3. Prior performance (mastery experiences) (e.g. Bandura, 1997; Zaccaro et al., 1995)
4. Feedback (e.g. Bandura, 1997; Greenlees et al., 1999; Prussia & Kinicki, 1996)
5. Social influences (Spink, 1990a)
6. Focus of athletes (e.g. goal orientations) (Spink, 1990a)
7. Past history of the team (e.g. how long the team has been together) (Spink, 1990a)
8. Team cohesion (e.g. George & Feltz, 1995; Paskevich et al., 1999; Spink, 1990a)

Based on this theoretical information, several player and team level predictors of collective efficacy were included in the analysis. For exploratory reasons, individual characteristics such as length of netball career were also included in the analysis. It also seems reasonable to include athlete goal orientations (mastery or competitive orientations) as an extension of focus of the athletes. That is, an individual's tendency towards deriving sport success from competitive or mastery experiences may influence goal orientations and collective efficacy beliefs of the team, and thus should be included in the analysis.

It should be noted however, that prior team performance was not included as a predictor in the present study. This was due to the fact that teams participating in this study were formed for the one competition only. The majority of teams were formed only two months prior to the start of the competitions, and had not played any competitive games together prior to the

competition. Although collective efficacy literature has stated that prior team performance is a significant predictor, it could not be included in the present study for the above reasons. It would be unwise to include prior performance of the teams (i.e. previous season's performance), when the team is reformed each season with possibly different athletes each time.

For HLM purposes, variables were split into player level variables and team level variables. Also, in order to provide more interpretable and useful results, the three measures used as predictors (POS, SSCQ and GEQ) were first modelled with the total measure scores, and then with the theory-based subscales as individual predictors. Thus, the proposed player level variables used as predictors in the first analysis were:

1. Years of playing netball (NETYR)
2. Years of playing netball at elite level (LEVELYR)
3. Perceptions of Success total score (POSTOT)
4. Sources of Sport Confidence total score (NSSCTOT)

The proposed player predictors modelled in the second analysis were:

1. Perceptions of Success Mastery orientation subscale score (POSMAST)
2. Perceptions of Success Competitive orientation subscale score (POSCOMP)
3. SSCQ Mastery subscale score (NSCMAST)
4. SSCQ Vicarious experiences subscale score (NSCVEXP)
5. SSCQ Coach's leadership subscale score (NSCLEAD)
6. SSCQ Social support subscale score (NSCSUPP)

Three team level variables were used as proposed predictors in the first HLM model:

1. Mean length of time team has been together -months (MEANTYR)
2. Mean time spent in team meetings other than practice – minutes (MEANMEET)
3. Mean GEQ scores (MEANGEQ)

In the third analysis, the four GEQ subscales were modelled as proposed team level predictors:

1. Mean ATG-Task subscale score (ATGTASK)

2. Mean ATG –Social subscale score (ATGSOC)
3. Mean GI-Social subscale score (GISOC)
4. Mean GI-Task subscale score (GITASK)

Following the analytical strategy outlined by Bryk and Raudenbush (1992), three analytical steps within the HLM procedure were used. First, a one-way analysis of variance (ANOVA) with random effects was carried out. This provided useful preliminary information about how much variation existed in the collective efficacy scores within and between teams (see Bryk & Raudenbush, 1992, for more detail about centering HLM variables).

Specifically, two analytical models were formed. At the player level of analysis, players' collective efficacy score in each team was defined as its team mean of collective efficacy plus a random error at the player level (see Equation 7):

$$Y_{ij} = \beta_{0j} + r_{ij} \quad (7)$$

where  $Y_{ij}$  is the collective efficacy score of player  $i$  in team  $j$ ,  $\beta_{0j}$  is the team mean, and  $r_{ij}$  is the random error at the player level.

At the team level of analysis, each team's mean collective efficacy score was represented as a function of the grand mean of collective efficacy score plus a random error at the team level (see Equation 8):

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad (8)$$

where  $\gamma_{00}$  is the grand mean of collective efficacy scores and  $u_{0j}$  is the random error at the team level.

Second, a random coefficient model was used to examine regression equations within and between teams to determine: (1.) what were the averages of team regression coefficients, including intercepts and slopes?, (2.) how much did the regression coefficients vary from team to team?, and (3.) how much of the variance was explained at the player level? In detail then, players' collective efficacy scores within each team were first determined by their Perceptions of Success and Sources of Sport Confidence scores, their length of netball and elite level netball career, all player level predictors. In order to make interpretation more meaningful, the

player level predictors were centred around their team means, and so intercepts represented adjusted average team collective efficacy scores (Zhu, 1997). Thus, the player level equation became:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{NETYR} - \text{NETYR mean}) + \beta_{2j}(\text{LEVELYR} - \text{LEVELYR mean}) + \beta_{3j}(\text{POSTOT} - \text{POSTOT mean}) + \beta_{4j}(\text{NSSCTOT} - \text{NSSCTOT mean}) + r_{ij} \quad (9)$$

Where:

$Y_{ij}$  = collective efficacy score of player i in team j.

$\beta_{0j}$  = collective efficacy score mean for team j.

$\beta_{1j}$  = relationship between players years spent playing netball and collective efficacy in team j.

$\beta_{2j}$  = relationship between players years spent playing netball at elite level and collective efficacy in team j.

$\beta_{3j}$  = relationship between perceptions of success (success orientation) and collective efficacy in team j.

$\beta_{4j}$  = relationship between sources of sport confidence and collective efficacy in team j.

$r_{ij}$  = residual (random error) in team j.

In this level one model,  $\beta_{1j}$  to  $\beta_{5j}$  were slopes of the equation. The coefficients of the level one equations were further defined as a function of a grand mean of collective efficacy and a random error:

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad (10)$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad (11)$$

$$\beta_{2j} = \gamma_{20} + u_{2j} \quad (12)$$

$$\beta_{3j} = \gamma_{30} + u_{3j} \quad (13)$$

$$\beta_{4j} = \gamma_{40} + u_{4j} \quad (14)$$

Where:

$\gamma_{00}$  = average of the team means of collective efficacy

$\gamma_{10}$  = average netball years across teams

$\gamma_{20}$  = average elite level years across teams

$\gamma_{30}$  = average perceptions of success orientation across teams

$\gamma_{40}$  = average sport confidence sources across teams

$u_{0j}$  to  $u_{6j}$  = random errors at the team level

Third, assuming that regression coefficients varied from team to team, and little variance could be explained at the player level, an intercepts- and slopes-as-outcomes model was used to determine why some teams had higher averages than others or stronger associations between the player level predictors and collective efficacy scores. The player level model was defined exactly the same as Equation 9, but Equations 10 to 14 were expanded to include the team level predictors in the team level modelling (see Equation 15).

The team level model was defined exactly the same as Equation 9, but with team level predictors included in team level modelling (see Equation 15). Equations 10 to 14 were explained by the team predictors:

$$\beta_{xj} = \gamma_{x0} + \gamma_{x1}(\text{MEANTYR}) + \gamma_{x2}(\text{MEANMEET}) + \gamma_{x3}(\text{MEANGEQ}) + u_{xj} \quad (15)$$

Where:

$\beta_{xj}$  = player-level regression coefficients

$\gamma_{x0}$  = team level intercepts

$\gamma_{xx}$  = team level slopes

$u_{xj}$  = random errors

Following the procedure of Zhu (1997), team level modelling was carried out in a way similar to stepwise regression analysis. This method was appropriate for the relatively small sample size at the team level, and controlled for Type II error (Zhu, 1997). That is, only one team level predictor was brought in each time in the process of modelling. If the predictor was found to be statistically significant ( $p < 0.05$ ) in explaining coefficient variation, on either intercepts or slopes, the predictor would be retained. If the predictor was not found to be

significant, it would be dropped from further modelling, and a new predictor was brought in. This process was repeated until the impact of all predictors was investigated.

# Chapter Four

## *Results*

### **4.1 Descriptive Statistics**

Table 1 shows the various means and standard deviations associated with the demographic questions asked in the questionnaire. The average age of the sample ( $n = 318$ ) was 20.34 years, and had been playing netball for just over 11.5 years, and elite level netball for just over three years. On average, teams had been together for almost seven months, and spent three hours 15 minutes in team practice each week. Team members socialised with teammates for just under five hours per week, and spent 45 minutes in team meetings other than practice each week. Also, approximately 63 % of time during practice was spent on developing team skills, and 30 % was spent on developing individuals' skills. However, teams also stated that on average they spend approximately 43 % of time during practice on team building skills.

It should be noted that Team 12 (see Table 1) was problematic, due to zero standard deviations for several questions. This indicated that players' responses for this team in terms of the demographic questions were not individually answered. Team 12 was problematic as it was vary much an outlier for hours spent socialising. This very large number of hours spent socialising may have been due to the fact that some teams had high school students as players that attended school together. They may have included time spent with teammates during school hours as part of time spent socialising.

Table 2 shows the means and standard deviations associated with the four measures included in the study. Over the total sample, the means indicated fairly high confidence in team capabilities (i.e. efficacy beliefs), as well as reasonably strong beliefs about success and sources of sport confidence, and reasonably high team cohesiveness. The means also show that there was variability between teams for both demographic questions and measures.

**Table 1***Means for demographic questions for Teams 1–31 (N = 318).*

Team number	Total number of players	Age		Netball playing years		Elite Level years		Time together (months)		Practice time (hours)	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	10	17.40	1.08	9.44	1.01	2.94	2.01	4.30	7.63	1.90	0.21
2	10	16.70	1.16	9.22	2.39	1.10	0.32	2.00	0.00	1.65	0.24
3	10	18.00	0.67	9.20	3.29	2.10	1.10	6.20	11.18	4.05	0.50
4	10	16.40	0.97	7.50	2.55	1.50	0.85	2.00	0.00	1.90	0.21
5	10	17.30	0.82	8.10	3.07	4.33	2.18	1.33	0.91	3.40	1.08
6	10	16.20	1.14	9.10	2.23	2.10	0.74	2.00	0.00	2.80	0.42
7	10	16.90	1.10	7.20	1.69	1.90	0.88	2.70	0.95	2.10	0.77
8	10	17.40	0.84	9.6	2.01	2.10	0.88	6.30	7.27	4.00	0.00
9	9	17.75	0.71	10.78	1.48	3.56	2.07	1.44	0.53	3.06	0.88
10	10	17.10	1.29	9.30	1.42	1.30	0.48	4.01	7.05	2.50	0.53
11	10	18.50	0.71	11.00	1.41	3.40	1.26	2.00	0.00	3.45	0.76
12	9	16.44	0.88	9.56	1.13	2.00	1.32	10.67	10.72	3.00	0.00
13	10	17.00	1.05	9.50	1.27	3.10	1.20	9.2	15.18	1.60	0.21
14	10	16.78	0.67	9.10	1.79	3.00	0.71	5.30	10.79	2.15	0.24
15	10	17.60	1.08	10.30	1.25	1.90	0.88	2.20	0.35	2.10	0.32
16	10	18.60	1.58	11.70	1.64	3.30	1.77	5.56	11.42	2.10	0.32
17	10	19.67	1.32	11.10	1.79	2.70	2.41	5.56	12.82	3.50	1.08
18	11	22.18	3.49	13.55	4.74	4.00	2.53	24.82	13.29	4.82	1.25
19	12	23.33	3.28	14.33	3.03	4.33	2.99	23.25	25.97	4.27	0.90
20	9	23.00	1.73	13.22	2.77	2.33	2.40	2.33	0.50	3.17	1.54
21	10	24.90	3.45	12.70	5.03	3.50	1.60	13.89	10.39	4.80	1.03
22	10	22.00	3.33	12.30	4.50	2.00	2.00	2.45	0.89	5.20	1.14
23	11	25.36	6.99	16.90	6.44	2.45	1.57	13.60	16.19	4.00	0.77
24	12	27.67	2.57	17.83	5.20	6.45	3.07	21.50	28.65	3.63	0.93
25	11	24.82	4.47	15.36	3.72	6.45	3.50	2.86	0.95	4.82	0.75
26	11	21.91	2.95	14.40	3.17	4.00	3.61	0.95	0.15	4.27	0.79
27	12	21.73	3.10	11.83	3.27	3.82	3.25	1.88	0.31	3.83	0.83
28	10	23.90	3.45	12.10	3.21	4.50	3.41	6.40	14.63	2.30	0.67
29	10	25.70	5.06	15.60	4.48	5.00	2.98	7.06	10.92	3.90	1.37
30	11	22.64	3.47	14.64	3.44	5.36	2.46	10.27	9.53	3.82	0.60
31	10	20.90	2.77	11.40	4.33	2.20	1.03	4.39	7.37	2.10	0.32
Total	318	20.34	4.29	11.65	4.13	3.23	2.47	6.94	12.51	3.27	1.28

**Table 1 continued.**

Team number	Playing time		Socialising (hours)		Team Meetings (minutes)		Team skills %		Individual skills %		Team building skills %	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	33.33	19.53	0.65	0.97	60.00	.00	66.00	15.78	27.00	18.89	46.00	23.66
2	57.00	9.49	1.19	1.25	10.50	1.58	56.00	12.65	42.50	13.89	43.00	10.59
3	47.00	14.94	2.60	1.10	51.00	34.79	61.00	20.79	22.00	11.35	53.00	20.58
4	58.33	5.00	7.80	15.35	18.00	28.98	66.00	10.75	28.00	6.32	49.00	25.14
5	60.00	0.00	9.35	14.32	57.00	9.49	59.00	19.69	24.44	15.89	31.11	20.88
6	46.67	13.92	10.60	11.60	53.33	20.00	53.00	8.23	28.00	13.17	48.89	15.37
7	48.33	14.58	2.17	2.32	40.00	27.77	58.89	9.28	25.00	7.56	40.00	28.98
8	45.00	14.14	3.80	4.37	60.00	0.00	56.00	22.71	29.00	15.95	53.00	20.58
9	60.00	0.00	8.89	4.88	46.67	40.00	57.78	19.86	25.56	18.10	25.56	25.06
10	51.43	14.64	4.26	6.39	37.50	31.05	65.00	5.35	37.50	11.65	60.00	28.28
11	48.00	11.83	1.66	1.46	53.33	20.00	63.33	13.23	36.67	14.14	18.89	11.67
12	46.67	21.79	45.56	13.33	120.0	0.00	30.00	0.00	20.00	0.00	100.0	0.00
13	52.50	7.91	0.45	0.59	24.00	30.98	63.00	14.94	37.00	6.75	39.00	14.49
14	54.00	12.65	10.00	6.11	34.50	14.23	73.00	10.59	29.00	12.87	62.00	25.73
15	49.50	14.23	1.40	3.10	36.00	41.95	51.00	18.53	31.00	19.69	65.00	24.15
16	55.71	11.34	0.44	0.88	37.78	40.55	61.00	15.24	28.00	14.76	25.56	14.24
17	46.67	13.92	1.80	1.93	42.00	28.98	74.00	13.50	24.00	10.75	37.00	26.27
18	43.50	13.13	1.82	2.79	72.27	47.82	79.09	17.00	41.82	30.60	41.82	36.56
19	44.09	14.29	3.50	3.39	25.00	30.90	71.67	11.93	24.17	11.65	40.00	27.63
20	39.44	10.44	1.39	1.41	43.33	26.46	65.56	11.30	26.67	7.07	32.22	15.63
21	55.00	8.66	2.50	4.77	45.00	38.08	70.00	14.91	41.00	24.24	60.00	29.44
22	49.50	7.25	1.90	2.08	24.00	30.98	72.00	7.89	27.00	20.03	28.00	14.76
23	45.50	12.35	2.45	2.42	16.36	24.61	55.45	13.68	31.00	12.87	37.00	27.10
24	50.45	12.14	1.64	2.38	21.82	30.27	52.50	20.06	24.17	16.21	40.00	29.54
25	46.50	16.51	1.86	3.16	43.64	38.80	50.09	29.82	25.45	16.95	18.18	15.37
26	45.00	16.77	3.91	3.08	185.5	118.4	71.82	11.68	43.00	17.67	50.91	24.27
27	46.25	18.60	3.58	3.34	57.50	32.51	67.50	14.85	32.50	24.54	48.33	32.98
28	50.00	12.25	6.00	6.22	39.00	28.46	61.00	15.95	30.00	14.91	50.00	27.08
29	55.00	7.75	2.40	2.37	25.50	30.04	64.00	6.99	43.00	22.14	36.00	15.06
30	46.36	12.47	2.45	3.64	27.27	31.33	64.55	14.39	32.73	15.55	34.55	25.05
31	55.00	7.50	3.40	5.95	42.00	49.40	72.00	10.33	34.00	18.94	38.00	29.74
Total	49.08	13.64	4.78	9.46	46.84	48.62	62.77	17.04	30.62	16.91	43.46	27.17

**Table 2***Mean scores for four measures for total sample and individual teams.*

Team number	POS		GEQ – reduced*		SSCQ – reduced*		Collective efficacy	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	47.70	7.72	77.70	7.12	176.50	27.42	204.56	23.25
2	44.60	3.66	72.20	7.89	164.20	19.02	174.44	18.76
3	49.89	3.06	89.00	9.19	191.10	16.88	213.89	14.49
4	50.10	2.81	80.10	9.69	172.00	21.23	180.78	14.56
5	43.10	4.38	73.70	12.91	151.10	25.95	152.25	34.25
6	45.67	4.66	86.20	6.73	177.30	23.83	215.40	23.36
7	45.40	2.91	67.22	12.35	139.70	31.32	163.63	14.10
8	50.30	5.14	85.00	13.85	178.20	26.87	211.00	36.53
9	51.67	3.20	68.67	17.07	183.22	19.89	182.67	24.99
10	47.60	6.83	78.33	78.33	166.00	33.59	188.13	15.09
11	45.80	3.71	82.20	19.01	156.00	24.12	220.00	21.78
12	45.22	4.58	100.22	5.63	177.89	24.16	234.44	16.83
13	49.60	3.98	86.50	6.57	187.70	14.35	203.40	22.84
14	47.80	4.54	82.10	5.15	167.90	18.13	198.90	16.71
15	45.80	5.01	71.56	10.51	162.90	20.95	178.00	17.19
16	48.50	9.52	85.00	9.65	184.30	30.86	218.11	21.54
17	45.10	7.37	78.40	5.87	172.00	30.36	194.30	35.46
18	45.00	8.26	82.73	8.10	173.27	30.35	215.40	29.85
19	51.08	4.50	81.50	12.66	179.00	29.04	204.25	25.86
20	48.67	4.74	78.78	7.64	174.89	17.11	204.67	12.28
21	50.40	10.76	80.10	15.21	197.90	23.60	206.63	30.79
22	53.20	4.94	78.30	14.78	170.40	22.88	193.60	28.28
23	48.10	13.42	74.00	16.05	186.60	22.17	199.89	14.29
24	48.83	5.81	70.17	14.62	175.83	24.66	172.17	37.35
25	52.27	7.18	78.18	13.14	183.45	18.02	202.45	23.38
26	52.36	5.22	85.91	9.82	168.70	24.24	235.64	21.42
27	48.50	7.28	80.92	11.78	172.00	19.26	219.55	22.39
28	54.67	4.87	78.10	11.21	195.89	20.82	202.00	36.83
29	50.80	5.05	69.00	16.96	176.70	20.90	192.90	34.78
30	49.73	5.90	73.91	10.51	169.36	28.71	218.30	16.72
31	50.89	5.13	79.10	12.18	173.90	15.80	207.13	23.93
Total	48.67	6.50	79.18	12.93	174.32	25.79	200.82	30.27

Note. \* Measures with items removed after factor analysis.

## 4.2 Factor Analysis

Factor analyses were carried out on all four measures in order to obtain the most interpretable measures for later analyses. Table 3 shows the factor loadings and correlations for the two POS subscales. Two factors were extracted with no items cross loading. Table 3 also showed that the relationship between the two factors was small, indicating that the two subscales assessed two different aspects of Perceptions of Success. Factor loadings ranged from 0.69 to 0.89 for the mastery subscale, 0.48 to 0.91 for the competitive subscale.

**Table 3**

*Factor loadings and correlations for POS items.*

	Factor 1 $\lambda$	Factor 2 $\lambda$
POS 4	0.69	
POS5	0.71	
POS 8	0.82	
POS 9	0.89	
POS 10	0.83	
POS 12	0.71	
POS 1		0.60
POS 2		0.87
POS 3		0.91
POS 6		0.48
POS 7		0.52
POS 11		0.78

Factor Correlation Matrix for two factors of POS

Factor	1	2
1	1.00	
2	0.25	1.00

Note. Factor 1 = Mastery, Factor 2 = Competitiveness.

The data from the present study supported the four factor structure of the GEQ, although only with the exclusion of several items. GEQ items that cross-loaded with other factor or did not factor into proposed subscales were removed from the measure (i.e. items 5, 9, 11, 14, and 18). Table 4 summarises the factor loadings and factor correlations for the reduced GEQ measure.

**Table 4***Factor loadings and correlations for GEQ items (reduced version).*

	Factor 1 $\lambda$	Factor 2 $\lambda$	Factor 3 $\lambda$	Factor 4 $\lambda$
GEQ 2	0.37			
GEQ 4	0.49			
GEQ 6	0.70			
GEQ 8	0.70			
GEQ 10		0.66		
GEQ 12		0.78		
GEQ 16		0.60		
GEQ 13			0.61	
GEQ 15			0.48	
GEQ 17			0.58	
GEQ 1				0.60
GEQ 3				0.58
GEQ 7			0.31	0.17 <sup>a</sup>

Factor correlation matrix for reduced GEQ factors

Factor	1	2	3	4
1	1.00			
2	-0.36	1.00		
3	0.34	-0.29	1.00	
4	0.40	-0.18	0.32	1.00

Note. <sup>a</sup> Items that cross-loaded with other factors.

Factor 1 = ATG-Task

Factor 2 = GI-Task

Factor 3 = GI-Social

Factor 4 = ATG-Social

Factor loadings ranged from 0.37 to 0.70 for ATG-Task, 0.60 to 0.78 for GI-Task, 0.48 to 0.61 for GI-Social, and 0.17 to 0.60 for ATG-Social subscales. In order to have at least three items per subscale, item number 7 (in ATG-Social subscale) was included in the reduced measure. However, caution must be taken when interpreting this subscale due to its cross-loading on to other factors. The factor correlations showed that there was modest to small relationships between the four factors, with the highest correlation being 0.40 between the ATG-Task and ATG-Social subscales.

The data of the present study did not support the nine factor structure of the SSCQ as proposed by Vealey et al. (1998). Ten items that cross-loaded with other factors or did not factor into proposed subscales were removed from the measure. Items 12 and 14 (“psych myself up” and “know I have support from others”) cross-loaded with several other factors. However, if these two items were removed from the measure, the factor structure became more unclear. As a result, items 12 and 14 were retained in the measure, appeared to load together in a separate factor. The factor loadings and correlations for the eight factors retained in the analysis are shown in Table 5. Factor loadings ranged from 0.20 to 0.92 for the eight factors. It should be noted that items 12 and 14 were not originally in the same proposed subscale, and although they loaded with one another, this new unknown subscale was not used in subsequent analyses.

Factor correlations showed small to moderate relationships between the eight factors, with the strongest correlation being  $-0.50$  between demonstration of ability and physical self-presentation subscales.

**Table 5***Factor loadings and correlations for SSCQ items (reduced version).*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
	$\lambda$	$\lambda$	$\lambda$	$\lambda$	$\lambda$	$\lambda$	$\lambda$	$\lambda$
SSCQ 16	0.59							
SSCQ 25	0.63							
SSCQ 33	0.82							
SSCQ 39	0.71							
SSCQ 2		0.68						
SSCQ 11		0.61						
SSCQ 20		0.77						
SSCQ 29		0.86						
SSCQ 36		0.67						
SSCQ 40		0.47						
SSCQ 8			0.69					
SSCQ 26			0.84					
SSCQ 34			0.92					
SSCQ 4				0.66				
SSCQ 13				0.74				
SSCQ 22				0.92				
SSCQ 1					0.44			
SSCQ 10					0.70			
SSCQ 19					0.77			
SSCQ 28					0.52			
SSCQ 35					0.69			
SSCQ 6						0.80		
SSCQ 15						0.68		
SSCQ 24						0.82		
SSCQ 32						0.62		
SSCQ 43						0.58		
SSCQ 12							0.37 <sup>a</sup>	0.32
SSCQ 14					0.17	0.18	0.20 <sup>a</sup>	
SSCQ5								0.44
SSCQ23								0.43
SSCQ31								0.56
SSCQ38								0.65
SSCQ42								0.77

**Table 5 continued**

Factor correlation matrix for SSCQ factors (reduced version)

Factor	1	2	3	4	5	6	7	8
1	1.00							
2	0.27	1.00						
3	-0.42	-0.33	1.00					
4	-0.29	-0.50	0.32	1.00				
5	0.37	0.21	-0.38	-0.25	1.00			
6	-0.47	-0.11	0.25	0.22	-0.40	1.00		
7	0.00	0.00	0.00	-0.15	0.00	-0.13	1.00	
8	0.40	0.24	-0.37	-0.14	0.38	-0.28	0.00	1.00

Note. <sup>a</sup> Items that cross-loaded with other factors. (was not originally a separate factor – but if taken out, factor structure did not hold).

Factor 1 = Vicarious experience

Factor 2 = Demonstration of ability

Factor 3 = Environmental comfort

Factor 4 = Physical self-presentation

Factor 5 = Mastery

Factor 6 = Coach's leadership

Factor 7 = Unknown

Factor 8 = Social support

Table 6 shows the factor loadings and correlations for the collective efficacy measure. From the original 72 items, 27 were retained for further analysis. Items that cross-loaded or did not factor into proposed subscales were removed from the measure. The data supported a six factor structure, and the top five factor loadings for each subscale were included in the reduced measure (three highest factor loadings for motivation and four highest factor loadings for communication subscales). Factor loadings ranged from 0.39 to 0.97 for communication, 0.49 to 0.93 for defence, 0.65 to 0.94 for general, 0.65 to 0.92 for obstacles, 0.47 to 0.88 for attack, and 0.36 to 0.57 for motivation subscales. As Table 6 shows, the motivation items tended to cross-load with other factors, however the loadings still demonstrated a sixth factor, with all three motivation loadings loading above the minimum loading of 0.30.

**Table 6***Factor loadings and correlations for collective efficacy items.*

	Factor 1 $\lambda$	Factor 2 $\lambda$	Factor 3 $\lambda$	Factor 4 $\lambda$	Factor 5 $\lambda$	Factor 6 $\lambda$
CECOM 3	0.39					
CECOM 5	0.64					
CECOM 6	0.66					
CECOM 7	0.68					
CEDEF 3		0.49				
CEDEF 4		0.64				
CEDEF 6		0.90				
CEDEF 7		0.93				
CEDEF 10		0.70				
CEGEN 3			0.74			
CEGEN 4			0.84			
CEGEN 5			0.94			
CEGEN 6			0.73			
CEGEN 9			0.65			
CEATT 1				0.68		
CEATT 2				0.88		
CEATT 3				0.76		
CEATT 11				0.64		
CEATT 14				0.47		
CEOBS 5					0.74	
CEOBS 6					0.83	
CEOBS 8					0.92	
CEOBS 9					0.65	
CEOBS 10					0.66	
CEMOT 1	0.25				0.29	0.39 <sup>a</sup>
CEMOT 2	0.18			0.24	0.16	0.57 <sup>a</sup>
CEMOT 3		0.25				0.36 <sup>a</sup>

Factor correlation matrix for collective efficacy factors

Factor	1	2	3	4	5	6
1	1.00					
2	0.39	1.00				
3	-0.59	-0.37	1.00			
4	0.48	0.51	-0.53	1.00		
5	-0.55	-0.42	0.43	-0.62	1.00	
6	-0.33	-0.17	0.29	-0.26	0.44	1.00

Note. <sup>a</sup> Items that cross-loaded with other factors.

Factor 1 = Communication

Factor 2 = Defence

Factor 3 = General

Factor 4 = Attack  
Factor 5 = Obstacles  
Factor 6 = Motivation

Table 6 also shows the factor correlations for the six factors of the collective efficacy measure. Correlations ranged from  $-0.62$  to  $0.51$ , demonstrating small to moderate relationships between the factors. Five correlations were moderately strong ( $-0.62$ ,  $-0.59$ ,  $-0.55$ ,  $-0.53$ , and  $0.51$ ), however, some degree of correlation was expected due to the nature of the measure.

### **4.3 Reliability Analysis**

Table 7 shows the internal reliabilities for the four measures (reduced versions), and their respective subscales. Cronbach's alphas ranged from  $0.86$  to  $0.90$  for the POS,  $0.62$  to  $0.81$  for the GEQ,  $0.55$  to  $0.92$  for the SSCQ, and  $0.85$  to  $0.96$  for the collective efficacy scale. All alphas exceeded the  $0.70$  criterion advocated by Nunnally (1978) for the POS and collective efficacy measures. However, only one of the four GEQ subscales (GI-Task) exceeded this criterion. Also the social support subscale and unknown factor of the SSCQ were both below the  $0.70$  alpha criterion (see Table 7).

**Table 7***Internal consistency reliabilities for four measures (N = 318).*

Scale	Number of items	Total/Subscale	Cronbach's alpha
POS	6	Competitiveness	0.86
	6	Mastery	0.90
	12	Total scale	0.90
			(n = 314)
GEQ –reduced	3	ATG–social	0.56
	4	ATG–task	0.69
	3	GI–social	0.62
	3	GI–task	0.73
	12	Total scale	0.77
			(n = 314)
SSCQ – reduced	5	Mastery	0.81
	6	Demonstration of ability	0.86
	3	Environmental comfort	0.87
	3	Physical self-presentation	0.83
	4	Vicarious experience	0.82
	5	Coach's leadership	0.88
	5	Social support	0.69
	2	Unknown	0.55
	33	Total scale	0.92
			(n = 314)
Collective Efficacy	5	Attack	0.85
	5	Defence	0.89
	3	Motivation	0.85
	5	Obstacles	0.92
	4	Communication	0.90
	5	General	0.92
	27	Total scale	0.96
			(n = 297)

#### 4.4 Analysis of Variance

One-way analysis of variance (ANOVA) were calculated to determine whether there was significant variation between teams for team level variables for justification of aggregating responses to represent the shared beliefs of a team (as suggested by Moritz and Watson, 1998). Table 8 presents the one-way ANOVA data for the team level variables. As discussed previously, a significant  $F$  value means that there was greater variance between groups than within groups, and thus have agreement within teams (i.e. homogeneity of responses). As Table 8 shows, all team level variable  $F$  values were significant. Therefore, aggregation of players' responses to represent shared beliefs was appropriate.

As an extension of this, intraclass correlations (ICCs) were calculated for all team level variables (see Equation 6), and results are summarised in Table 8. A significant ICC indicates that a group level phenomenon is evident (at a level greater than expected by chance) (Paskevich et al., 1999). All ICCs were significant, indicating that the proposed team level variables were in fact representing group level phenomena. The ICC also demonstrates the strength or magnitude of the relationship between two peoples' responses that were in the same group (Paskevich et al., 1999). A high value is associated with small within group variance (with a upper limit of +1.00). The ICCs ranged from 0.05 to 0.42, and although the ICCs were only of moderate magnitude, the  $F$  tests were statistically significant, thus representing agreement within teams (i.e. shared beliefs). In other words, these results further support the ANOVA results and team means could be used in subsequent analyses (Moritz & Watson, 1998).

**Table 8***Analysis of variance and intraclass correlations for team level variables.*

Team level variables		Degrees of freedom	SS	MS	F	Intraclass Correlation $\rho$
Collective efficacy scale	Between groups	30	105462.14	3515.41	5.64**	0.34
	Within groups	266	165789.41	623.27		
GEQ – reduced scale	Between groups	30	13796.01	459.87	3.38**	0.23
	Within groups	282	38336.61	135.95		
Team Meetings	Between groups	30	342832.06	11427.74	8.23**	0.42
	Within groups	279	387469.87	1388.78		
Team Years	Between groups	30	13963.09	465.44	3.77**	0.22
	Within groups	282	34831.06	123.51		
ATG-Social	Between groups	30	556.89	18.56	1.52*	0.05
	Within groups	287	3515.33	12.24		
ATG-Task	Between groups	30	1794.58	59.82	2.43**	0.13
	Within groups	286	7034.22	24.60		
GI-Social	Between groups	30	2344.98	78.17	4.33**	0.25
	Within groups	283	5107.13	18.05		
GI-Task	Between groups	30	1599.35	53.31	2.39**	0.12
	Within groups	282	6289.65	22.30		

Note. \*  $p < .05$ . \*\*  $p < .001$ .

## 4.5 Statistical Assumptions

First, assumptions about level one random effects were examined. The level one variables (Netball Years, Elite Level Years and SSCQ total scores and SSCQ subscales) were found to have fairly normal distributions, thus not violating the normality assumption. However, the POS total scores had a slightly upwards skewed distribution, thus implying non-normality of the POS data. When investigated further, the POS Competitive orientation was normally distributed, but the POS Mastery orientation was skewed upwards. This indicated that this sample tended quite strongly to the Mastery orientation of success perceptions.

The homogeneity of variance of level one effects was also examined. The results of this assumption test were  $\chi^2 = 77.23$  ( $df = 30, p < 0.001$ ), which indicated that this assumption was violated. That is, there was heterogeneity of variance for the level one effects. This may have been due to one or more important level one predictors being omitted from the model (Bryk & Raudenbush, 1992). As the level one predictors in the above models only accounted for 39 % of the player level variance in collective efficacy, it seems reasonable to suggest that an important predictor may have been left out of the models. Alternatively, the heterogeneity of variance may have been caused by non-normal data (i.e. more extreme observations than normally suggested) (Bryk & Raudenbush, 1992). As previously discussed, the POS Mastery scores were found to be non-normal, and thus may have caused this heterogeneity. One other possible reason for the heterogeneity of level one variance was found through the histogram of the residual dispersions for the 31 teams based on the final fitted model (see Figure 1, Appendix B). There was one team that had a considerably smaller within-team standard deviation that was expected under the homogeneity hypothesis.

Second, assumptions concerning level two effects were investigated. This was achieved through analysis of residuals. The normality was checked via a Mahalanobis Distance for each unit. This summarises the degree of departure of the random effects from normality and allows detection of outliers (Bryk & Raudenbush, 1992). The plot of the Mahalanobis Distances (see Figure 2, Appendix B) showed that the level two random effects were fairly

normal. Thus, normality could be assumed. However, the plot also revealed one extreme outlier, which may have some effect on the normality of the data.

Plots of the level two predictors in the fully saturated model against EB residuals for the intercepts indicated that the assumption of linearity was appropriate (see Figure 3 – 7, Appendix B). That is, the residuals appeared to be randomly distributed around the zero line without regard to values of the level two predictors.

## 4.6 HLM Analysis

There were three main steps in the HLM analysis, as suggested by Bryk and Raudenbush (1992) and Zhu (1997).

### 4.6.1 One-way ANOVA with random effects.

First, a one-way ANOVA with random effects was calculated, and these results are shown in Table 9. The one-way ANOVA with random effects provided necessary information to determine if there was a significant difference between teams in terms of the collective efficacy scores (Bryk & Raudenbush, 1992; Zhu, 1997). The grand mean (mean of all team collective efficacy means) of the collective efficacy scores was 199.74 with a standard error (*SE*) of 3.39.

**Table 9**

*Results of one-way ANOVA with random effects.*

Fixed effect	Coefficient	<i>SE</i>		
Average team mean	199.74	3.39		
Random effect	Variance component	<i>df</i>	Chi-square	<i>p</i> value
Team mean	299.45	30	158.33	0.000
Player level effect	617.53			

Note. ANOVA = analysis of variance; *SE* = standard error, *df* = degrees of freedom.

The variance components are also given in Table 9. The variance component was 617.53 at the player level, and 299.45 at the team level. These estimates demonstrated that to some extent, players varied from each other within teams, however a substantial proportion of the

difference was found between teams. Table 9 also reports the results of the statistical chi-square test. This test determines whether the variance of the team means is significantly greater than zero (i.e. null hypothesis was that no variance existed between team means). The large chi-square ( $\chi^2 = 158.33$ ,  $df = 30$ ,  $p < 0.001$ ) supported the finding that players' collective efficacy scores varied significantly between teams. As a significant difference was found in the collective efficacy scores, further examination of the effects of team variables was appropriate.

#### **4.6.2 Random coefficient model I.**

Second, a random coefficient model was developed to examine the proposed player level predictors of collective efficacy. Table 10 reports the results of the random coefficient model. The overall team mean collective efficacy score (i.e. the average of the intercepts), with an adjustment for netball years, elite level years, POS total scores, and SSCQ total scores, was 199.77 ( $SE = 3.39$ ). The average of the netball years slopes was 0.54 ( $SE = 0.70$ ); average elite level years slope was  $-0.02$  ( $SE = 0.77$ ); average POS total score slopes was 0.23 ( $SE = 0.38$ ); and the average SSCQ total score slopes was 0.17 ( $SE = 0.08$ ). The  $t$  ratio of the SSCQ total score slopes was 2.14, with a significant  $p$  value ( $p < 0.05$ ), which indicated that SSCQ total score was positively related to players' collective efficacy scores.

The variability among regressions coefficients is also shown in Table 10. The results demonstrated that a significant difference existed between teams for mean team collective efficacy, Netball Years, POS Total scores, and SSCQ Total scores. More specifically, the estimated variance of the intercepts (team mean) was 316.37, which was statistically significant according to the chi-square statistic ( $\chi^2 = 209.19$ ,  $df = 30$ ,  $p < 0.001$ ). This confirmed the previous finding (by one-way ANOVA with random effects; Table 9) that collective efficacy scores varied significantly across teams. The estimated variance of the Netball Years slope was 6.29 ( $\chi^2 = 49.88$ ,  $df = 30$ ,  $p < 0.01$ ), which indicated that length of time spent playing netball varied significantly among teams. The estimated variance of the POS total score slopes was 2.64 ( $\chi^2 = 44.11$ ,  $df = 26$ ,  $p < 0.05$ ), which indicated that the POS total score varied significantly across teams. The estimated variance of the SSCQ total score

slopes was 0.07 ( $\chi^2 = 54.95$ ,  $df = 26$ ,  $p < 0.01$ ), which also suggested that the SSCQ total score varied significantly among teams, and that significant variation remains to be explained.

No significant difference was found among elite level years slopes (see Table 10). This indicated that the relationship between collective efficacy and years spent playing netball at an elite level did not vary significantly across teams.

**Table 10***Results of the random coefficient model I (POS and SSCQ total scores).*

Fixed effect	Coefficient	SE	t ratio	p value
Overall mean collective efficacy score	199.77	3.39	58.89	0.000
Mean Netball years slope	0.54	0.70	0.76	0.451
Mean Elite level years slope	-0.02	0.77	-0.03	0.979
Mean POS total slope	0.23	0.38	0.59	0.557
Mean SSCQ total slope	0.17	0.08	2.14	0.041
Random effect	Variance component	df	Chi-square	p value
Team mean	316.37	30	209.19	0.000
Netball years slope	6.29	30	49.88	0.013
Elite level years slope	4.91	30	38.93	0.127
POS total slope	2.64	30	44.11	0.046
SSCQ total slope	0.07	30	54.95	0.004
Player level effect	467.37			

Note. *SE* = standard error, *df* = degrees of freedom.

Table 10 also reports the estimated player level variance, which was 467.37. The same variable was estimated as 617.53 in the one-way ANOVA with random effects (see Table 9), where the player level predictors were not included. An index known as “Variance Explained” (Bryk & Raudenbush, 1992) was computed, based on this information, to determine the variance of collective efficacy explained at the player level. The equation was:

$$\text{Variance Explained}_{\text{at player level}} = \frac{617.53 - 467.37}{617.53} = 0.243 \quad (16)$$

This result indicated that player level predictors accounted for 24.3 % of the player level variance in the outcome (players’ collective efficacy scores). More specifically, adding netball years, elite level years, POS total, and SSCQ total scores as predictors reduced the player level variance in collective efficacy by 24.3 %. Thus, the impact of team level variables required further investigation.

### **4.6.3 Intercepts- and slopes-as-outcomes model I.**

In the third and final step of the HLM analysis, an intercepts- and slopes-as-outcomes model was developed. In this model, three team level predictors were used to model the variability of player level intercepts and slopes (Bryk & Raudenbush, 1992; Zhu, 1997). The three team variables (i.e. mean Team Years, mean Team Meetings, and mean GEQ scores) included in this model were selected on the basis of collective efficacy theory and research (see Chapter 2 and 3). The level one predictor Elite Level Years was not included in the model as it did not vary significantly between teams (see Table 10). However, all of the three remaining level one predictors were included in the intercepts- and slopes-as-outcomes model as they were found to vary significantly between teams.

Table 11 reports the results of the intercepts- and slopes-as-outcomes model. For the intercepts (average adjusted team collective efficacy scores) length of time spent in team meetings (MEANMEET), and mean team cohesion (MEANGEQ) were the only statistically significant predictors (see Table 11). More specifically, controlling for mean Team Years and mean Team Meetings, for every standard deviation above average team cohesion, average collective efficacy score for that team was 1.70 points higher. Also, controlling for mean Team Years and mean Team Cohesion, for every standard deviation above the average time spent in team meetings, average collective efficacy score was 0.14 points higher. The positive gamma coefficients for mean Team Meetings and mean GEQ score demonstrated positive significant relationships with collective efficacy scores.

Mean Team Years (length of time team has been together) was not found to be a significant predictor of collective efficacy scores. Additionally, mean Team Years and mean GEQ scores were not found to be significantly related to either POS total scores or SSCQ total scores. However, mean Team Meetings was found to have significant positive relationships with Netball Years slopes and POS slopes. Although, Team Meetings was found to predict Netball Years and POS total scores, these relationships were small. Gamma coefficients were 0.03 ( $t$

ratio = 2.81,  $p < 0.01$ ) for Netball Years slopes, and 0.02 ( $t$  ratio = 2.05,  $p < 0.05$ ) for POS slopes.

**Table 11**

*Results of the intercepts- and slopes-as-outcomes model 1 (with POS, SSCQ and GEQ total scores).*

Fixed Effect	Gamma Coefficient	SE	$t$ ratio	$p$ value
For Intercepts at player level				
Intercept2	56.40	29.39	1.92	0.065
Meantyr	0.35	0.25	1.38	0.179
Meanmeet	0.14	0.06	2.44	0.022
MeanGEQ	1.70	0.38	4.51	0.000
For Netball Years slopes at player level				
Intercept2	3.34	7.29	0.46	0.650
Meantyr	0.09	0.06	1.47	0.153
Meanmeet	0.03	0.01	2.81	0.010
MeanGEQ	-0.06	0.10	-0.64	0.529
For POS slopes at player level				
Intercept2	5.91	4.11	1.44	0.162
Meantyr	0.05	0.05	1.14	0.263
Meanmeet	0.02	0.01	2.05	0.050
MeanGEQ	-0.09	0.05	-1.54	0.134
For SSCQ slopes at player level				
Intercept2	0.83	1.08	0.77	0.448
Meantyr	-0.00	0.01	-0.29	0.776
Meanmeet	0.00	0.00	0.18	0.863
MeanGEQ	-0.01	0.01	-0.58	0.566

Final estimation of variance components:

Random Effect	Variance component	$df$	Chi-square $\chi^2$	$p$ value
Intercepts at player level	101.40	27	79.88	0.000
Netball Years slopes at player level	4.19	27	37.59	0.084
POS slopes at player level	2.82	27	53.99	0.002
SSCQ slopes at player level	0.09	27	43.71	0.022
Player level effect	489.39			

Note.  $SE$  = standard error,  $df$  = degrees of freedom.

The final stage of the intercepts- and slopes-as-outcomes model was to calculate the “Variance Explained” index to determine whether other team level predictors may also account for the variability of the player level coefficients (Bryk & Raudenbush, 1992; Zhu, 1997). As the analysis was performed at the team level, the baseline model was the variance estimated from the random coefficient model.

For the intercepts, the variance explained was:

$$\text{Variance Explained}_{\text{for intercepts}} = \frac{316.37 - 101.40}{316.37} = 0.679 \quad (17)$$

where the value 316.37 was the estimated variance of intercepts by the random coefficients model (see Table 10), and the value of 101.40 was the estimated variance by the intercepts- and slopes-as-outcomes model (see Table 11). Thus, team level predictors accounted for approximately 68 % of the intercept variation. More specifically, 68 % of parameter variation in mean collective efficacy score has been explained by the team level predictors (i.e. mean Team Years, mean Team Meetings and mean GEQ score). The chi-square test also showed that the null hypothesis (that no residual variance remained to be explained) was rejected ( $\chi^2 = 79.88$ ,  $df = 27$ ,  $p < 0.001$ ). In other words, other team level predictors not included in this model explained the remaining 32 % percent of team level variance in collective efficacy.

#### **4.6.4 Random coefficient model II.**

As an extension of the HLM analysis, significant level one predictors (POS and SSCQ) were split into their respective subscales to determine more specifically if they predicted collective efficacy. However, to supplement the analyses, the subscale predictors that were placed into the new random coefficient model and were also selected on theoretical grounds. For the POS measure, both subscales were included in the new random coefficient model. For the SSCQ measure, only theory based subscales were included, namely Mastery, Vicarious Experiences, Coach’s Leadership, and Social Support subscales.

Table 12 summarises the results of the random coefficients model that included POS and SSCQ subscale scores. In this model, the overall collective efficacy score (average of the intercepts) was 199.72 ( $SE = 3.39$ ). The average of the Competitive and Mastery POS subscales slopes was 0.29 ( $SE = 0.39$ ) and  $-0.05$  ( $SE = 0.75$ ) respectively. The averages of the SSCQ subscale slopes were: average Mastery slopes was 1.83 ( $SE = 0.50$ ); average Vicarious Experiences slopes was  $-0.15$  ( $SE = 0.34$ ); average Coach's Leadership slopes was 0.44 ( $SE = 0.40$ ); and the average Social Support slope was 0.18 ( $SE = 0.54$ ).

Only the SSCQ Mastery subscale was a significant factor in determining players' collective efficacy scores within teams. The  $t$  ratio of the mastery slope was 3.66 ( $p < 0.001$ ), which indicated that Mastery was positively related to players' collective efficacy scores. More specifically, controlling for all other level one predictors, for every standard deviation above the average Mastery score, collective efficacy score for that team was 1.83 points higher.

**Table 12***Results of the random coefficient model II (with subscale scores for POS and SSCQ).*

Fixed effect	Coefficient	SE	t ratio	p value
Overall mean collective efficacy score	199.72	3.39	58.87	0.000
Mean POS Competitive slope	0.29	0.39	0.73	0.474
Mean POS Mastery slope	-0.05	0.75	-0.07	0.947
Mean SSCQ Mastery slope	1.83	0.50	3.66	0.001
Mean SSCQ Vicarious Experiences slope	-0.15	0.34	-0.45	0.659
Mean SSCQ Coach's Leadership slope	0.44	0.40	1.10	0.279
Mean SSCQ Social Support slope	0.18	0.54	0.33	0.746
Random effect	Variance component	df	Chi-square	p value
Team mean	326.40	30	257.90	0.000
POS Competitive slope	2.19	30	36.35	0.197
POS Mastery slope	10.76	30	65.10	0.000
SSCQ Mastery slope	1.78	30	43.21	0.056
SSCQ Vicarious Experience slope	0.79	30	31.89	0.372
SSCQ Coach's Leadership slope	1.61	30	45.18	0.037
SSCQ Social Support slope	5.35	30	37.99	0.150
Player level effect	379.12			

Note. *SE* = standard error, *df* = degrees of freedom.

Variability among regression coefficients was also shown in Table 12. The estimated variance of the intercepts (team means) was 326.40, which was statistically significant ( $\chi^2 = 257.90$ ,  $df = 30$ ,  $p < 0.001$ ). This again confirmed the previous finding (by one-way ANOVA with random effects; Table 9) that a significant difference existed among teams in collective efficacy score. Similar results were found for the Mastery slopes of the POS, and Mastery and Coach's Leadership slopes of the SSCQ.

The estimated variance of the Mastery slopes of the POS was 10.76 ( $\chi^2 = 65.10$ ,  $df = 30$ ,  $p < 0.001$ ). This result suggested that the relationships between collective efficacy and mastery orientations did vary significantly among teams.

The estimated variance of the Mastery and Coach’s Leadership slopes of the SSCQ were 1.78 ( $\chi^2 = 43.21$ ,  $df = 30$ , nearly significant  $p = 0.056$ ) and 1.61 ( $\chi^2 = 45.18$ ,  $df = 30$ ,  $p < 0.05$ ) respectively. This result suggested that the relationship between collective efficacy scores and perceptions of mastery experiences and coach’s leadership did vary significantly across teams. However, no significant differences were found among Competitive success orientations (POS), Vicarious Experiences, and Social Support slopes (SSCQ), which indicated that the relationships between collective efficacy scores and these subscales did not vary significantly among teams.

Based on the estimated player level variance in Table 12 and Table 9, the “Variance Explained” index was calculated to determine the variance in collective efficacy scores explained by player level predictors. The equation was:

$$\text{Variance Explained}_{\text{at player level}} = \frac{617.53 - 379.12}{617.53} = 0.386 \quad (18)$$

Therefore, the player level predictors accounted for approximately 38.6 % of the player level variance of the players’ collective efficacy scores. That is, adding the POS and SSCQ subscales as predictors of collective efficacy scores explained 38.6 % of the player level variance in collective efficacy. This also illustrated that the impact of team level variables should be examined further.

**4.6.5 Intercepts- and slopes-as-outcomes model II.**

Table 13 summarises the results of the second intercepts- and slopes-as-outcomes model, in which only significant level two predictors (i.e. mean Team Meetings and mean GEQ total score; see Table 11) were used to model the variability of the player level coefficients (intercepts and slopes). Once again, only player level factors that were found to be significantly different among teams (see Table 12) were included in the model (i.e. POS Mastery, SSCQ Mastery and SSCQ Coach’s Leadership subscales).

For the intercepts, the average time spent in team meetings (MEANMEET) and mean team cohesion score (MEANGEQ) were again statistically significant predictors. More specifically, controlling for mean Team Meetings, for every standard deviation above the average GEQ score, average collective efficacy score for that team was 1.77 points higher. Also, controlling for mean GEQ scores, for every standard deviation above the average time spent in team meetings, average collective efficacy for that team was 0.12 points higher (see Table 13). The *t* ratios for Team Meetings and mean GEQ scores were 2.08 ( $p < 0.05$ ) and 4.68 ( $p < 0.001$ ) respectively, indicating significant positive relationships with collective efficacy scores. For the remaining three slopes (Mastery orientations, and Mastery experiences and Coach's Leadership), neither of the two team factors were found to be significant predictors (see Table 13).

**Table 13**

*Results of the intercepts-and slopes-as-outcomes model II (with significant POS and SSCQ subscales and significant level two variables).*

Fixed Effect	Gamma Coefficient	SE	t ratio	p value
For Intercepts at player level				
Intercept2	53.71	29.52	1.82	0.079
Meanmeet	0.12	0.06	2.08	0.046
MeanGEQ	1.77	0.38	4.68	0.000
For POS mastery slopes at player level				
Intercept2	-3.21	7.81	-0.41	0.684
Meanmeet	0.01	0.01	0.92	0.367
MeanGEQ	0.04	0.10	0.37	0.712
For SSCQ mastery slopes at player level				
Intercept2	0.89	6.71	0.13	0.895
Meanmeet	0.01	0.02	0.56	0.580
MeanGEQ	-0.00	0.09	-0.02	0.982
For SSCQ coach's leadership slopes at player level				
Intercept2	1.78	5.93	0.30	0.767
Meanmeet	0.01	0.01	1.13	0.267
MeanGEQ	-0.02	0.08	-0.32	0.748

Final estimation of variance components:

Random Effect	Variance component	df	Chi-square $\chi^2$	p value
Intercepts at player level	105.54	28	81.47	0.000
POS mastery slopes at player level	11.57	28	71.03	0.000
SSCQ mastery slopes at player level	1.37	28	38.57	0.088
SSCQ coach's leadership at player level	1.84	28	43.96	0.028
Player level effect	492.46			

Note. SE = standard error, df = degrees of freedom.

Lastly, an index of “Variance Explained” based on the formula in Equation 17 was calculated in order to determine whether other team level predictors might also account for the variability of the player level intercepts.

For the intercepts, the variance explained was:

$$\text{Variance Explained}_{\text{for intercepts}} = \frac{326.40 - 105.54}{326.40} = 0.677 \quad (19)$$

where the value of 326.40 was the estimated variance of intercepts by the random coefficients model (see Table 12), and the value of 105.54 was the estimated variance by the intercepts- and slopes-as-outcomes model (see Table 13). Therefore, team level predictors accounted for approximately 68 % of the intercept variation. In other words, 67.7 % of the parameter variation in mean collective efficacy has been explained by time spent in team meetings and team cohesiveness. The test of the null hypothesis was rejected ( $\chi^2 = 81.47$ ,  $df = 28$ ,  $p < 0.001$ ), thus the impact of other unknown team level predictors remained to be explained.

#### **4.6.6 Intercepts- and slopes-as-outcomes model III.**

As a further extension, the team level variable “mean team cohesion” (MEANGEQ) was split into its respective subscales in order to investigate in more detail which aspects of team cohesion predicted team collective efficacy scores. Again, only player level variables that varied significantly between teams were included in this model (see Table 12). Also, the other significant team level variable (TEAMMEET) was retained in the new model. More specifically, mean time spent in team meetings, mean ATG-Social, mean ATG-Task, mean GI-Social and GI-Task were the team level variables used to model the variability of the player level intercepts and slopes.

Table 14 reports the results of the third intercepts- and slopes-as-outcomes model. For the intercepts, mean Team Meetings and mean GI-Task (GEQ subscale) were the only statistically significant predictors. In more detail, controlling for ATG-Social, ATG-Task, GI-Social, and GI-Task, for every standard deviation above average time spent in team meetings, average collective efficacy score was 0.20 points higher. Also, controlling for Team Meetings, ATG-

Social, ATG-Task and GI-Social, for every standard deviation above average Group Integration-Task score, average collective efficacy score was 4.44 points higher. The  $t$  ratio for mean Team Meetings and mean GI-Task were 5.80 ( $p < 0.001$ ) and 4.00 ( $p < 0.001$ ) respectively. These ratios also indicated that mean Team Meetings and mean GI-Task scores were significantly positively related to collective efficacy scores.

The results of this model also suggest that the subscales of the GEQ also tend to predict the POS and SSCQ subscale slopes (see Table 14). More specifically, mean ATG-social, ATG-task and GI-social were significant predictors of the POS mastery slopes. ATG-task and GI-social had significant positive relationships with POS mastery, with gamma coefficients equalling 0.55 and 0.74 respectively. Mean ATG-social had a significant negative relationship with POS mastery, with its gamma coefficient equalling  $-2.10$ .

**Table 14**

*Results for intercepts- and slopes-as-outcomes model III (with significant POS and SSCQ subscales, mean team years and GEQ subscales).*

Fixed Effect	Gamma Coefficient	SE	t ratio	p value
For Intercepts at player level				
Intercept2	69.04	23.80	2.90	0.008
Meanmeet	0.20	0.03	5.80	0.000
Mean ATG-Soc	-0.17	1.14	-0.15	0.886
Mean ATG-Task	0.91	0.99	0.92	0.368
Mean GI-Soc	0.56	0.74	0.75	0.461
Mean GI-Task	4.44	1.11	4.00	0.001
For POS mastery slopes at player level				
Intercept2	11.14	10.22	1.09	0.287
Meanmeet	0.02	0.01	1.36	0.186
Mean ATG-Soc	-2.10	0.72	-2.93	0.008
Mean ATG-Task	0.55	0.19	2.84	0.009
Mean GI-Soc	0.74	0.28	2.62	0.015
Mean GI-Task	-0.41	0.29	-1.42	0.168
For SSCQ mastery slopes at player level				
Intercept2	-11.34	6.36	-1.78	0.086
Meanmeet	0.00	0.01	0.06	0.950
Mean ATG-Soc	1.48	0.44	3.33	0.003
Mean ATG-Task	0.14	0.14	1.03	0.315
Mean GI-Soc	-0.20	0.30	-0.67	0.511
Mean GI-Task	-0.51	0.19	-2.70	0.013
For SSCQ coach's leadership slopes at player level				
Intercept2	6.39	5.45	1.17	0.252
Meanmeet	0.01	0.01	1.53	0.138
Mean ATG-Soc	-1.00	0.32	-3.07	0.006
Mean ATG-Task	0.07	0.12	0.58	0.565
Mean GI-Soc	0.22	0.19	1.16	0.257
Mean-GI Task	0.11	0.19	0.58	0.570

**Table 14 continued**

Final estimation of variance components:

Random Effect	Variance component	<i>df</i>	Chi-square $\chi^2$	<i>p</i> value
Intercepts at player level	88.72	25	66.20	0.000
POS mastery slopes at player level	7.39	25	56.20	0.001
SSCQ mastery slopes at player level	0.18	25	25.57	0.431
SSCQ coach's leadership at player level	1.95	25	40.62	0.025
Player level effect	480.59			

Note. *SE* = standard error, *df* = degrees of freedom.

Mean ATG-social and mean GI-task scores were significant predictors of SSCQ mastery slopes, with gamma coefficients of 1.48 (*t* ratio = 3.33, *p* < 0.01) and -0.51 (*t* ratio = -2.70, *p* < 0.05) respectively. Mean ATG-social scores also had a significant negative relationship with SSCQ coach's leadership slopes ( $\gamma = -0.99$ , *t* ratio = -3.07, *p* < 0.01).

An index of "Variance Explained", based on Equation 17, was calculated to determine whether other team level predictors might also account for the variability of the intercepts (i.e. mean collective efficacy scores).

For the intercepts, the variance explained was:

$$\text{Variance Explained}_{\text{for intercepts}} = \frac{326.40 - 88.72}{326.40} = 0.728 \quad (20)$$

where the value 326.40 was the estimated variance of intercepts by the random coefficients model (see Table 12), and the value of 88.72 was the estimated variance by the intercepts- and slopes-as-outcomes model (see Table 14). Thus, the team level predictors in this model accounted for approximately 73 % of the intercept variation. In other words, 72.8 % of the parameter variation in mean collective efficacy scores has been explained by mean time spent in team meetings and mean Group Integration-Task subscale score. The chi-square test, that

no residual variance remained to be explained, was rejected ( $\chi^2 = 66.20, df = 25, p < 0.001$ ). Thus, other unknown predictors of collective efficacy remained.

## Chapter Five

### *Discussion.*

The aim of the study was to investigate predictors of collective efficacy. Furthermore, the study used Hierarchical Linear Modelling (one type of multilevel model) to address the unit of analysis issue in collective efficacy research. Thus, the major strength of the study was the analytical method used to analyse the data at both individual and team levels, thus investigating player, team and cross-level effects.

Examination of the descriptive statistics showed that average level of team collective efficacy and cohesion was fairly high in elite athletes (see Table 2). However, this was expected due to the high performance level of the athletes. The results also indicated that teams tended more strongly towards a mastery goal orientation, rather than a competitive orientation. That is, the teams appeared to derive success from successfully accomplishing set goals or skills instead of beating opponents. This result may also reflect the elite level of the athletes.

With respect to the SSCQ, the overall average across teams indicated that the most important sources of sport confidence for this sample were mastery experiences, demonstration of ability, social support and coach's leadership. This result is similar to that found by Vealey et al. (1998), who found mastery, social support and demonstration of ability to be the most important sources of sport confidence for their mixed gender sample. Thus, for a female sample of elite athletes, mastery of skills and support and feedback from the coach appeared to be the most important sources of confidence.

Psychometric analyses of the four measures generally supported the proposed factor structures for each the four measures. The results of factor analysis supported the two-factor structure of the POS, as found by Roberts et al. (1998). The factor analysis of the GEQ weakly supported

the four-factor structure as proposed by Widmeyer et al. (1985). Widmeyer et al. (1985) found GEQ items to group into four factors, which were interpreted as the ATG (Individual Attractions to Group – Task and Social) and GI (Group Integration – Task and Social) subscales of the GEQ. However, the present study only found 13 items that grouped into these four subscales. This result follows along similar lines to Schutz et al. (1994), who did not find support for this widely used measure of group environment. This suggests that future research needs to investigate the factor structure of the GEQ to further ascertain usefulness of this measure with other populations. However, an interpretable factor structure was obtained with the removal of five items, thus the reduced scale contained 13 items in total.

The nine factors of the SSCQ, as proposed by Vealey et al. (1998) were generally supported in the present study. However, two subscales were not found to be during within the factor analyses (i.e. Situational Favourableness and Physical/Mental preparation), and several items from other subscales were not found to group into their proposed factors. In total, ten items were removed from the scale. This may have been due to cultural differences (i.e. measure was developed in North America), or lack of comprehension of certain items. Mastery, demonstration of ability, coach's leadership, social support, vicarious experiences, environmental comfort, and physical self-presentation were all factors that were supported in the study and these were clearly identified.

Finally, the factor analysis of the collective efficacy measure provided support for the six-factor structure as suggested by Paskevich et al. (1999). The results indicated a 27-item collective efficacy measure with six factors (Attack, Defence, Motivation, Overcoming Obstacles, Communication and General), with all factor loadings above the 0.30 minimum. As collective efficacy is posited to be situation specific (Bandura, 1997; Zaccaro et al., 1995), the respective collective efficacy measure was sport specific, thus following the suggestion made by Paskevich et al. (1999).

The internal reliability estimates found in the present study provided strong support for the reliability of the POS, SSCQ and collective efficacy measures. That is, all Cronbach's alpha scores were all above 0.70 (except for the eighth unknown factor of the SSCQ). The

reliability analysis for the GEQ indicated that some scales were less reliable, with a range of 0.62 to 0.77 for the subscales.

Following the suggestion of Moritz and Watson (1998), one-way ANOVAs and corresponding ICCs for each of the team level variables were calculated (see Table 8). All team level variables had significant *F* values, and significant moderate ICCs. This result indicated that teams did in fact share beliefs in regards to the team level variables, and aggregation (via the use of team means) at the team level was appropriate. This also allowed for the level two model to be specified using these variables and thus the use of HLM.

Three different models were formed to investigate collective efficacy, with each model conforming to the three steps suggested by Bryk and Raudenbush (1992) and Zhu (1997). The first model was mainly concerned with model building and included total scale scores (i.e. POS, SSCQ and GEQ) to provide preliminary information about the proposed predictors at both levels. The first stage in Model One indicated that collective efficacy was explained to some degree by level one variables, but also by level two variables (see Table 9). This provided justification to continue to build the model to explain this variance at level two.

For the total scores model (see Table 10) at level one, the results indicated that at the player level, the Sources of Sport Confidence scores was the only significant predictor of collective efficacy. In other words, the more important sport confidence was to the players, the higher the level of collective efficacy. This result suggests that Sport Confidence significantly explained more variance in collective efficacy than did other level one variables. Perceptions of Success (i.e. success orientations), length of netball career, and length of elite level netball career did not predict collective efficacy at the player level. The use of a total score, or global measure, to assess Perceptions of Success may have affected this result. In other words, using subscale scores that indicate players' success orientations in more detail may be a more appropriate method for examining the affect Perceptions of Success has on collective efficacy. It also seems reasonable to suggest that a player at an early stage of their netball career may derive confidence from the length of time they have played the game. However, the athletes in the present study had been playing netball for an average of 11 years, and so it could be

suggested that these players have been playing netball for a long time, and therefore confidence is no longer derived from the length of their netball careers. Results also indicated that these player level predictors accounted for 24 % of the variance in collective efficacy, thus approximately 76 % of variance in collective efficacy remained to be explained by team level predictors. This highlighted the need to further explain the variance in collective efficacy by team level variables.

At the team level, the total score model suggested that team cohesion and length of time spent in team meetings (outside of normal practices) were significant predictors of collective efficacy. This supports previous research by Spink (1990b) and Paskevich et al. (1999) who found team cohesion and collective efficacy to be related to one another. The total scores model at the team level explained a substantial proportion of the variance in collective efficacy. In other words, length of time the team has been together, length of time spent in team meetings and team cohesion explained 68 % of the variance in collective efficacy.

Spink (1990a) proposed that past history of the teams would affect collective efficacy. So in the present study, how long the team had been together, and how much time was spent in team meetings were included in the modelling to represent history of the team. Time spent in team meetings does not appear to have been empirically studied previously, however it seems reasonable to suggest that increased time spent in team meetings (other than team practices) would in fact enhance a team's efficacy beliefs through increased communication.

It should be noted that what constituted team meetings was not investigated. The question however (see Appendix A), specified that these were team meetings outside of normal practice times. From feedback and questions asked by participants during questionnaire completion, it appeared that participants included pre- and post-game discussions as potential components of this variable. Therefore, it could be suggested that these meetings consisted of discussion with the coach about game specific skills (e.g. strategies to use during the game), as well as verbal feedback or encouragement about the game in general. If this was indeed the case, it makes sense then that this type of meeting would enhance a team's sense of efficacy. It could also be suggested that these meetings may also have an impact on team cohesion. Although this was

not investigated in much depth, the correlation between the total GEQ scores and team meetings was 0.20 ( $p < 0.01$ ), indicating a small but significant relationship. It would be useful for future studies to include a more detailed investigation of this relationship to determine what it is about these team meetings that have an impact on other team level characteristics.

Mean time spent in team meetings was also found to have significant positive relationships with years spent playing netball and POS slopes, indicating team meetings have a significant impact on the success orientations of players. That is, these team meetings appear to provide opportunity for communication between players and the coach, and possibly expression of performance related goals, and therefore have an affect on how the players perceive success in their sport. These results highlight that team meetings have a significant positive impact on several team and individual processes, and should be examined in more depth in future studies.

In the second model, the POS and SSCQ measures were split into their respective subscales, however only subscales that were theoretically justified entered this model (see Table 12). For the subscale scores at the player level, the results indicated that the mastery orientation of the POS was the only significant predictor of collective efficacy. That is, players who tended to derive success in sport from mastery related accomplishments (rather than beating opponents), also tended to have a higher level of collective efficacy beliefs. This result supported the research by Spink (1990a) to some extent, who proposed that the focus of the athletes could affect collective efficacy. It seems reasonable to suggest that the focus of athletes is related to athletes' goal and success orientations. So in this respect, the results of the study support the notion that players' success orientations have an effect on the collective efficacy of the team. In other words, players who perceived success in sport to come from accomplishing goals belonged to teams that had a high sense of collective efficacy.

The player level results also indicate that the subscales of the SSCQ did not predict collective efficacy. This result suggests that subscales left out of the analysis contributed to the relationship between SSCQ total scores and collective efficacy scores. It should be noted that

the models were driven from a theoretical perspective, which was the reason for the omission of the three other SSCQ subscales. Also, Bryk and Raudenbush (1992) suggested the inclusion of only one to three predictors at the player level with this sample size. The model in this analysis actually included seven level one predictors at the player level, which lends itself to a potentially over-saturated model, especially for this sample size. To include these remaining, non-theoretical subscales would have over-saturated the level one model.

The player level model (see Table 12; random effects) indicated that POS Mastery slopes, SSCQ Mastery slopes and Coach's Leadership slopes were the only level one predictors to vary significantly across teams, and therefore be included in the team level model. Although the SSCQ subscales were not found to be significant predictors at the level, they were found to vary significantly across teams, and so according to Bryk and Raudenbush (1992), should be included in the level two model. The player level variance, explained in this model, accounted for 38.6 % of the variance in collective efficacy. Therefore, although the total scores of the POS and SSCQ provided interesting preliminary information, using the subscales in this model explained more variance (an increase of 14.6 %) in collective efficacy at the player level. This result also tells us however that approximately 62 % of the variance in collective efficacy still remained to be explained by team level predictors.

At the team level (see Table 13), the model included the level one variables that were found to vary significantly across teams (i.e. POS Mastery, SSCQ Mastery, and SSCQ Coach's Leadership), and the significant level two predictors obtained in the first model (i.e. Mean Team Meetings and Mean Team Cohesion). The results of this model supported the earlier finding that time spent in team meetings and team cohesion have significant positive relationships with collective efficacy. Team meetings did not appear to have any further relationships with the POS Mastery subscale in this model, suggesting the relationship identified earlier was with the Competitive orientation. In other words, the significant impact of team meetings on POS total scores (see Table 11) could possibly be due to the competitive subscale.

In this team level model, the two team level predictors accounted for 68 % of the variance in collective efficacy. Thus, the level one predictors (POS Mastery, SSCQ Mastery and SSCQ Coach's leadership) and team meetings and team cohesion alone explained 68 % of the variance in collective efficacy.

The final model was the most saturated model, and included the same level one variables as the previous model (i.e. POS Mastery, SSCQ Mastery, and SSCQ Coach's Leadership), and subscale scores of the GEQ (instead of the total scores) at level two. The results of this team level model indicated that the only GEQ subscale that had a significant positive relationship with collective efficacy was GI-Task. This subscale purports to measure an "individual team members' feelings about the similarity, closeness, and bonding within the team as a whole around the group's task" (Widmeyer et al., 1985, pp.17). Therefore, mean GI-Task represents a team's feelings about the similarity, closeness and bonding associated with the team's tasks and goals. Thus, the results indicated that the more cohesive a team was in relation to team tasks and goals, the higher the level of collective efficacy. This result did not support the finding of Spink (1990b), who found that ATG-Task and GI-Social subscales of the GEQ differentiated between high and low efficacy groups. It should be noted however, that these relationships found by Spink (1990a) may have been affected by Type I error, that is variance at level one may have been thrown out due to analysis only at the team level. This result partially supports the findings of Paskevich et al. (1999), who found that both task related aspects of team cohesion (i.e. ATG-Task and GI-Task) differentiated between high and low efficacy groups. These two studies only analysed the data at one of the two levels. The results of this study extends the previous research from a more robust statistical methodology, and thus has more statistical power due to the analysis at both individual and team levels. The net result is a reduction in Type I errors.

This team level model also showed that when split into subscales, the GEQ tended to have significant relationships with the level one predictor slopes. These relationships were cross-level effects, or effects that occurred between the level one and level two variables. These cross-level effects were important findings, as they indicated that team level variables (especially team cohesion) seems to impact on individuals within the team as well as on the

team as a whole. More specifically, ATG-Social was found to have significant relationships with POS Mastery and SSCQ Mastery slopes. In other words, the more cohesive a team was in regards to social aspects of the players, the higher the likelihood of perceiving mastery of skills and goals to be important. ATG-Task and GI-Social both had significant positive relationships with the Mastery orientation of the POS. That is, the more cohesiveness a player feels with respect to belonging within the team and given the players' involvement in team tasks, the more likely the players are to perceive success in sport to be based on accomplishing goals. Also, GI-Task was found to have a significant positive relationship with SSCQ Mastery. Thus, if a team is cohesive in terms of team tasks, then the players will tend to perceive mastery experiences as important sources of sport confidence.

The saturated model also indicated that 73 % of variance in collective efficacy was due to these team level predictors, over and above the variance explained at the player level. Thus, including mean team meetings and the four GEQ subscales explained a further 4 % of the variance in collective efficacy, than did mean team meetings and mean GEQ total scores. Overall, the results provide a stronger explanation of the variance in collective efficacy, than when using a global or total measure. The results indicate that team level variables account for a substantial proportion of the variance in collective efficacy, thus demonstrating that collective efficacy is primarily a function of team level characteristics.

The first limitation of the present study was that prior performance was not included as a predictor of collective efficacy. Performance data was collected, but its use was not appropriate as the teams were only formed approximately two months prior to the competition, and thus team members were not necessarily the same as the previous season. Descriptive statistics revealed that although the mean time teams had been together was 6.9 months, the median was two months. Thus, the majority of teams had only been together for approximately eight weeks. Therefore, previous seasons' results were not relevant to these teams' performance. Also, the teams did not play any competitive games prior to the competition, so performance data was not available for the present season's teams.

A second limitation of the study was that collective efficacy information could only be collected at one point in time, which was within 24 hours of the start of the competitions. This meant that collective efficacy and the other information collected was probably situation (or competition) specific. However, this could also be seen as a strength, as the study therefore investigated context specific collective efficacy for two short (five day), but important national level competitions. In other words, as the competition was at one point in time, and not spread out over a couple of months, assessing context specific collective efficacy was appropriate.

In order to address these limitations, future studies would benefit from following or tracing teams across an entire season (i.e. spread over a couple of months), rather than a weeklong competition. This would allow for the inclusion of performance data, and would reduce the situational specificity. This would also allow for investigation of the development of collective efficacy across an entire season. This type of longitudinal study would allow for investigation of collective efficacy–performance spirals, which have recently been identified in group performance literature (c.f. Lindsley et al., 1995).

The results of the present study suggest that team meetings outside of regular practices are a significant predictor of collective efficacy and thus requires further investigation. Future collective efficacy research should examine this construct in more detail to find out the nature of these meetings, and therefore possible reasons why they impact on collective efficacy beliefs. Based on the relationships team meetings had with collective efficacy, and goal orientations, it seems reasonable to suggest that this construct may be considered an important part of the development of the team and its beliefs. Thus, future research should also consider the effect of team building and development techniques on collective efficacy.

Although, the coach's leadership subscale was not found to be a significant predictor of collective efficacy in these models, it was still found to be an important source of player's sport confidence. This suggests that the coach's efficacy and role as leader, as well as the team's perceptions of the coach should be included in future multilevel analyses of collective efficacy. This supports the suggestion made by Short and Feltz (2000) that coach's efficacy should be explored in future research.

In conclusion, the results of the study suggest that players' tendency towards deriving sport success from accomplishing goals (i.e. mastery orientations), time spent in team meetings outside of normal practices, and team cohesiveness all have a significant impact on a team's collective efficacy beliefs. In other words, this study identified several factors that impact on collective efficacy. The fact that effects were analysed at both the player and team level gives more meaning to these results. Obtaining the fairly large number of teams (31) at the group level was a major highlight of the study, which also adds to the interpretation and statistical power of the analyses. This large number of teams also meant that the results of the study were representative of the larger population (with over half of the teams invited taking part).

It real strength of this study is that it is one of the first to use HLM to analyse both individual and group levels, representing a new direction in group research. More specifically, it appears to be the first multilevel analysis with such a sample size at both individual and team levels in sport and collective efficacy research. Results of the study provide substantial support for collective efficacy as a team level characteristic. The team level predictors accounted for a substantial proportion of the variance in collective efficacy at the team level, over and above the variance explained at the player level. Thus, it is clear that sport psychologists should be applying interventions, and aiming team development and team building strategies at the team level.

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## **Appendix A**

### ***Questionnaire and Consent form.***

# *The predictors of team efficacy in elite netball teams.*

## **INFORMATION SHEET**

My name is Heidi Wilkinson, and I am a post-graduate student in the School of Psychology, Albany, Massey University. My supervisor is Dr Richard Fletcher, a lecturer in the School of Psychology.

This study looks at team efficacy and factors that influence team efficacy of elite netball players in New Zealand. Team efficacy is an individual's beliefs in their team's ability to succeed at their sport.

In cooperation with Netball New Zealand, I am inviting you, as an elite netball player, to participate in this research. If you agree to participate you will need to complete the following questionnaires. The questionnaires relate to different aspects of sports participation, in particular your perceptions about sport and your team, as well as a few demographic questions. The aim of the questionnaires is to obtain an understanding of how players in elite netball teams view different aspects of the sport and team processes. There are no right or wrong answers to any of the questions. The questions are simply a gauge of your personal views and preferences. It should take you approximately 30 minutes to complete the questionnaire.

Your participation in the research is completely voluntary. All of your responses will be **anonymous and confidential** as no identifying marks of any kind will be used on the questionnaire. Signed consent forms will be kept separate from questionnaires at all times for the duration of the study. It will not be possible to identify you (or your team) in any reports that are written up from this research.

- **You have the right not to participate in the study.**
- **You have the right to withdraw from the study at any time without penalty.**
- **You have the right to decline to answer any particular questions.**
- **You have the right to ask any questions about the study at any time during participation.**
- **You have the right to be given access the completed thesis.**

Should you have any questions about the research please do not hesitate to contact Heidi Wilkinson on (09) 6255049 or Richard Fletcher on (09) 4439700 Ext 9880.

## Demographic Questions

What is the name of your team? \_\_\_\_\_

Playing Status: Starter / Reserve

Age: \_\_\_\_\_ Years

1. How many years have you been playing netball? \_\_\_\_\_ Year(s)
2. How many years have you been playing at this level? \_\_\_\_\_ Year(s)
3. How long have you been part of this team? \_\_\_\_\_ Months \_\_\_\_\_ Years
4. How much competitive playing time do you get? \_\_\_\_\_ Minutes/Game
5. How much time does your team spend in practice/training? \_\_\_\_\_ Hours/Week
6. What percentage of time is spent during practice on team skills (e.g. strategies, ball skills)?

(Please circle.)

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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7. What percentage of time is spent during practice on individual skills? (Please circle.)

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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8. How much time do you spend socialising with your teammates? \_\_\_\_\_ Hours/Week

9. How much time does your team spend in team meetings (other than practices) each week? (Please circle)

0hr	1 hr	2 hr	3 hr	4 hr	5 hr	6 hr	more
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10. What percentage of time is spent during practice on team building skills (e.g. working together)?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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## ***Questionnaire Instructions.***

The following questionnaires assess your perceptions of sport and your team.

*There are no right or wrong answers so please give your immediate reaction. Some of the questions may seem repetitive but please answer All questions. Your candid responses are very important to us.*

### **A: Perceptions of Success**

*This is a questionnaire which asks you to express your perception of what success in sport means to you. We ask you to circle the number that best reflects how you feel about that question.*

#### ***When playing sport, I feel most successful when:***

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. I beat other people	A	B	C	D	E
2. I am clearly superior	A	B	C	D	E
3. I am the best	A	B	C	D	E
4. I work hard	A	B	C	D	E
5. I show clear personal improvement	A	B	C	D	E
6. I outperform my opponents	A	B	C	D	E
7. I accomplish something others cannot do	A	B	C	D	E
8. I reach a goal	A	B	C	D	E
9. I overcome difficulties	A	B	C	D	E
10. I master something I couldn't do before	A	B	C	D	E
11. I show other people I am the best	A	B	C	D	E
12. I perform to the best of my ability	A	B	C	D	E

## **B: Group Environment Questionnaire**

Copyright 1985, By Sport Dynamics.

Source: Widmeyer, W.N., Brawley, L.R., & Carron, A.V. (1985). *The measurement of cohesion in sport teams: The Group Environment Questionnaire*. London, Ontario: Sports Dynamics.

## C: Sport Confidence

Think about playing and practicing your sport, and about what types of things made you feel confident in those situations.

Please circle the number which best represents the level of importance each statement has for you.

### *I usually gain self-confidence in my sport when I...*

		Not at all important		Moderately important			Of highest importance	
1.	Master a new skill in my sport.	1	2	3	4	5	6	7
2.	Demonstrate I am better than others.	1	2	3	4	5	6	7
3.	Keep my focus on the task.	1	2	3	4	5	6	7
4.	Feel good about my weight.	1	2	3	4	5	6	7
5.	Get positive feedback from teammates.	1	2	3	4	5	6	7
6.	Believe in my coach's abilities.	1	2	3	4	5	6	7
7.	See successful performances.	1	2	3	4	5	6	7
8.	Perform in environment I like.	1	2	3	4	5	6	7
9.	Get breaks from officials.	1	2	3	4	5	6	7
10.	Improve my performance on a skill.	1	2	3	4	5	6	7
11.	Show ability by winning/placing.	1	2	3	4	5	6	7
12.	Psych myself up.	1	2	3	4	5	6	7
13.	Feel I look good.	1	2	3	4	5	6	7
14.	Know I have support from others.	1	2	3	4	5	6	7
15.	Know coach will make good decisions.	1	2	3	4	5	6	7
16.	Watch another athlete perform.	1	2	3	4	5	6	7
17.	Follow certain rituals.	1	2	3	4	5	6	7
18.	See breaks going my way.	1	2	3	4	5	6	7
19.	Improve my skills.	1	2	3	4	5	6	7
20.	Know I can outperform opponents.	1	2	3	4	5	6	7
21.	Know I'm mentally prepared.	1	2	3	4	5	6	7
22.	Feel my body looks good.	1	2	3	4	5	6	7
23.	Am told others believe in me.	1	2	3	4	5	6	7
24.	Know coach is a good leader.	1	2	3	4	5	6	7
25.	Watch a teammate perform well.	1	2	3	4	5	6	7

Please circle the number which best represents the level of importance each statement has for you.

***I usually gain self-confidence in my sport when I...***

		Not at all important		Moderately important			Of highest importance	
		1	2	3	4	5	6	7
26.	Feel comfortable in environment.	1	2	3	4	5	6	7
27.	Feel every thing "going right".	1	2	3	4	5	6	7
28.	Increase the number of skills I can perform.	1	2	3	4	5	6	7
29.	Prove I am better than opponents.	1	2	3	4	5	6	7
30.	Stay focused on my goals.	1	2	3	4	5	6	7
31.	Am encouraged by coaches/family.	1	2	3	4	5	6	7
32.	Trust in coach's decision.	1	2	3	4	5	6	7
33.	See a friend perform successfully.	1	2	3	4	5	6	7
34.	Like environment I am performing in.	1	2	3	4	5	6	7
35.	Develop new skills and improve.	1	2	3	4	5	6	7
36.	Show I'm one of the best.	1	2	3	4	5	6	7
37.	Prepare myself physically and mentally.	1	2	3	4	5	6	7
38.	Get positive feedback from coaches.	1	2	3	4	5	6	7
39.	Watch teammates at my level.	1	2	3	4	5	6	7
40.	Win.	1	2	3	4	5	6	7
41.	Believe in my ability to give maximum effort.	1	2	3	4	5	6	7
42.	Receive support/encouragement.	1	2	3	4	5	6	7
43.	Feel coach provides leadership.	1	2	3	4	5	6	7

## D: Collective Efficacy.

The following questions are designed to assess your feelings about YOUR TEAM'S CONFIDENCE in the team's skills and abilities with respect to the following questions. Use the scale below to rate your team's confidence in its ability to complete each skill. Please answer in **intervals of 10%** (e.g. 30% or 40%, **not** 35%). Remember, we want you to rate how you think the team feels as a whole.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No										Completely
Confidence										Confident

### ATTACK

#### ***Our team's confidence that we can ...***

1. clear the centre pass successfully is..... \_\_\_\_\_
2. work the ball into our goal third is..... \_\_\_\_\_
3. feed the goal circle effectively is..... \_\_\_\_\_
4. retain the ball from an offensive rebound..... \_\_\_\_\_
5. convert turnover possession into a successful goal is..... \_\_\_\_\_
6. play to our stated game plan is..... \_\_\_\_\_
7. execute attacking play under pressure is..... \_\_\_\_\_
8. balance the court is..... \_\_\_\_\_
9. control our footwork is..... \_\_\_\_\_
10. avoid ball handling errors is..... \_\_\_\_\_
11. handle and pass the ball accurately..... \_\_\_\_\_
12. be successful in our goals is..... \_\_\_\_\_
13. have a successful back line throw in (attack end) is..... \_\_\_\_\_
14. have a successful back line throw in (defence end) is..... \_\_\_\_\_
15. win the ball in toss up situations is..... \_\_\_\_\_
16. evade the defence of our opposition is..... \_\_\_\_\_

### DEFENSIVE

#### ***Our team's confidence that we can ...***

1. win an opposition centre pass is..... \_\_\_\_\_
2. play to our stated defensive game plan is..... \_\_\_\_\_
3. obtain possession by clean interception is..... \_\_\_\_\_
4. obtain possession by forcing a turnover (held ball etc) is..... \_\_\_\_\_
5. contest for the ball fairly (avoid contact) is..... \_\_\_\_\_
6. control the pace of the oppositions game is..... \_\_\_\_\_
7. control the style of the oppositions game is..... \_\_\_\_\_
8. execute our defensive plays under pressure is..... \_\_\_\_\_
9. obtain defensive rebounds is..... \_\_\_\_\_
10. force the opposition to change their game plan..... \_\_\_\_\_
11. work as an effective defence unit is..... \_\_\_\_\_
12. avoid obstruction is..... \_\_\_\_\_
13. react quickly after a turnover is..... \_\_\_\_\_
14. play varied styles of defence..... \_\_\_\_\_

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No										Completely
Confidence										Confident

**MOTIVATION**

***Our team's confidence that we can...***

1. remain motivated after losing the previous game is..... \_\_\_\_\_
2. remain motivated when behind in a game is..... \_\_\_\_\_
3. outwork other teams during games is..... \_\_\_\_\_
4. remain motivated to play to the same level when tired (e.g. towards end of game) is..... \_\_\_\_\_
5. remain motivated during away games (e.g. low spectator support) is..... \_\_\_\_\_
6. remain motivated to play to same level when goals are not scored (e.g. shooter missing the goal, intercepts by opposing team) is..... \_\_\_\_\_
7. keep our reserve players motivated during games/competitions is..... \_\_\_\_\_

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No										Completely
Confidence										Confident

**OBSTACLES**

***Our team's confidence that we can...***

1. play at the same level even when our best shooter is injured is..... \_\_\_\_\_
2. play at the same level even when our captain is injured is..... \_\_\_\_\_
3. play at the same level even when our best defender is injured is..... \_\_\_\_\_
4. play at the same level even when a teammate is injured during a game is..... \_\_\_\_\_
5. overcome dissatisfaction with progress in practice is..... \_\_\_\_\_
6. overcome dissatisfaction with a game loss is..... \_\_\_\_\_
7. overcome dissatisfaction with a competition loss is..... \_\_\_\_\_
8. overcome dissatisfaction with poor defence/offence during a game is..... \_\_\_\_\_
9. play at the same level when our team is behind in a game is..... \_\_\_\_\_
10. play at the same level even when mistakes have been made (e.g. inaccurate passing) is..... \_\_\_\_\_
11. rethink/change goal feeding strategy when opposition's goal defence is strong is..... \_\_\_\_\_
12. change/adapt game strategy when original plan is unsuccessful is..... \_\_\_\_\_
13. play at the same level even when players are changed/replaced is..... \_\_\_\_\_
14. use negative feedback from coach productively to increase next performance is..... \_\_\_\_\_
15. come from behind and win is..... \_\_\_\_\_
16. not allow foul play by opposing team affect our performance is..... \_\_\_\_\_
17. remain positive even when someone (e.g. coach/ other players/ media) gives us negative feedback is..... \_\_\_\_\_

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No										Completely
Confidence										Confident

**COMMUNICATION**

***Our team's confidence that we can...***

1. successfully signal game strategies to each other during a game is..... \_\_\_\_\_
2. successfully signal centre pass strategies during a game is..... \_\_\_\_\_
3. effectively discuss game strategies during practice or before a competition is..... \_\_\_\_\_
4. productively discuss the team's performance (success/failure) after a game/competition is..... \_\_\_\_\_
5. encourage each other during a game is..... \_\_\_\_\_
6. use feedback from the coach productively to increase our performance is..... \_\_\_\_\_
7. use information from others (e.g. coach, other players) to our advantage is..... \_\_\_\_\_

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No										Completely
Confidence										Confident

**GENERAL**

***Our team's confidence that we can...***

1. win is..... \_\_\_\_\_
2. set realistic performance goals is..... \_\_\_\_\_
3. have regular and productive practices is..... \_\_\_\_\_
4. plan game strategies (offensive/defensive strategies) together is..... \_\_\_\_\_
5. discuss game strategies with the coach effectively is..... \_\_\_\_\_
6. use our practices effectively (e.g. learn and practice new skills/plays) is..... \_\_\_\_\_
7. warm up effectively before each game is..... \_\_\_\_\_
8. have regular and productive team meetings is..... \_\_\_\_\_
9. rely on one another to be on time for practices and games is..... \_\_\_\_\_
10. learn set plays (e.g. throw ins, centre pass) during practice is..... \_\_\_\_\_
11. use set plays successfully during games is..... \_\_\_\_\_

**Thank you.** That is all the questions we have.  
 We appreciate you taking the time to complete this questionnaire.

*The predictors of team efficacy  
in elite netball teams.*

**CONSENT FORM**

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researcher on the understanding that my name will not be used at any time during the research. The information will be used only for this research and publications arising from this research project.

I agree to participate in this study under the conditions set out in the Information Sheet.

**Signed:** .....

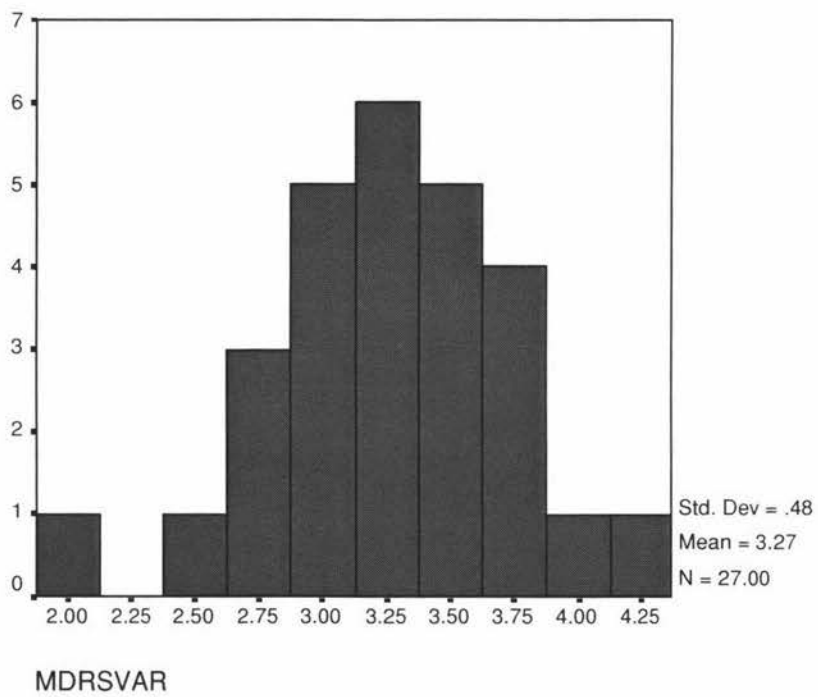
**Name:** .....

**Date:** .....



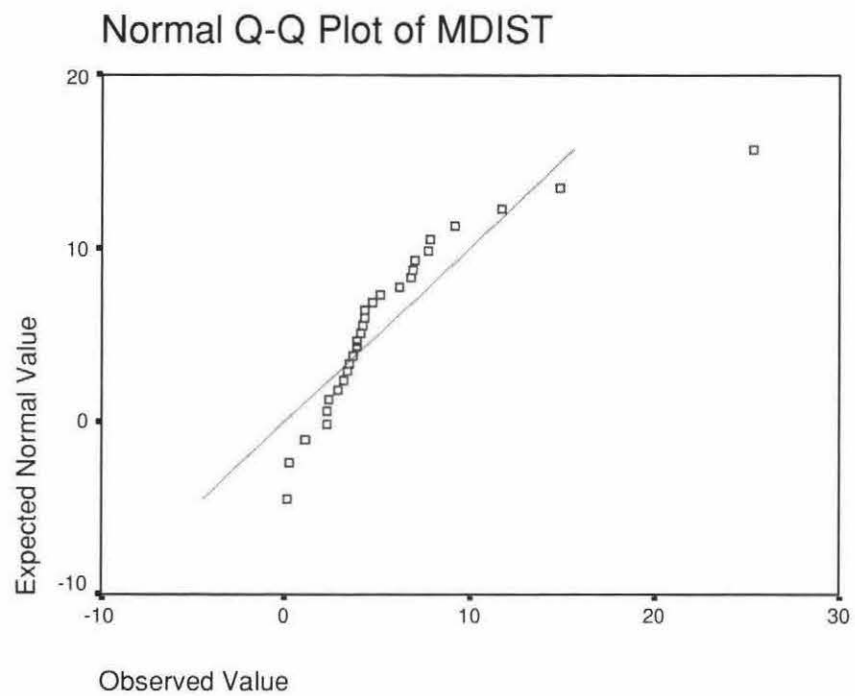
## Appendix B

### *Plots of Residuals for Assumption Checking.*



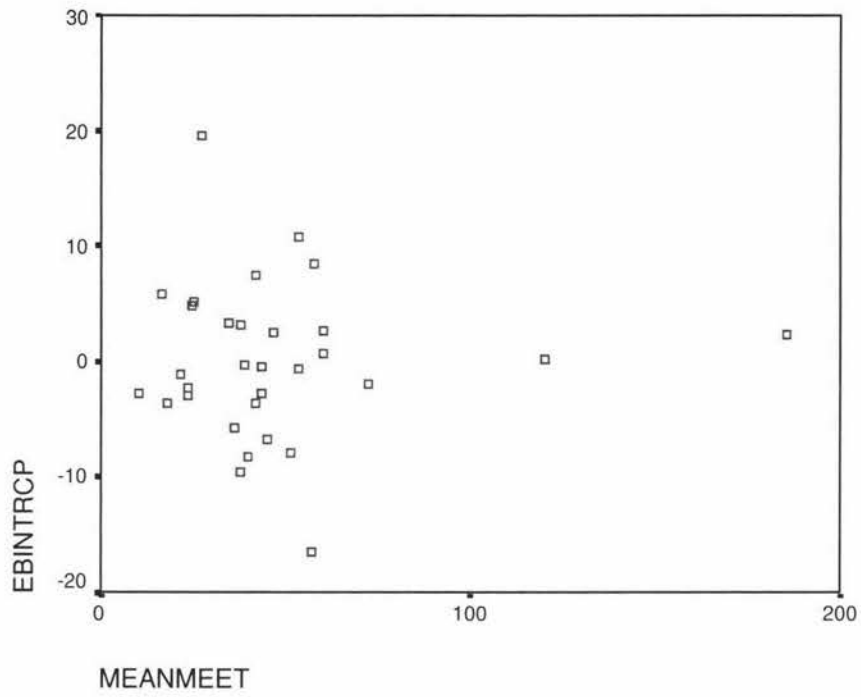
**Figure 1.**

*Histogram of the residual dispersions for the 31 teams based on the final fitted model.*



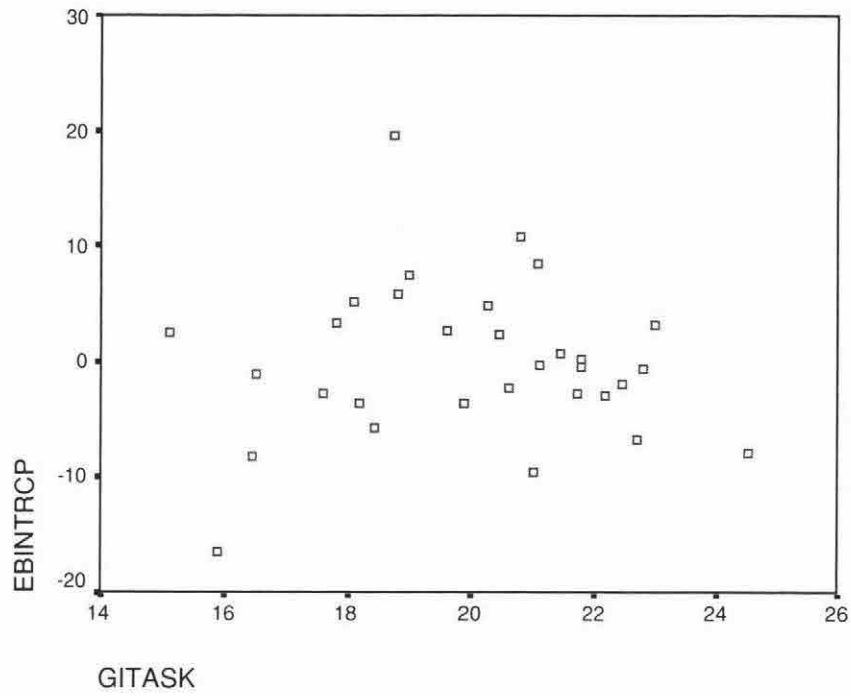
**Figure 2.**

*Plot showing Mahalanobis Distances for the 31 teams in the final fitted model.*



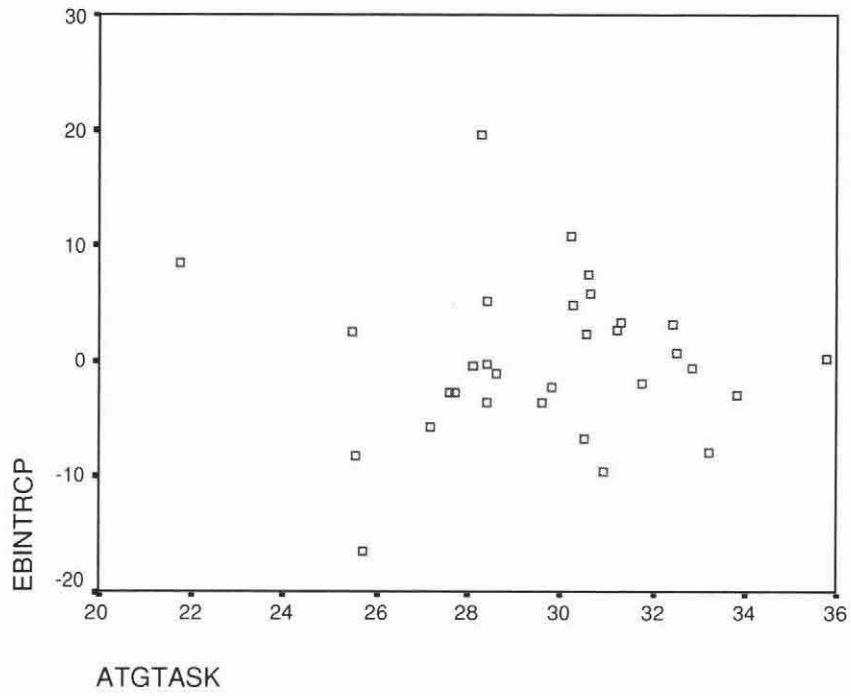
**Figure 3.**

*Scatter plot showing residuals for mean team meetings and intercepts for examination of linearity.*



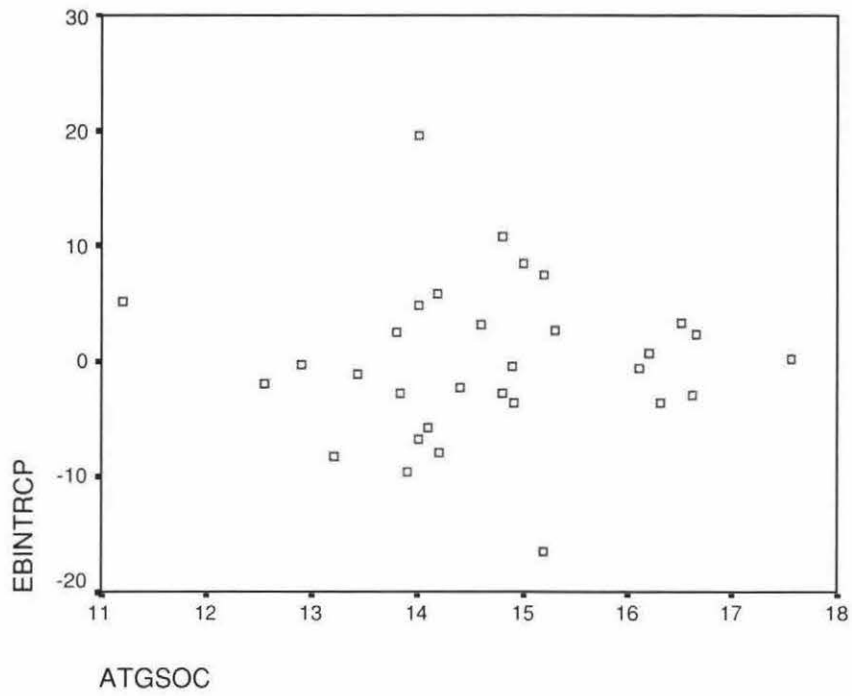
**Figure 4.**

*Scatter plot showing residuals for mean GI-Task subscale and intercepts for examination of linearity.*



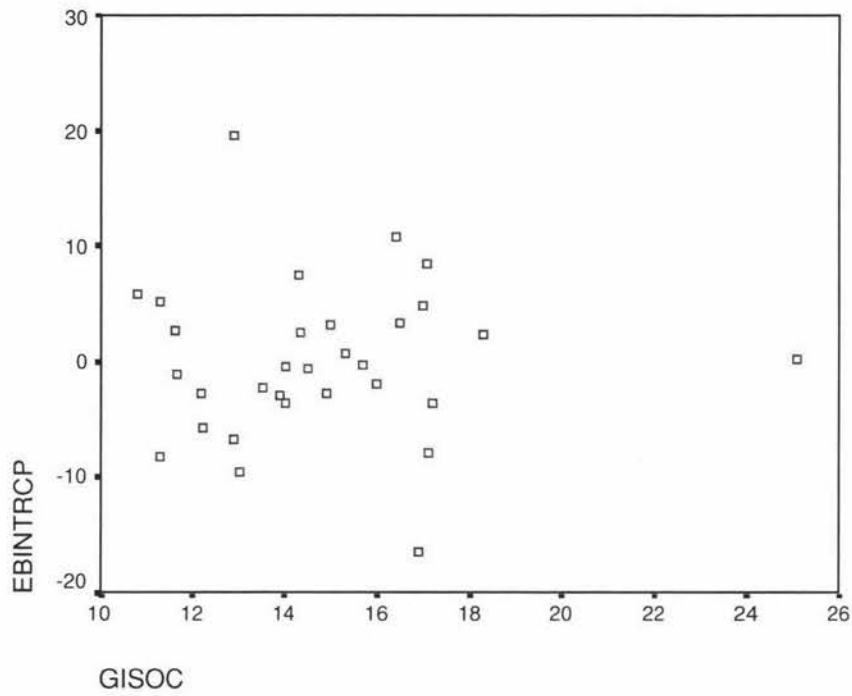
**Figure 5.**

*Scatter plot showing residuals for mean ATG-Task subscale and intercepts for examination of linearity.*



**Figure 6.**

*Scatter plot showing residuals for mean ATG-Social subscale and intercepts for examination of linearity.*



**Figure 7.**

*Scatter plot showing residuals for mean GI-Social subscale and intercepts for examination of linearity.*