The measurement of collective efficacy and its manipulation through imagery.

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The Measurement of Collective Efficacy and its Manipulation through Imagery

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Doctor of Philosophy

September 2007

Abstract

Previous investigations of collective efficacy have lacked consistency in the way in which it has been conceptualised, operationalised, measured, and analysed. In addition, limited research has considered how collective efficacy might be manipulated to improve overall team performance. The broad aim of this thesis therefore, was to advance the understanding of collective efficacy measurement and its application in sport psychology. In chapter three, two separate studies were conducted to design and preliminarily validate a collective efficacy inventory for sport. Confirmatory factor analysis was used in the first study to assess the factorial validity of a pool of 18-items, and indicated that either a 10-item single-factor model or two 5-item models provided the closest fit to the conceptual model. In the second study, data collected using the 10 remaining items revealed both the 10-item and two five-item models had robust construct and criterion validity when correlated with three other theoretically related inventories. However, the two five-item models were highly correlated, indicating they measured the same construct. Therefore, given that longer inventories have greater internal reliability, the 10-item model was adopted as a measure of collective efficacy (Collective Efficacy Inventory; CEI) for the remainder of the thesis. The remaining experimental chapters of the thesis considered the psychological strategies appropriate for the manipulation of collective efficacy. Of the four basic psychological skills, imagery was proposed to have the strongest conceptual link with collective efficacy. Therefore, chapter four examined the relationship between different imagery types and individual perceptions of collective efficacy as a function of skill. Motivational general-mastery (MG-M) type imagery significantly predicted collective efficacy scores for the elite sample, indicating that MG-M type imagery was a suitable intervention for improving levels of collective efficacy. In chapter five, a multiple baseline across-groups design was then used to examine the effects of an MG-M type imagery intervention on perceptions of collective efficacy. Collective efficacy increased for the first group, became more consistent for the second, and did not change for the final group. Lower levels of intra-group variability were reported for all groups following the introduction of the intervention. The findings provided partial support for the use of MG-M type imagery interventions to enhance collective efficacy in an elite sports team. The overall findings of this thesis have increased understanding of the measurement of collective efficacy and its manipulation using imagery interventions. Practical recommendations are suggested for how the CEI can be used to monitor the effects of an imagery intervention on collective efficacy, and specific design implications for the delivery of the intervention to team sports.

Declaration

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.. (Candidate)

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STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references.

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I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

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Publication List

Aspects of the findings contained within this thesis have been published as follows:

Refereed Academic Journal Papers

Shearer, D. A., Thomson, R., Mellalieu, S. D., & Shearer, C. R. (2007). The relationship between imagery use and collective efficacy as a function of skill level. *Journal of Sport Science and Medicine, 6*, 180-187.

Refereed Academic Journal Papers: Manuscripts under review.

Shearer, D. A., Mellalieu, S. D., & Thomson, R. (under review). The effects of an imagery training programme upon perceptions of collective efficacy of an elite wheelchair basketball team: a multiple baseline group case study. *Adapted Physical Activity Quarterly.*

Refereed abstracts:

Shearer, D. A., Thomson, R., & Mellalieu, S. D. (2007). Imagery type and collective efficacy perceptions as a function of skill level. *Journal of Sports Sciences, 25, 324-325.*

Callow, N., Hardy, L., Markland, D., & **Shearer, D. A.** (2003). The conceptualisation and measurement of collective efficacy. *Journal of Sports Sciences*, *22*, 301-302.

Conference communications

Callow, N., Hardy, L., **Shearer, D. A.,** & Markland, D. (2005). *Testing the validity of the Collective Efficacy Inventory.* Paper presented at the British Psychological Society Quinquennial Conference. Manchester, UK.

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Acknowledgements

At various points in last six years, I came very close to throwing my computer out the window and walking away from this PhD. Many people have provided the support and guidance that persuaded me not to do this.

First, I am indebted to Dr Stephen Mellalieu, who has guided me towards completion and helped me stay focussed and driven throughout. Without his invaluable comments and guidance, this PhD would still be "*work in progress*". In addition, I also thank Dr Robert Thomson, who was my caretaker supervisor during my time at Glamorgan University and has continued to be a source of advice throughout the PhD.

I would also like to express my gratitude to both Swansea University and the University of Glamorgan for funding my research and providing the necessary resources.

Thanks are also given to all coaches and their respective teams who permitted access to collect data. In particular, I am extremely grateful to the Great Britain Wheelchair Basketball Association for allowing me to recruit their players in the final experimental chapter. Personal thanks also, to each player that took part.

I owe a special thank you to my family for their unending love and support. My Mum and Dad in particular, have given unfailing support and guidance throughout my life. They have believed in me when I have not believed in myself, and have taught me that hard work and persistence overcomes most of life's hurdles.

Finally, I would not have completed this PhD without the love and support from my wife Cath. She has suffered my moods, listened to me waffle, offered advice, sent me out to climb, and provided smiles when they were needed most. She is amazing!

"Never give in! Never give in! Never, never, never. Never - in anything great or small, large, or petty - never give in except to convictions of honour and good sense."

Winston Churchill

1.0 Chapter One: Introduction

1.1. Sport psychology's position in modern sport

In 2004, the British Psychological Society established a Division of Sport and Exercise Psychology, recognising the academic status and public awareness of the subject area. Indeed, as a branch of sport science, sport psychology has developed substantially in the last decade with considerable expansion in the scope of topics covered by research (cf. Hanton & Mellalieu, 2006). Applied sports psychology is now readily accepted as an integral part of elite athletes' preparation for competition. Consequently, all the Home Country Institutes (e.g., Welsh Institute of Sport) now employ full-time sport psychologists to help prepare their athletes for international competition, highlighting the importance of mental factors in elite performance. Indeed, Johnson (2006) predicts that the need for, and the accessibility of sport psychologists, particularly in competitive team sports, will continue to grow in the future.

1.2. A brief history of sport psychology research

Interest in the psychology of sport began in the late nineteenth century when Norman Triplett examined the effects of social influence on performance (Triplett, 1898). Sport psychology then received little recognition until the 1920s when Coleman Griffiths wrote two books titled *"The Psychology of Coaching"* and *"The Psychology of Athletics"* (Griffith, 1926, 1928). Even then, it was not until the 1960s that the first conference of the North American Society for the Psychology of Sport and Physical Activity (NASPSPA) was held and sport psychology was recognised as a distinct area of academic research. Twenty years later the laboratory-based research popular at that time was criticised for being too simplistic and mechanistic (Landers, 1980). Indeed, Rainer Martens advocated that sport psychologists swapped their *"smocks for jocks"* and moved away from laboratory-based research to use more ecologically valid field studies (Martens, 1979). Martens also commended the use of alternative methodologies over traditional experimental designs. Consequently, modern sport psychology research now uses an eclectic range of methods, which still include traditional experimental designs (e.g., Greenlees, Graydon, & Maynard, 1999), but also qualitative (e.g., Hanton, Mellalieu, & Hall, 2004) and single-subject methods (e.g., Callow & Waters, 2005).

The majority of research in sport psychology has been primarily concerned with understanding athlete's behaviours and cognitions, with the ultimate aim of maximising performance potential. However, research has also considered the study of teams and groups, often referred to as group dynamics (Widmeyer, Brawley, & Carron, 2002). Group dynamics was initially popularised by Lewin (1943), and attempts to explore the ways that groups behave and change, and the factors that influence these processes (Widmeyer et al., 2002). Given that athletes often compete in teams or are part of groups (e.g., a training group), sport provides an ideal environment to study group dynamics. Sports teams are real groups with a fixed number of members, working towards zero-sum goals (i.e., win/loss) and with clear performance indicators (cf. Widmeyer et al., 2002). The knowledge gained through researching group dynamics in sport can subsequently be applied to improve sports team and group function, and ultimately performance.

Group dynamics research in sport psychology has considered a number of different topics, such as the impact of team-building interventions on unity and performance (e.g., Voight & Callaghan, 2001), the influence of goal orientation on social loafing (e.g., Swain, 1996), and the effects of team cohesion on performance (e.g., Hardy, Eys, & Carron, 2005; Holt & Sparkes, 2001). However, while certain factors, such as team cohesion, have been researched extensively (for a full review, see Loughead & Hardy, 2006), other group variables that have been hypothesised to influence team performance have received relatively little attention (Widmeyer et al., 2002). Furthermore, few studies have considered the types of interventions that may influence group functioning, and ultimately team performance (cf. Widmeyer et al., 2002).

1.3. Collective efficacy

In 1977, Bandura introduced self-efficacy as a situation-specific form of confidence that affects how individuals feel, think, behave, and motivate themselves (Bandura, 1998). In sport psychology, self-efficacy theory has frequently been used to explain differences in individual performance (see Moritz, Feltz, Fahrbach, & Mack, 2000). However, Bandura (1997) also noted that humans do not live in social isolation and often work together towards collective objectives. This is particularly true in sport, where individuals often compete with and against each other in teams. In such circumstances, individuals will naturally reflect and hold beliefs concerning the team's ability to achieve their objectives. That is, team members will hold perceptions of the team's level of collective efficacy. Bandura (1997, p. 477) defined 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 attainment"* and suggested that collective efficacy influences a team's individual efforts, their use of available resources, their persistence in the face of failure, and their resistance to discouragement (Bandura, 1997). These characteristics are often observed in high achieving sports teams, such as the New Zealand All Blacks Rugby Union team of the past decade. Therefore, it is likely that a team environment that fosters collective efficacy will be beneficial for overall performance.

The existing collective efficacy research has consistently demonstrated that the construct has a positive effect on sport performance (e.g., Feltz & Lirgg, 1998; Myers, Feltz, & Short, 2004; Myers, Payment, & Feltz, 2004). Despite this, collective efficacy has been examined infrequently in the sport psychology literature (Paskevich, Brawley, Dorsch, & Widemeyer, 1999), with little consideration of the specific mechanisms (e.g., neurological) that underpin collective efficacy perceptions. Consequently, existing research has lacked consistency in the way in which collective efficacy has been conceptualised, operationalized, measured, and analyzed (Zacarro, Blair, Peterson, & Zazanis, 1995). Indeed, Maddux (1999) suggests that researchers have yet to decide what it is they are attempting to measure. This lack of consensus makes comparison across studies difficult, as it is unclear whether they have measured the same construct.. Therefore, to develop our understanding of collective efficacy, researchers must first develop a consistent conceptual definition (Maddux, 1999). Once achieved, this definition can be used to drive the design of a sport-specific collective efficacy inventory, which can be used to test the influence of relevant independent variables upon collective efficacy. In particular, this will enable researchers to investigate the utility of appropriate interventions for increasing collective efficacy beliefs.

1.4. Imagery and collective efficacy

While group dynamics research has considered the use of group-based interventions to improve team function (e.g., team unity; Voight & Callaghan, 2001), limited attention has been given to the potential of individual interventions for improving psychological variables that contribute to team functioning (e.g., collective efficacy). In applied sport psychology research and practice, goal setting, relaxation, self-talk, and imagery are the four basic psychological skills examined and used (see Hardy, Jones, & Gould, 1996 for review). Of these four psychological skills, mental imagery has the strongest socio-cognitive, neurological, and practical basis for use as an intervention to increase collective efficacy. Specifically, as collective efficacy is rooted in self-efficacy (Bandura, 1997) and shares similar antecedents (Carron & Hausenblas, 1998), both constructs should be related, such that high levels of self-efficacy predict similar collective efficacy perceptions. Recently, Magyar, Feltz, and Simpson (2004) found support for this notion when they demonstrated that self-efficacy beliefs determined individual collective efficacy perceptions in rowing teams. The close association between self-efficacy and collective efficacy indicates that interventions used to improve self-efficacy should also increase individual perceptions of collective efficacy. Bandura (1997) proposes that imagery provides both enactive mastery and vicarious experiences, which in turn enhances self-efficacy. Furthermore, research has shown that imagery can increase perceptions of self-confidence and self-efficacy (Callow & Waters, 2005; Jones, Mace, Bray, MacRae, & Stockbridge, 2002). Hypothetically, therefore, imagery has the potential to have a similar effect on individual collective efficacy perceptions as it does on self-efficacy.

From a neurological perspective, recent research suggests that the action and observation of behaviours and social cognitions share similar neural processes (Decety & Sommerville, 2003; Uddin, Lacoboni, Lange, & Keenan, 2007), and that these same representations can be accessed using imagery (e.g., Fourkas, Avenanti, Urgesi, & Aglioti, 2006; Jackson, Brunet, Meltzoff, & Decety, 2006). Theoretically therefore, imagery interventions should access similar representational pathways associated with collective efficacy perceptions, and as a consequence imagery might be a potential method for manipulating collective efficacy. From a practical perspective, team imagery interventions allow athletes to rehearse team aspects of performance without direct contact with the team (e.g., in downtime or away from training sessions). Indeed, Callow (1999) has suggested that imagery may influence a team's collective efficacy, as it allows an individual to rehearse game elements such as team moves or plays.

Therefore, unlike group-based interventions, imagery interventions of this nature can be generated in the absence of team-mates.

Research to date has consistently demonstrated that imagery has a diverse range of applications in sport, such as increasing sport confidence and self-efficacy (Callow, Hardy, & Hall, 2001; Callow & Waters, 2005; Short, Bruggeman et al., 2002), training attentional skills (Calmels, Berthoumieux, & Arripe-Longueville, 2004), and reducing anxiety (Vadocz, Hall, & Moritz, 1997). Imagery has also been shown to impact upon a combination of factors such as anxiety, confidence, and motivation (Evans, Jones, & Mullen, 2004). However, although this and other evidence (e.g., Blair, Hall, & Leyshon, 1993; Smith, Holmes, Whitemore, Collins, & Devonport, 2001) suggests that imagery can successfully mediate factors that in turn influence individual performance, only a limited amount of attention has been given to how imagery can influence group factors that affect team performance, such as collective efficacy (e.g., Munroe-Chandler & Hall, 2004).

1.5. Thesis rationale, aims, and objectives

Given the lack of consensus surrounding collective efficacy and the apparent dearth of specialised interventions to manipulate the construct, research that addresses these two areas is warranted. Before researchers can accurately measure collective efficacy they must agree on what they are actually trying to measure (Maddux, 1999). Once achieved, this knowledge can be used to examine specific ways to increase or manipulate collective efficacy perceptions thereafter. While some research has examined the efficacy of group-based interventions to improve team function (Voight & Callaghan, 2001), limited research has considered how traditional individual psychological skill interventions, such as imagery, might be used. The broad aim of this thesis therefore was to advance the understanding of collective efficacy measurement and its application in applied sport psychology. Specifically, the first objective was to develop a valid collective efficacy inventory based on sound conceptual and operational methods that can be used across a variety of team sports. This will allow investigations to examine how collective efficacy can be enhanced to facilitate team performance. In particular, as collective efficacy is rooted in self-efficacy, imagery interventions, which have been shown to increase self-efficacy and are linked neurologically with social-cognitions, may also be used to increase collective efficacy. To this end, the second objective of the thesis was to examine the relationship between collective efficacy and mental imagery. Specifically, to assess how imagery use is associated with high levels of collective efficacy perceptions. Finally, the third objective was to employ this knowledge to assess the effectiveness of an appropriate imagery intervention programme for increasing levels of collective efficacy in sports teams.

1.6. Structure of the thesis

The thesis will adhere to the following structure. Chapter two provides a contemporary review of literature for both collective efficacy and imagery. For collective efficacy, this review will consider the historical development of the construct and the conceptual, operational, and analytical issues surrounding its measurement. For imagery, the review discusses the most pertinent theoretical explanations for the mechanisms of imagery's effectiveness in relation to performance, the specific applied models used to generate the imagery intervention used in this thesis, and the relationship between imagery and efficacy beliefs. As this thesis considers two areas of sport psychology, the experimental chapters are presented in two phases. The first phase details the development and preliminary validation of a collective efficacy inventory. Specifically, chapter three describes the initial development of a collective efficacy inventory including its face and factorial validation. Following this, a separate data sample is used to test the construct validity of the new inventory against other measures of psychological constructs related to collective efficacy. Phase two of this thesis comprises two studies and uses the inventory developed in chapter three to consider the nature of the relationship between collective efficacy perceptions and imagery use in team sport athletes. In chapter four, the relationship between individual collective efficacy perceptions and imagery use is examined (cf. Hall, Mack, Pavio, & Hausenblas, 1998). Chapter five then tests the effectiveness of an imagery intervention to change the collective efficacy perceptions of an elite sports team. Finally, chapter six provides a discussion of the findings obtained throughout the thesis and the subsequent practical implications and future research directions that arise.

2.0 Chapter Two: Literature Review

In line with the thesis objectives outlined in chapter one, this chapter reviews the collective efficacy and imagery research conducted within sports psychology. Until recently, collective efficacy had received little attention in the sports psychology literature. Therefore, the first section (2.1) of this literature review discusses the historical background and conceptual development of collective efficacy. Particular attention is given to the issues that currently surround the conceptualisation, operationalisation, dimensional structures, and level of analysis of collective efficacy. In addition, the current research in sport psychology that demonstrates the importance of collective efficacy to team performance and team cohesion is considered. The section concludes with a brief discussion regarding the lack of suitable and empirically tested interventions that can be used to increase collective efficacy.

In contrast to collective efficacy, imagery has received considerable attention in the sport psychology research literature. Indeed, Short and Short (2005) note that over 200 imagery studies have been published in sport psychology alone, and these have examined how imagery is used, when it is used, why it is used, and how it actually works. The second section of the review (2.2) will therefore consider the recent developments in the terminology used in imagery research. Subsequently, the contemporary theories of imagery mechanisms that explain observed changes in cognitions, behaviour, and emotion in sport are discussed. The review then highlights the theoretical relationship between imagery use, self-efficacy, and collective efficacy, before concluding with a discussion of the specific models that have been proffered to improve our understanding and application of imagery interventions in sport.

2.1. Collective efficacy

2.1.1. Historical development of collective efficacy

The development of collective efficacy is linked closely with self-efficacy theory. Self-efficacy theory was first introduced as a theory to understand and adapt human behaviour (Bandura, 1977), where the early focus was to demonstrate that the theory could be utilised to help patients overcome phobias (e.g., ophiciophobia – fear of snakes). Self-efficacy is defined as "*Beliefs in one's capabilities to organise and execute the courses of action required to produce given attainments*" (Bandura, 1997, p. 3), reflecting the confidence an individual has in their ability to perform a specific task. Bandura (1997) suggested four specific antecedents of self-efficacy beliefs: enactive mastery experiences, vicarious experience, verbal persuasion, and physiological/affective states. Mastery experiences are considered the most influential source of self-efficacy, and refer to situations in which the individual succeeds in their endeavours (Bandura, 1997). The effects of these experiences are influenced by factors including, pre-existing knowledge structures (e.g., Cervone & Palmer, 1990), the difficulty of the task (e.g., Bandura, 1982), and effort expended to achieve the mastery experience (e.g., Bandura & Cervone, 1986). In contrast, vicarious experiences refer to experiences generated through modelling others' behaviours. The appraisal of self-efficacy through these sources is influenced by factors including the similarity of the observed performance to that of the intended performance (e.g., Bandura & Jourden, 1991), the extent to which the models attributes are similar to their own (e.g., George, Feltz, & Chase, 1992), and competence and skill level of the observed model (e.g., Lirgg & Feltz, 1991). Verbal persuasion refers to feedback provided by relevant others regarding the specific situational context and is influenced both by the knowledgeableness of the source (e.g., Crundall & Foddy, 1981) and the extent to which the appraisal matches the individuals own perceptions regarding their performances (Bandura, 1997). Finally, physiological and affective states refer to how individual efficacy levels are determined, in part, by how they feel physiologically and emotionally at the time. The extent to which physiological and affective states influence self-efficacy beliefs is largely dependent on the perceived source of the activation levels (e.g., Harris, 1989) and the magnitude of the activation itself (Bandura, 1997).

Since 1977, the popularity of the theory has grown and has been used to explain human behaviour in a wide variety of domains, such as educational, organisational, and sport psychology (cf. Bandura, 1997). In sport psychology research, self-efficacy theory has most often been used to explain differences in individual performance (e.g., Martin, 2002; Moritz, Feltz, Fahrbach, & Mack, 2000; Treasure, Monson, & Lox, 1996). However, research also indicates that self-efficacy is related to other psychological factors including self-handicapping (Kukzka & Treasure, 2005), role ambiguity (Eys & Carron, 2001), and athletes use of imagery (Beauchamp, Bray, & Albinson, 2002; Mills, Munroe, & Hall, 2000). Indeed, the diversity of research in self-efficacy highlights the theory's wide range of applications in sport psychology.

Following the introduction of self-efficacy theory, Bandura (1982, 1997) observed that humans do not live their lives in social isolation, and often need to work together as a group to achieve their aims and objectives. Indeed, groups are an integral part of the social, domestic, occupational, and recreational aspects of human life, and while self-efficacy may play some role in a group's success, factors that acknowledge group interactions are likely to have a greater influence. Bandura (1997) therefore proposed that groups and teams have collective efficacy beliefs regarding their functional abilities. Collective efficacy is defined by Bandura as *"a group's shared belief in its conjoint capabilities to organise and execute the courses of action required* *to produce given levels of attainment"*, (Bandura, 1997, p. 477). However, before an individual makes a judgement about their team's collective efficacy, they are first suggested to consider their own and their other team-mate's levels of self-efficacy (Bandura, 1997). Furthermore, other authors indicate that although collective efficacy has group-specific antecedents (e.g., leadership), it also shares those of self-efficacy (Carron & Hausenblas, 1998). That is, mastery experiences, vicarious experiences, verbal persuasion, and emotional arousal are antecedents of both self and collective efficacy. This close association between self and collective efficacy has been established empirically, with studies demonstrating that self-efficacy beliefs predict collective efficacy (Magyar, Feltz, & Simpson, 2004; Watson, Chemers, & Preiser, 2001). Therefore, while collective efficacy is a separate construct and differs in its unit of agency (i.e., group versus individual), it remains rooted in self-efficacy (Bandura, 1986, 1997).

2.1.2. What is collective efficacy...really?

Within the existing research the conceptualisation of collective efficacy and its subsequent measurement has been inconsistent (Baker, 2001; Maddux, 1999). Maddux (1999) proposed that the search for the true nature of any psychological construct is simply a search for consensus about what researchers want that construct to be. This suggests we cannot begin to understand collective efficacy until agreement is reached on what we are actually trying to understand (Maddux, 1999). This sub-section reviews the current definitions of collective efficacy, and then critically discusses the methods by which the construct has been operationalised and the dimensional structure of subsequent measurement methods for collective efficacy. The sub-section concludes with discussion concerning the most appropriate level of analysis used to analyse collective efficacy perceptions (i.e., individual or group).

2.1.2.1. Definition

The lack of consensus in how collective efficacy is conceptualised is illustrated in two popular definitions of collective efficacy. Bandura's definition (1997, p.477) describes collective efficacy as, *"A groups' shared belief in its conjoint capabilities to organise and execute the courses of action required to produce given levels of attainment"*. In comparison, Zacarro et al. (1995) define collective efficacy as, *"a sense of collective competence shared among individuals when allocating, co-ordinating, and integrating their resources in a successful concerted response to specific situational demands"*. These definitions differ slightly, in that Bandura's specifies a "*given level of attainment*", whereas Zacarro and colleagues suggests a *"successful concerted response"*. In other words, Bandura's definition considers the specific goals defined by the team, whereas Zacarro's definition focuses more on success in general. Therefore, given that sport performance is often by driven specific goals (e.g., shots on target in hockey), for the purposes of this thesis, Bandura's (1997) definition will be used to drive conceptual arguments, operational definitions and the initial measurement of collective efficacy. This is because the definition clearly states the presence of a "*shared belief*" and is more specific about what a team is trying to attain (i.e., goals). In addition, this is the definition that the majority of research to date has used, allowing for some comparison across studies.

2.1.2.2. Neurological mechanisms of collective efficacy perceptions

Similar to most concepts and constructs studied in sport psychology, collective efficacy has lacked explanation of the neurological mechanisms that underpin its function and action. However, recent neuroscience research has identified that common brain areas are active during 'self' and 'other' perceptions. Specifically, the mirror-neuron system (MNS; Rizzolatti et al., 1988), and the cortical midline structures (CMS) have been identified as brain regions that are active during both action and observation (see Rizzolatti, 2005, and Uddin, Lacoboni, Lange, & Keenan, 2007 for detailed reviews). Research has shown that fronto-parietal areas of the brain associated with the MNS show similar activation patterns when physical actions are observed or performed (e.g., Calmels, Holmes, Jarry, Hars et al., 2006; Calmels, Holmes, Jarry, Lévèque, et al., 2006; Fadiga, Fogassi, Pavesi, & Rizzolatti, 1995; Hommel, Musseler, Ascherleben, & Prinz, 2001; Muthukumaraswamy & Johnson, 2004). For example, Fadiga et al. observed similar muscle response patterns during the observation and execution of the same action sequence. Similarly, the CMS, which includes the medial prefrontal cortex, the anterior cingulate cortex and the precuneus, has been associated with 'self' and 'other' comparisons of a more abstract nature, such as, social cognition and understanding (Gallese, Keysers, & Rizzolati 2006; Schilbach et al., 2006). For example, Gallese et al. suggested that when we observe emotions in others (e.g., disgust), the same part of our brains is activated as when we experience that emotion ourselves. Furthemore, Iacoboni et al. (2004) observed increased activity in the medial parietal (precuneus) and dorsomedial prefrontal cortices when participants observed video footage of social interactions, when compared to observing video of an individual engaged in everyday activities. Therefore, while no research has specifically investigated the role of the MNS and CMS in the development of collective efficacy perceptions, by observing other team-mates action, behaviour, and apparent emotions, both brain areas may allow individuals to make judgment about collective efficacy.

2.1.2.3. Operational methods used to measure collective efficacy

To date, four different operational methods have been used to measure collective efficacy (cf. Bandura, 1997; Gist, 1987; Lindsley, Brass, & Thomas, 1995). The first method simply aggregates the self-efficacy scores of each individual in the team.

However, while collective efficacy is rooted in self-efficacy (Bandura, 1982, 1997), the two are not the same. Specifically, Lindsley et al. (1995) believe that this method fails to account for the dynamic social and organisational processes that occur within groups. For example, it does not consider the manner in which team members interact and communicate, or how different leadership styles might influence collective efficacy perceptions. Consequently, unlike collective efficacy, this operational method does not represent a group-based construct or a shared belief.

The second method uses the group's response to a single question to attain collective efficacy beliefs. Specifically, the group discusses and decides on a consensual response or score to a specific item (e.g., "*How confident are you about winning your next game?*"). This method more closely represents the idea of a shared belief, as it involves the whole group. However, Bandura (1997) believes that individual responses would be affected by social persuasion from, and conformity to, dominant team members. For example, younger players within a team might conform to the beliefs of the older members, so that they fit more easily into the team culture. Furthermore, Lindsley et al. (1995) feel that this method would be difficult to implement outside of the laboratory and in large groups. Consequently, it may be particularly inappropriate in applied domains such as applied sport psychology.

The third operational method aggregates team members perceptions of what they personally believe their team's collective efficacy is (Gully, Incalcaterra, Joshi, & Beaubien, 2002; Moritz, Sullivan, & Feltz, 2000; Short, Apostal, et al., 2002). For example, participants would respond to items such as, *"I believe my team is confident"*. Where the stem of the item (*I believe...)* directs the respondents to consider their own belief about the team. However, because this method assesses the individual's own beliefs it might not accurately reflect the shared belief of collective efficacy (Lindsley et al., 1995). In contrast, the fourth method aggregates each individual's perceptions of what they feel the teams' perceptions of collective efficacy are. Specifically, participants respond to items such as, "*my team believes we are confident*" and rather than answering with how they feel personally, respondents consider how they think everyone else feels. Indeed, according to Louis and Sutton (1991), although cognitions reside within the individual a group can posses a belief. Therefore, when responding to the stem "*My team believes*" it makes intuitive sense that the group's viewpoint is being considered by respondents.

Recent research has examined the difference between these third and fourth operational methods (Short et al., 2002). Specifically, Short et al. used two versions of the Collective Efficacy Questionnaire for Sport (CEQS; Short, Sullivan, & Feltz, 2005) with either "*rate your confidence that your team...*" (i.e., individual perceptions) or "*rate your team's confidence ...*" (i.e., individual perceptions of group perceptions) as the operational stems. Results demonstrated that the corresponding subscales for both versions were significantly correlated and no significant differences between the two operational methods were found. The authors concluded that either operational method could be used adequately to assess collective efficacy. However, further research that uses more rigorous confirmatory factor analysis techniques is warranted to assess which method is the most appropriate to operationalise collective efficacy items.

2.1.2.4. Dimensional structure

Collective efficacy was first measured in the sport psychology literature using unidimensional, single-item inventories (e.g., Greenlees, Graydon, & Maynard, 1999; Hodges & Carron, 1992; Spink, 1990). Typically, these inventories evaluated the expected outcome of the task to be performed. For example Greenlees et al. (1999) used the question, "*What do you think your team's chances are of coming 1st on a 100-point* *scale? 0 being a definite loss and 100 being a definite win*". However, despite their popularity, the concurrent validity of single-item efficacy scales has been questioned. Specifically, Lee and Bobko (1994) found that single-item scales of self-efficacy had the lowest levels of concurrent validity compared to four other measurement methods. As a result, they recommended that single-item scales for self-efficacy beliefs should not be used. As collective efficacy is rooted in self-efficacy (Bandura, 1997), it is likely that the concurrent validity of single-item collective efficacy scales would also be low.

More recently, some authors have used a multidimensional representation of collective efficacy (e.g., Paskevich et al., 1999; Short et al., 2005). For example, Paskevich et al. attempted to use Zacarro et al.'s (1995) conceptualisation of collective efficacy to develop a multidimensional collective efficacy scale for volleyball. Specifically, they defined eight separate dimensions/factors relating to aspects of volleyball performance and included three factors that measured collective efficacy for communication, coordination, and motivation. The final 58 items were worded in such a way that the respondents were asked to reflect on their team's level of confidence for that particular item (e.g., *"Our team's confidence that we can spike from the left hand side of the court is…"*).

Despite Paskevich et al.'s (1999) attempt to represent Zaccarro and colleagues conceptualisation of collective, they misinterpreted some of their conceptual arguments. In particular, Zacarro et al. do not suggest that the collective efficacy for coordination, motivation, and communication should be measured directly. Rather, they recommend that any measure should consider the influence of these three constructs upon collective efficacy. Indeed, coordination, motivation, and communication are likely to be important constructs of group function in their own right. In addition, the eight dimensions used by Paskevich et al. do not represent a multidimensional measure of collective efficacy *per se*. Instead, they represent the multidimensional nature of volleyball performance and the efficacy beliefs associated with performance components (e.g., offence). Consequently, the questionnaire does not match the conceptual guidelines that it claims to represent or provide an adequate representation of multi-dimensional collective efficacy.

Recently, Short et al. (2005) developed and tested the validity of the CEQS. In contrast to the majority of research that has used sport-specific measures of collective efficacy (e.g., Heuze et al., 2006a, b; Paskevich et al., 1999), the authors' intentions were to develop a generic questionnaire that could be used across all team sports. In addition, unlike previous collective efficacy questionnaires, the questionnaire underwent three phases of development to establish face, factorial, and construct validity. Confirmatory factor analysis was used to confirm five dimensions of; ability, effort, persistence, preparation, and unity. However, although the authors claimed that the fit indices for the final model were good, closer examination indicated that the fit indices were marginal and outside recommended guidelines. Specifically, research suggests a minimum of 0.95 for the Comparative Fit Index (CFI) and Non Normed Fit Index (NNFI) (Hu & Bentler, 1999), and that values between 0.08 and 0.10 for the Root Mean Square Error of Approximation (RMSEA) only indicate a mediocre estimation of the model (MacCallum, Brown, & Sugawara, 1996). Short et al. appear not to have followed these recommendations for their study. Therefore, while the CEQS is the first questionnaire that has undergone rigorous validation, more research is needed to confirm the factorial validity of the scale.

In contrast to Paskevich et al. (1999) and Short et al. (2005), the dimensional structure of collective efficacy hypothetically could match the structure of self-efficacy theory. Specifically, Bandura (1997) indicates that self-efficacy has three dimension;

strength of efficacy belief; *level* of task demands or challenge; and *generality* of efficacy beliefs across a variety of domains. The same dimensions could be used to drive the design of measurement inventories for collective efficacy. However, given that each team sport has specific task demands, a separate inventory would be needed to assess each of these three dimensions adequately for each sport. To do this would be very time consuming and would hamper the progress of research in collective efficacy. In addition, unless all researchers used the exact same guidelines for development of these inventories, it would be very difficult to compare studies. Therefore, an inventory that simply measures the strength of the efficacy beliefs for specific aspects of overall team performance would seem the most appropriate methods to advance the present understanding of collective efficacy in sport.

2.1.2.5. Level of analysis issues in collective efficacy research

Similar to other group dynamics variables, such as group cohesion, collective efficacy is defined as a shared belief (Bandura, 1997). However, research to date has examined collective efficacy using both individual and group-level analyses. While an individual-level analysis considers each individual's collective efficacy perceptions (e.g., Heuze et al., 2006b), group-level analysis aggregates the collective efficacy perceptions for each individual and assesses the extent of within group agreement in the team as a whole. The group-level analysis assumes that when within group agreement is high, the aggregation of collective efficacy represents a shared belief. For example, Paskevich et al. (1999) used intra-class correlation to measure intra-group agreement of collective efficacy perceptions in volleyball teams. They confirmed the homogeneity of scores within teams, indicating that collective efficacy represented a shared belief. That is, there was a high-degree of consensus regarding the level of collective efficacy within each team.

Some researchers now believe that selecting one level of analysis over another does not reflect the complete picture of collective efficacy. In particular, Moritz and Watson (1998) make three specific criticisms of single-level analyses. First, the approach may over-generalise findings at a group-level to the individual-level and vice versa. Second, single-level research underestimates cross-level effects; that is, the effect of the individual on the group, and the group on the individual. Indeed, Bandura (1997) highlights that group function is the consequence of interactions and coordination between group members and is an emergent group property that is more than the sum of the individual attributes. Finally, single-level analysis at a group-level may lead researchers to treat group constructs as real and tangible, rather than the abstract constructs they actually are (see also Maddux, 1999). Therefore, instead of using a single-level analysis Moritz and Watson (1998) recommended a multi-level approach in which individuals are nested within teams. According to Lindsley et al. (1995), multi-level analysis recognises that individuals and groups are not separate entities, but instead are part of a whole. Consequently, factors that influence collective efficacy at an individual-level may also influence collective efficacy measured at the group-level.

Following Moritz and Watson's (1998) suggestions regarding level of analysis, subsequent studies have begun to analyse collective efficacy from a multi-level perspective (e.g., Magyar et al., 2004; Watson et al., 2001). For instance, Watson et al. (2001) measured the effects of different predictor variables on collective efficacy. They used hierarchical linear modelling to test across both the individual and group levels, with self-efficacy, optimism, perceptions of leader effectiveness and perception of recent team performances found to influence collective efficacy at an individual-level. In contrast, group size, past team performance, and confident leadership influenced collective efficacy at the group-level. More recently, Magyar et al. (2004) examined the individual and crew-level determinants of collective efficacy in rowing. Their results suggested that self-efficacy significantly predicted individual perceptions of collective efficacy at the individual-level, whereas mastery climate scores significantly predicted average collective efficacy scores at the group-level.

The recent studies that have used multi-level analysis indicate that different determinants of collective efficacy exist at each level. However, Short et al. (2005) argue that the appropriate level of analysis depends upon the research question being answered; a view supported by Carron, Brawley, and Widemeyer (1998) in the team cohesion literature. For example, if researchers are interested in how collective efficacy relates to anxiety, the individual-level of analysis may be most appropriate, as anxiety is an individual emotion. In contrast, if they were concerned with how collective efficacy affects overall team performance; a group-level analysis would be more suitable. Therefore, there are some circumstances in which a multi-level analysis would be surplus to the requirements of the research question. Furthermore, Heuze et al. (2006a) note that it is not always possible to collect sufficient data to allow for group-level analysis, particularly when the sample of interest is professional team athletes. Therefore, it would seem that the decision of which analysis method to use should be considered on a case-by-case basis. With this in mind, and the conceptual and operational issues discussed earlier (sub-sections 2.1.2.1 to 2.1.2.4.), the next sub-section examines the existing research in sport psychology that supports a link between collective efficacy and performance, and collective efficacy and cohesion respectively.

2.1.3. Sport psychology research on collective efficacy

The majority of sport psychology research has examined either the relationships between collective efficacy and performance or collective efficacy and team cohesion. This sub-section will critically discuss the literature that has considered these relationships and concludes with a brief overview of potential interventions that may be used to increase collective efficacy.

2.1.3.1. Collective efficacy and performance

The majority of elite sports have elements of team function and interaction. For example, swimmers often work with coaches and support staff to improve performance, and in some instances they may compete as a member of co-dependent teams (e.g., at the Olympics or Paralympics). Bandura (1997) suggests that collective efficacy is an important component for team sports because it can influence a team's collective effort, their persistence in tough situations or defeat, and is a characteristic often observed in successful teams. Despite this, relatively little sport psychology research has investigated collective efficacy in sporting contexts. Instead, the majority of research has been conducted within other sub-disciplines of psychology, including organisational (e.g., Seijts, Latham, & White, 2000; Shaubroek, Lam, & Xie, 2000), military (Chen & Bliese, 2002; Marks 1999), and educational psychology (e.g., Bandura, 1993; Goddard, Hoy, & Woolfolk, 2000). While the majority of this research indicates that collective efficacy has a positive effect on performance, sports teams are different in nature to groups of teachers, sales teams, and military units. Consequently, in the last ten years researchers have begun to examine collective efficacy in a sporting context.

Sport psychology research has consistently demonstrated that collective efficacy has a positive effect on performance (e.g., Feltz & Lirgg, 1998; Greenlees, et al., 1999; Heuze et al., 2006a; Hodges & Carron, 1992; Myers et al., 2004a; Myers et al., 2004b; Watson et al., 2001). Early studies used controlled laboratory designs to test this relationship. For example, Hodges and Carron (1992) examined the effects of collective efficacy on the performance of a muscular endurance task by falsely manipulating collective efficacy to produce teams with high and low collective efficacy. Their results indicated that following manipulated failure, groups with high collective efficacy improved their performance, whereas the performance of teams with low collective efficacy decreased. Other research has supported this finding, indicating that teams with high collective efficacy maintain effort following failure, whereas those with low collective efficacy reduce their goals (Greenlees, Graydon, & Maynard, 1999, 2000). The results of these laboratory studies concur with the notion that teams with high levels of collective efficacy will persist in the face of adversity and set more challenging goals (Bandura, 1986, 1997). However, although the findings from the Hodges and Carron, and Greenlees and colleagues studies are promising, the laboratory methods used lack ecological validity, limiting the application of their results to real sports teams.

Research has also demonstrated that collective efficacy is related to competitive sport teams' performance. For example, Feltz and Lirgg (1998) found that collective efficacy predicted performance in hockey players and that collective efficacy itself changed according to the outcomes of games. Similarly, in a longitudinal study of college football teams, Myers et al. (2004a) demonstrated that collective efficacy predicted subsequent offensive performance. However, the authors noted that little was still known about the direction of the relationship between collective efficacy and performance. Therefore, in a follow up study, Myers et al. (2004b) investigated the reciprocal relationship between collective efficacy and team performance in female ice hockey teams. By measuring pre-game collective efficacy and performance during weekends when teams were playing the same team twice, they discovered that Friday night performance only had a small influence on the subsequent Saturday collective efficacy scores. In contrast, Saturday collective efficacy scores had a positive moderate effect on subsequent Saturday performance. Their results highlight that protecting levels of team collective efficacy is important in preparation for subsequent performance. Furthermore, it suggests that when teams are performing badly, it may be possible to improve performance by manipulating collective efficacy in some way.

2.1.3.2. Cohesion and Collective Efficacy

The literature discussed so far indicates that collective efficacy leads directly to improved team performance. However, the relationship between collective efficacy and performance may be mediated by perceptions of team cohesion. Specifically, researchers have consistently shown that team cohesion has a positive influence on team performance (e.g., Carron, Colman, Wheeler, & Stevens, 2002; Mullen & Copper, 1994), and it is also suggested that collective efficacy underpins the cohesion/performance relationship (Loughead & Hardy, 2006). Indeed, research has shown that collective efficacy and cohesion are closely related (e.g., Heuze et al., 2006a; Heuze et al., 2006b; Kozub & McDonnell, 2000; Paskevich et al., 1999; Spink, 1990). For example, Paskevich, et al. (1999) found that the task components of team cohesion, measured with the Group Environment Questionnaire (GEQ; Carron, Widemeyer, & Brawley, 1985), were significantly related with collective efficacy. This relationship has been supported in at least two subsequent investigations. First, Kozub and McDonnell (2000) demonstrated that the task components of cohesion, accounted for 32% of the variance in collective efficacy scores. While more recently, Heuze et al. (2006a) found that both task components and one social component of the GEQ were positively related to collective efficacy. Even so, the research indicates that task cohesion mediates the relationship between collective efficacy and performance to a greater extent than social cohesion. This observation is unsurprising, given that collective efficacy is defined as a task-specific construct (Bandura, 1997).

2.1.3.3. Interventions to increase collective efficacy

Although research indicates that collective efficacy is an important determinant of team performance, little research has considered specific interventions that might be used to increase collective efficacy. Indeed, since 1982 when Bandura first introduced the construct, only one published study in sport psychology has examined interventions to manipulate collective efficacy (Munroe-Chandler & Hall, 2004). Given that collective efficacy has a strong link with cohesion it is likely that traditional team building interventions often used to increase cohesion could work equally well for collective efficacy. For example, interventions such as personal-disclosure/mutual sharing exercises have been shown to improve team dynamics (e.g., Crace & Hardy, 1997; Dunn & Holt, 2004). However, limited research has considered how traditional individual interventions might also improve team functions such as collective efficacy. For example, the close link between collective efficacy and self-efficacy highlighted in this review indicates that interventions traditionally targeted at increasing self-efficacy and self-confidence (e.g., self-talk, mental imagery), may have some utility in influencing collective efficacy perceptions. From a socio-cognitive and neurological perspective, imagery has the strongest conceptual link with collective efficacy (see section 2.2.3.). In addition, imagery interventions are practically suited for manipulating collective efficacy, as they can easily be adapted to incorporate aspects of team function (e.g., Munroe-Chandler & Hall, 2001) and provide a useful method of improving collective efficacy in isolation of other team members (e.g., away from training). Consequently, the next section discusses imagery research in sport and considers the potential of imagery interventions to increase collective efficacy.

2.2. Imagery and sport

The idea that imagery interventions can be used to enhance performance is not new (e.g., Blair et al., 1993; Cumming, Nordin, Horton, & Reynolds, 2006; Driskell, Copper, & Moran, 1994; Feltz & Landers, 1983; Smith, Holmes, Whitemore, Collins, & Devonport, 2001), and imagery research is one of the most popular areas of study in sport psychology. This section of the review considers some of the research that is most pertinent to the thesis and is separated into two sub-sections. The purpose of the first sub-section is to emphasise the important conceptual and methodological developments in imagery research and discuss the salient theories used to describe how imagery use influences human cognition, behaviour, and emotion. Following a brief introduction to imagery, to ensure clarity throughout the thesis, the review considers the five different types of imagery frequently reported in the literature (Hall et al., 1998) and the recent research that proposes appropriate terminology for reporting these imagery types. This discussion is followed by an evaluation of the theories and mechanisms that are most pertinent to the research chapters that follow, which best explain how imagery interventions influence cognitions, behaviour, and emotion. Particular attention is given to bioinformational theory (Lang, 1979), triple code theory (Ahsen, 1984), and more recent functional equivalence research (e.g., Grezes & Decety, 2001).

The second sub-section then provides a conceptual argument for using imagery interventions to increase collective efficacy, and considers the specific implications for design of such interventions. Specifically, the relationship between imagery use, self-confidence, self-efficacy, and ultimately collective efficacy is discussed in detail, followed by a discussion of the models that have been proffered to improve the understanding and application of imagery interventions in sport. First, the applied model of mental imagery (Martin, Moritz, & Hall, 1999) provides an account of how athletes use imagery interventions in sport and the factors that influence the success of these interventions. Second, the PETTLEP model (Holmes & Collins, 2001) provides a number of neuropsychological-based considerations for the development of imagery interventions.

2.2.1. What is imagery?

Imagery in sport has recently been defined by Morris, Spittle, and Watt (2005, p.19) as:

> …the creation or re-creation of an experience generated from memorial information, involving quasi-sensorial, quasi-perceptual, and quasi-affective characteristics, that is under the volitional control of the imager, and which may occur in the absence of the real stimulus antecedents normally associated with the actual experience.

Researchers have suggested that imagery is the most popular of all the psychological skills techniques used in sport psychology (DeFrancesco & Burke, 1997; Short et al., 2002). Indeed, successful elite performers such as Neil Jenkins (Jackson & Baker, 2001) and Steve Backley (Backley, 2007) have often reported using imagery to help them with performance issues. Empirical studies have also consistently shown that imagery interventions have a positive influence over performance and can be used to manipulate perceptions of other psychological variables such as anxiety (e.g., Page, Sime, & Nordell, 1999; for a full review see Morris et al., 2005). Indeed, the potential uses of imagery appear to be limited only by creativity. In a recent review of imagery use, Morris et al. (2005) concluded that there are probably many more applications than we can imagine.

Given the wide-ranging applications of imagery in sport, it is unsurprising that some researchers have attempted to categorise the different types of imagery. The majority of current research uses the taxonomy of imagery types suggested by Hall et al. (1998). Specifically, Hall et al. (1998) proposed five different types of imagery, broadly separated into cognitive and motivational categories, namely: *Cognitive Specific* (CS) imagery, which involves imagery that focuses on improving a specific motor skill; *Cognitive General* (CG) imagery, which entails imaging strategies or plays that might be used in specific competitions; *Motivational Specific* (MS) imagery that is used to image successfully achieving one's goals; *Motivational General-Mastery* (MG-M) imagery, which requires the individual to image being mentally tough and confident in all circumstances; and finally, *Motivational General-Arousal* (MG-A) imagery, which contains scenes that evoke emotions and arousal. These five imagery types form the five factors of the Sport Imagery Questionnaire (SIQ, Hall et al., 1998) which is commonly used in current sport imagery research (e.g., Moritz, Hall, Martin, & Vadocz, 1996).

Despite the popularity of Hall and colleague's taxonomy of imagery types, recently some researchers have questioned its use (e.g., Short, Monsma, & Short, 2004; Short, Ross-Stewart, & Monsma, 2006). The main concerns highlighted by Short and colleagues reflect how certain terminology has been used interchangeably in the literature. Specifically, the terms *imagery content*, *imagery type*, *imagery function,* and *imagery outcome* have become conceptually confused. For example, while Moritz et al. (1996) referred to the SIQ subscales as reflecting imagery *content*, Martin, Moritz, and Hall (1999) consistently used the term *function*. This is despite a clear distinction between the content of the image, which reflects what is being imaged by the performer, and the function, which is dependent on the meaning that image holds for the performer (Callow & Hardy, 2001). Given this confusion, Short et al. (2006) suggest that *imagery type* should be used to describe the content of the imagery, *imagery function* should reflect the purpose each athlete is using the imagery for (e.g., to increase confidence), and *imagery outcome* should indicate the actual effect the imagery has had (e.g., increased concentration or performance). Sport psychologists who use the SIQ should recognise that unless they identify the function that an athlete uses imagery for (cf. Short & Short, 2005), they can only draw conclusions regarding the frequency of imagery types used by that athlete. The recommendations of Short et al. (2006) are pertinent to the remainder of this thesis and will be used accordingly.

2.2.2. Theories and mechanisms of imagery effectiveness

Despite the overwhelming support for the efficacy of imagery interventions, there is still some debate regarding the actual mechanism by which imagery influences cognition, behaviour, and emotion. Indeed, recent reviews suggest that none of the current popular theories provide a complete explanation of the mechanism of imagery in sport (Morris et al., 2005; Murphy & Martin, 2002). The first sub-section provides an overview of two early theories that were purported to explain the mechanisms of imagery via cognitive and psychophysiological mechanisms respectively (see Morris et al., 2005, for a full review). The review then considers theories that, although developed well over twenty years ago, are still considered contemporary explanations of imagery mechanisms.

2.2.2.1. Early theories of imagery

Symbolic learning theory (Sackett, 1934, 1935) hypothesises that imagery rehearsal allows an individual to prepare a particular skill cognitively (Murphy & Martin, 2002). Specifically, imagery rehearsal codes the movements of a skill into symbolic components, which allows the performer to become more familiar with the skill, and therefore increases performance. The nature of this theory implies that mental rehearsal should be more beneficial for tasks that have a high cognitive element and will have its greatest impact during the early stages of learning (e.g., Feltz & Landers, 1983;

Oslin, 1985; Ryan & Simons, 1981). However, other research suggests that imagery rehearsal is more effective for highly experienced performers (Blair et al., 1993; Savoy & Beitel, 1996). Therefore, while the theory holds intuitive appeal, it does not adequately explain how imagery influences performance and leaves many questions unanswered (Callow & Hardy, 2007; Morris et al., 2005).

Psychoneuromuscular theory (Richardson, 1967) suggests that imagery rehearsal activates the same muscles involved in the overt skill, and as a consequence, provides kinaesthetic feedback regarding the skill. Although of smaller amplitude to that observed during overt practice, the resultant muscle activity provides feedback via Golgi tendon organs in the muscles to reinforce the centrally stored motor programme and allow for subsequent changes in behaviour. Many studies have found that EMG measured muscle activity is present during the imagery rehearsal of movement (Bakker, Boschker, & Chung, 1996; Hale, 1982; Jowdy & Harris, 1990; Livesay & Samras, 1998). Despite this, other research has shown that although muscle activity is evident during imagery, it does not mirror that observed during overt practice (Slade, Landers, & Martin, 2002). This indicates that muscular activity during imagery is not necessarily specific to the imagined action and is instead more random in nature. Furthermore, Morris et al. (2005) propose that to support the theory it must be demonstrated that performance improvements through imagery result from neuromuscular feedback, and currently there is very little evidence to support this idea. Therefore, while psychoneuromuscular theory provides an explanation for some of the muscle activity observed during mental practice, it does not adequately explain the relationship between imagery use and improvements in the overt sporting task (Feltz & Landers, 1983; Slade et al., 2002).

2.2.2.2. *Contemporary theories of imagery*

Bioinformational theory (Lang, 1977, 1979, 1985) was originally developed to understand phobias and anxiety disorders and describes both the information processing and psychophysiology of imagery use. Lang (1977, 1979) proposed that images stored in the brain are a functionally organised, finite set of propositions, activated in the long-term memory and consist of stimulus and response propositions. The stimulus propositions describe the content of an image (e.g., the crowds on the terraces), whereas response propositions describe the individuals response to the stimulus proposition (e.g., feeling anxious at the sight of the crowd). Response propositions are thought to be doubly coded, with representations at both the conceptual and motor output level (Cuthbert, Vrana, & Bradley, 1991). Consequently, changes in behaviour through imagery are explained through the interaction between the propositions of the image and the associated motor programme.

Of the current imagery theories, bioinformational theory has had the most support in sport psychology. For example, Smith et al. (2001) found that imagery scripts laden with response propositions resulted in greater field hockey performance than scripts laden solely with stimulus propositions. In addition, research has demonstrated that response propositions are more effective in accessing the represented event and produce more physiological activation related to that event (Baker et al., 1996; Hecker & Kaczor, 1988). The theory describes this physiological activation (e.g., muscle activity) as "*random efferent leakage*", originating from central sites where the representation is processed during overt practice and imagery. However, during imagery some of this activity is filtered out by the cerebellum, reducing the resultant efferent activity (Cuthbert et al., 1991). Therefore, in contrast to psychoneuromuscular theory, according to bioinformational theory, this physiological activity does not necessarily mirror the overt task.

Bioinformational theory predicts that imagery will have its greatest benefit for those individuals who have greater experience in the context domain. For example, as experienced athletes have encountered more task-specific situations, they will have a greater number of relevant response propositions to generate the image (Morris et al., 2005). This requirement for experience contradicts symbolic learning theory. Furthermore, unlike symbolic learning theory and psychoneuromuscular theory, bioinformational theory provides an explanation for both the content of the image and the link between the image and the motor programme. Consequently, it is currently a popular explanation of the mechanisms of imagery in the sport psychology research and is often used to develop imagery scripts in intervention studies (e.g., Callow et al., 2001; Callow & Waters, 2005; Jones et al., 2002; Munroe-Chandler, Hall, Fishburne, & Shannon, 2005). In addition, it has been recognised as an important theory in models of applied imagery that are discussed later in this review (e.g., Holmes & Collins, 2001; Martin et al., 1999).

Like bioinformational theory, triple code theory (Ahsen, 1984) is grounded in psychophysiology and uses the acronym ISM to represent the three components: *Image, somatic response,* and *meaning*. Ahsen (1984) described the *image* as,

> A centrally aroused sensation. It possesses all the attributes of a sensation but it is internal at the same time. It represents the outside world with a degree of sensory realism, which enables us to interact with the image as if we were interacting with a real world. (p. 34)

The *somatic response* refers to the psychophysiological effects observed during mental practice and imagery rehearsal (e.g., Baker et al., 1996; Slade et al., 2002). While the *meaning* component takes into account the meaning of the image generated to each individual. This *meaning* will depend on the individual's experiences, such that two individuals who use the same imagery script would generate very different images, emphasising the need for individualised imagery interventions. Although the triple code theory remains largely untested in sport psychology, some researchers have recently acknowledged the importance of image meaning. For example, Short and colleagues (Short et al., 2004; Short et al., 2006) have recognised that the meaning associated with imagery content ultimately denotes the function that imagery has for an individual. That is, two performers who image the same sequence of play from a basketball game may use the image for different functions according to the meaning the image has for them. The importance of *meaning* to imagery was recognised by Lang, who subsequently incorporated a meaning proposition into bioinformational theory (Lang, 1985). Furthermore, Martin et al. (1999) also adopted the *meaning* component of the theory in their applied model of imagery use that is discussed later in this review. However, although triple code theory has intuitive appeal it does not fully explain the mechanisms of imagery on behaviour (Callow & Hardy, 2007).

2.2.2.3. Functional equivalence evidence for mechanisms of imagery

Modern advances in technology, such as regional cerebral blood flow (rCBF) and functional magnetic resonance imagery (fMRI) are now used to measure neural activity accurately. Consequently, it is now possible to investigate the brain mechanisms and neurophysiological activity that occurs during motor actions and imaginal processes. Research in the last twenty years has consistently shown functional equivalence between motor imagery and the movement it represents (see meta-analysis by Grezes & Decety, 2001), such that, similar neural activity (i.e., not matched) is observed when an individual images and performs the same skill (e.g., Montoya et al., 1998; Stephan et al., 1995). For example, Beisteiner, Hollinger, Lindinger, Lang, & Berthoz (1995) demonstrated that DC potentials recorded during action and imagery of a hand movement task were qualitatively and quantitatively similar. The neural activity observed during imagery is suggested to lead to Hebbian modulation of neural pathways, similar to the neurological changes that result from physical practice (Holmes & Calmels, in press; Jeanerrod & Decety, 1995). Indeed, Pacual-Leone et al. (1995) used transcranial magnetic simulation to demonstrate that brain areas active during finger movements increased during repeated imagined simulation of the same movement. Therefore, the evidence for functional equivalence suggests that motor imagery and motor activity share similar neural mechanisms (Holmes, 2006), and therefore provides a direct explanation for how imagery influences behaviour, cognition, and emotions. Accordingly, in the last ten years in sport psychology, research has begun to test and utilise the principles of functional equivalence (Holmes & Collins, 2001, 2002), which is discussed in detail later in this review (see section 2.2.2.3. & 2.2.4.2).

Alternative explanations of imagery mechanisms suggest that imagery may work by influencing an individual's levels of motivation (Paivio, 1984). Specifically, by imaging specific goals or positive emotions that relate to success, athletes can increase motivation levels and subsequent performance (Driskell et al., 1994; Martin et al., 1999; Paivio, 1985). Accordingly, as self-efficacy theory (Bandura, 1977) has been linked to closely with motivation levels (Bandura, 1997; Feltz, 1992), it can be utilised to explain the effects of imagery on performance. Indeed, the effectiveness of imagery interventions are thought to be mediated through changes in self-efficacy or self-confidence beliefs (e.g., Callow & Hardy, 2007). Therefore, the second part of this review of imagery describes the link between self-efficacy theory, self-confidence and imagery effectiveness, and provides conceptual arguments for the use of imagery to increase collective efficacy.

2.2.3. Imagery, self-efficacy, and self-confidence

Bandura (1977) suggests that efficacy beliefs are influenced by previous mastery experiences, vicarious experiences (modelling), verbal persuasion, and emotional arousal. Of these four antecedents, mastery and vicarious experiences have been proposed to be generated through imagery rehearsal (Callow et al., 2001, 2006; Jones et al., 2002), and consequently imagery interventions can be used to increase self-efficacy (Bandura, 1997, Morris et al., 2005). The relationship between imagery, self-confidence, and self-efficacy has been examined extensively (e.g., Callow et al., 2001; Martin & Hall, 1995). The following sub-sections discuss Bandura's views on imagery and self-efficacy, the literature that has investigated the predictive relationship between imagery types and self-efficacy, and the subsequent use of imagery interventions to increase self-efficacy. Finally, based on these relationships, the case is made for the use of imagery interventions to increase collective efficacy.

2.2.3.1. Bandura's views on imagery and self-efficacy

Bandura (1997, p. 376) uses the term *'cognitive enactment'* to refer to the process of imagery use in athletic populations. Amongst other potential uses, Bandura highlights how athletes who image themselves performing skilfully and successfully, increase their levels of self-efficacy for the task, and in doing so improve their level of performance. However, Bandura also highlighted a particular weakness in the current sports imagery research. Specifically, imagery research has often failed to provide participants with the requisite imagery skills needed to image successfully. Consequently, participants may lack the self-efficacy to perform the imagery and eventually abandon the intervention altogether. This highlights that the relationship between self-efficacy and imagery is bi-directional. That is, not only does imagery increase self-efficacy, but in addition, an individual's self-efficacy beliefs concerning their imagery ability will affect their motivation to adhere to a programme of imagery. This relationship needs to be considered when interpreting the results of research that uses correlational designs to investigate the relationship between imagery and self-efficacy.

2.2.3.2. Specific imagery types as predictors self-efficacy

In the last ten years the SIQ (Hall et al., 1996) has been used extensively to examine the types of imagery associated with self-efficacy and sport confidence (e.g., Abma, Fry, Li, & Relyea, 2002; Beauchamp et al., 2002; Callow & Hardy, 2001; Mills et al.,, 2001; Short & Short, 2005; Strachan & Munroe-Chandler, 2006). Early research indicated that athletes high in state sport confidence used more motivational general-mastery (MG-M) and motivational general-arousal (MG-A) type imagery than their less confident counterparts (Moritz, et al., 1996). Similarly, Callow and Hardy (2001) found that confident, low-skilled netball players used predominantly MG-M and cognitive general (CG) type imagery, whereas confident high-skilled players used more motivational specific (MS) type imagery. Callow and Hardy proposed that confident low-skilled netballers found MG-M type imagery more useful as it allowed them to gain performance accomplishment information, thus increasing efficacy expectations. In contrast, they suggested that the confident high-skilled netballers did not need reinforcement from performance accomplishments and gained confidence using MS type imagery to imagine their specific goals. Although the results seem reasonable, athletes were categorised as high or low-skilled dependent on the position of their team within the league. However, it is likely that some athletes from teams in lower league positions were equally as skilled as those athletes in teams with higher league positions.

Therefore, Callow and Hardy categorised successful and unsuccessful teams and not the actual skill level of each individual players.

Despite the methodological weaknesses of Callow and Hardy (2001), other research has supported the idea that athletes with high levels of confidence use specific types of imagery as measured by the SIQ. The majority of this research indicates that motivational types of imagery are most commonly associated with high levels of self-efficacy or confidence (Abma et al., 2002; Beauchamp et al., 2002; Mills et al., 2000; Strachan & Munroe-Chandler, 2006). However, as mentioned previously, the SIQ has been criticised because it does not consider that athletes can use the same imagery type for different functions (see section 2.2.1.). To address this matter, Short and Short (2005) used a modified version of the SIQ that measured frequency of both the type of imagery used and the intended function for each item. Results indicated that the high confident group used more MG-M and CS imagery, whereas the low confident group used more MG-A and MS imagery, therefore demonstrating a similar pattern of results to the research preceding the study. Although the research to date indicates that different combinations of imagery types and functions are associated with high levels of self-efficacy or confidence, MG-M is the type and function of imagery most frequently reported. Consequently, MG-M type imagery interventions have been used most often to increase levels of self-efficacy or self-confidence.

2.2.3.3. Imagery intervention effects on confidence

The consistent relationship between specific imagery types, self-efficacy, and self-confidence has lead researchers to examine the effectiveness of specific imagery interventions types for manipulating these variables (e.g., Callow et al., 2001; Callow et al., 2006; Callow & Waters, 2005; Jones et al., 2002; Short, Bruggeman, Engel, Marback, Wang, Willadsen, & Short, 2002). For example, Callow et al. (2001) assessed the effects of MG-M type imagery on the performance of four elite badminton players using a staggered multiple baseline design. Self-confidence scores increased in three of the participants and stabilised for the fourth participant who fluctuated pre-intervention. The authors concluded that MG-M type imagery interventions could improve and protect against fluctuations in self-confidence. Using similar methods, Callow and Waters (2005) found that confidence significantly increased for two of three jockeys who used a kinaesthetic imagery intervention. Given these results and others which have used traditional experimental designs (e.g., Callow et al., 2006; Jones et al., 2002; Short et al., 2002) imagery would appear to be an effective intervention for enhancing self-efficacy or self-confidence. Despite these findings, however, until recently the relationship between imagery and collective efficacy has not been investigated.

2.2.3.4. Collective efficacy and imagery

In this thesis, the evidence to support imagery as an intervention to increase collective efficacy is based on both socio-cognitive theory and neuroscience research. The following two sub-sections discuss how imagery and collective efficacy are linked neurologically, and how traditional social-cognitive perspectives can be used to explain imagery's effects on efficacy beliefs.

2.2.3.5. Simulation theory, collective efficacy and imagery

Humans often 'mind read' or make judgements about the mental states of others, including their goals, beliefs, and expectations (Gallese & Goldman, 1998). Simulation theory suggests that we perceive how others may feel or what they might do in a given situation, by imagining how we would respond if the same happened to us (Gallese & Goldman). For example, in an end-game situation, a defending basketball coach may attempt to 'mind-read' the tactics of the offensive coach by imagining what they would do themselves. As discussed earlier (section 2.1.2.2.), neurological evidence suggests that cortical and sub-cortical activity in the MNS and CMS is similar during both observation and action (Gallese et al., 2004; Uddin et al., 2007). Similarly, research also indicates that corticospinal activity is comparable for observation and imagery of the same action (Clark, Tremblay, & Ste-Marie, 2004). As with the functional equivalence literature discussed earlier (section 2.2.2.3), the research on simulation theory, MNS, and CMS indicates that imagery can access similar representations to those active during action and observation. Furthermore, as research has identified both common neural activity in the motor cortex, and distinct activity in separate brain areas during first and third person imagery, this suggests individuals can distinguish the agent of the action in the image (Anquetil & Jeannerod, 2007; Fourkas, Avenanti, Urgesi, & Aglioti, 2006; Ruby & Decety, 2001). The research to date supports the notion that individuals can perceive and differentiate others actions and feelings by mentally simulating their behaviours. Therefore, imagery interventions hypothetically have the capacity to influence how individuals perceive other peoples feelings and behaviours. Indeed, given the emphasis towards social-cognition in the CMS literature (Decety & Sommerville, 2003; Gallese et al., 2004; Uddin et al., 2007), collective efficacy perceptions should be particularly receptive to such an intervention programme.

2.2.3.6. Social cognition and imagery

As mentioned earlier (section 2.1.1.), Bandura (1997) suggested that collective efficacy is rooted in self-efficacy, and therefore they are likely to share the same antecedents. Consequently, imagery interventions may provide the opportunity for athletes to model desired team behaviours and re-create images of previous successful performance in sport. Recently, Hardy, Hall, and Carron (2003) measured the predictive relationship between imagery and individual perceptions of team cohesion using separate cross sectional and longitudinal studies. While results from the cross sectional study revealed no significant relationships, the longitudinal study indicated that changes in cohesion scores taken at the beginning and end of the season predicted changes in frequency of imagery use. This suggests that as a team spend more time with one another and become more cohesive, they are more likely to begin to image specific elements of team performance. Given the close relationship between collective efficacy and cohesion (e.g., Paskevich et al., 1999), Hardy et al. (2003) proposed that further lines of research should examine the relationship between collective efficacy and imagery use. Indeed, Callow (1999) supports the view that imagery might be useful to rehearse aspects of team performance.

Recently, Munroe-Chandler and Hall (2004) used a MG-M type imagery intervention to improve collective efficacy within a junior football (soccer) team. The study employed a multiple baseline single subject design similar to other imagery intervention research (e.g., Callow & Waters, 2006). However, instead of staggering the intervention across each individual, the team was separated into three groups based on playing positions within the team (i.e., forwards, midfield, & defence). Collective efficacy increased for two of the three groups with the authors concluding that imagery could be used successfully to increase perceptions of collective efficacy. Nevertheless, while Munroe-Chandler and Hall's results are encouraging, it is the first published article to have explored the use of imagery to improve collective efficacy and did not use a validated collective efficacy questionnaire. Furthermore, while sport psychology research on junior populations is warranted (cf. Strachan & Munroe-Chandler, 2006), it is not clear whether similar results would be found with elite adult teams. Indeed, children pass though a number of cognitive stages of development as they mature (Piaget, 1952), and imagery research has shown that imagery ability improves with age (Wolmer, Laor, & Torne, 1999), and with ability and experience (Mulder, Zijlstra,

Zijlstra, & Hochstenbach, 2004). Therefore, it might be expected that elite adult athletes, with a greater number of performance experiences (see also bioinformational theory described earlier), will benefit more from similar imagery interventions. In the United Kingdom, understanding the effects of an intervention in the context of elite sport is important because it is usually only elite sports that receive sport psychology support. Consequently, further research is needed to examine if imagery should be encouraged as an intervention to increase collective efficacy in elite athletes. To ensure suitable imagery interventions are provided to participants in these investigations, researchers should consider the design of the intended imagery programme. In particular, how certain aspects of current sport-specific models of imagery might be used for the delivery of these interventions.

2.2.4. Sport-specific models of imagery

The following sub-sections consider two models that have been developed specifically for use in the sport domain and which have direct implications for the design of imagery interventions used to manipulate collective efficacy. First, Martin et al.'s (1999) applied model of imagery use in sport, outlines how athletes use imagery and provides a framework for imagery research that can be used to develop specific testable hypotheses (Martin et al., 1999). Second, Holmes and Collins (2001) proposed the PETTLEP model as mnemonic to help applied practitioners develop imagery interventions that demonstrate functional equivalence between motor imagery and the overt skill. Both models have aspects that help explain how to conduct applied imagery interventions in sport. This review considers the relevant aspects of both to the thesis chapters that consider imagery types and interventions.

2.2.4.1. An applied model of mental imagery (Martin et al., 1999)

In order to understand how athletes use imagery in sport, Martin et al. (1999) proposed an applied model of imagery use in sport. They adopted the *meaning* component of triple code theory (Ahsen, 1984) and the emotional reactions provoked by response propositions (Lang, 1979) to reflect the individualised nature of imagery use. The model has four components namely; *sport situation*; *imagery type*; *imagery outcome*; and *imagery ability*. The *sport situation* component of the model proposes that athletes generally use imagery during training, in competition, and while rehabilitating after an injury. However, Munroe, Giacobbi, Hall, and Weinberg (2000) have subsequently identified that in addition to using imagery during training, athletes also use imagery outside of practice time, and differentiate between imagery that is used pre, during, and post competition. Indeed, while Martin et al. (1999) and Munroe et al. (2000) provide a general model of where and when imagery is used, the scope for imagery use by athletes is likely to be even more varied.

For the *imagery type* component, the model uses the taxonomy of imagery types (Hall et al., 1998) described earlier in section (2.1.1). These five types of imagery are linked closely with the *imagery outcome* component of the model. Specifically, the *imagery outcome* component suggests that the three outcomes of imagery use are learning and performance, modification of cognitions, and arousal regulation. Research indicates that increases in learning and performance as a result of imagery are most commonly associated with CS type imagery (e.g., Burhans, Richman, & Bergey, 1988) and CG type imagery (e.g., MacIntyre & Moran, 1996). In contrast, research has shown that MG-M type imagery is the most effective type of imagery for modifying thought patterns and cognitions, such as self-efficacy, motivation, and anxiety (Callow et al., 2001; Feltz & Riessinger, 1990; Jones et al., 2002). Finally, MG-A type imagery is often used by athletes to regulate arousal and anxiety (e.g., Hecker & Kaczor, 1988; Jones et al., 2002), and has been exploited in clinical treatments of phobias, such as stress inoculation training (e.g., Meichenbaum, 1985).

The final component of the model considers how *imagery ability* moderates the effectiveness of imagery programmes. Specifically, it is generally assumed that imagery interventions will be more successful for individuals who have greater imagery ability (e.g., Goss, Hall, Buckolz, & Fishburne, 1986; Isaac, 1992). However, Martin et al. recognise that little is known of how imagery ability influences types of imagery used by athletes, because current measurement methods (e.g., Movement Imagery Questionnaire – Revised; Hall & Martin, 1997) do not encompass the diverse uses of imagery available to athletes. In general, Martin et al.'s model provides a framework, for future imagery research in sport. However, from the perspective of this thesis, the most useful aspect of the model is that it considers how the type of imagery used by athletes determines the eventual outcome of the imagery intervention. This suggests that practitioners should match the intended goal of the imagery intervention with the content of the imagery (Martin et al., 1999). Therefore, to manipulate collective efficacy through imagery, it is likely that the imagery content would need to include the behaviour of other team members and the interactions between them.

2.2.4.2. The PETTLEP model of motor imagery

Despite the popularity of imagery interventions with athletes and coaches, Holmes and Collins (2001) proposed that the relationship between the image and the movement it represents was poorly understood. To address this lack of understanding, they proposed a seven-point mnemonic for imagery practitioners represented by the acronym PETTLEP. The main principle of this model is that motor imagery (i.e., imagery of movement), motor preparation, and motor execution are, to a certain extent, functionally equivalent (see also section 2.2.2.3.). That is, the areas of brain active during motor imagery are similar to those active during motor preparation and execution. Indeed, research has shown that motor imagery, motor preparation, and motor execution occur within relatively similar areas of the brain (e.g., Decety & Ingvar, 1990; Decety, Sjoholm, Ryding, Stenberg, & Ingvar, 1990), use similar neural substrates (e.g., Decety, 1996a), and involve similar physiological activation patterns (e.g., Decety, Jeannerod, Germaine, & Pastene, 1991). Consequently, imagery should, theoretically, be more effective when the image and the motor preparation/execution are closely matched. The letters of the PETTLEP acronym represent the following seven elements, namely: physical; environmental; task; timing; learning; emotion, and perspective (see Figure 1). While in-depth discussion of all the elements is not warranted in this literature review, the *physical*, *environmental*, *timing*, and *emotional* elements are discussed in more detail as they pertain to the imagery intervention used in this thesis. For an explanation of all seven areas, readers are directed to the original article by Holmes and Collins.

One aspect of the *physical* element of PETTLEP questions the efficacy of traditional approaches to imagery that involve a pre-relaxation session and lying down while imaging. Instead, Holmes and Collins (2001) proposed that athletes should match the physical afferent aspects of the skill as closely as possible to maximise functional equivalence. Therefore, athletes may stand in a similar position, hold relevant equipment, or even wear full kit (cf. Smith, Wright, Allsop, & Westhead, 2007). Indeed, recent research has shown that imagery, which incorporates the dynamic physical nature of the sport, increases the vividness of the experienced image (Callow, Roberts, & Fawkes, 2006). Consistent with bioinformational theory (Lang, 1979), the *environment* element proposes that imagery will be most effective when athletes have previous experience of the stimulus and response propositions relating to the environment. Consequently, photos and videos of the competition venue will provide environmental cues and stimulus propositions to help athletes access the correct motor representation (Holmes & Collins, 2001). Although very few studies have examined the use of video footage to enhance imagery, they have mostly shown positive effects on the overall outcome of the imagery (Atienza, Balaguer, & Garcia- Merita, 1998; Gray & Fernandez, 1990; Smith & Holmes, 2004). Research has also shown that the temporal nature of imagery is affected by the perceived force required for the overt skill (e.g., Decety, Jeannerod, & Prablanc, 1989). Accordingly, the *timing* element proposes that the tempo of the imagery interventions must match the overt behaviour, and this can be supported using relevant sporting equipment and body positions to include the required force of the overt skill (cf. *physical* element). Consequently, Holmes and Collins also question whether written imagery scripts can accurately represent the temporal nature of the overt task to allow functional equivalence. Finally, the *emotion* element refers to the importance of the emotional content of imagery for reinforcing the memory trace. Specifically, Lang (1978) defines the image as "*a conceptual network controlling specific somatovisceral patterns...constituting a prototype for overt behaviour*". Therefore, in accord with the *physical* element, relaxation before imagery may blunt the emotions felt by the individual, thus lessening the effectiveness of the image. Consequently, imagery might be best performed in a similar emotional state to that encountered in the specific sport.

The PETTLEP model was the first to provide a neuropsychological and functional equivalence explanation of the imagery process in sport. However, the authors acknowledged that the model was in its infancy and required a considerable

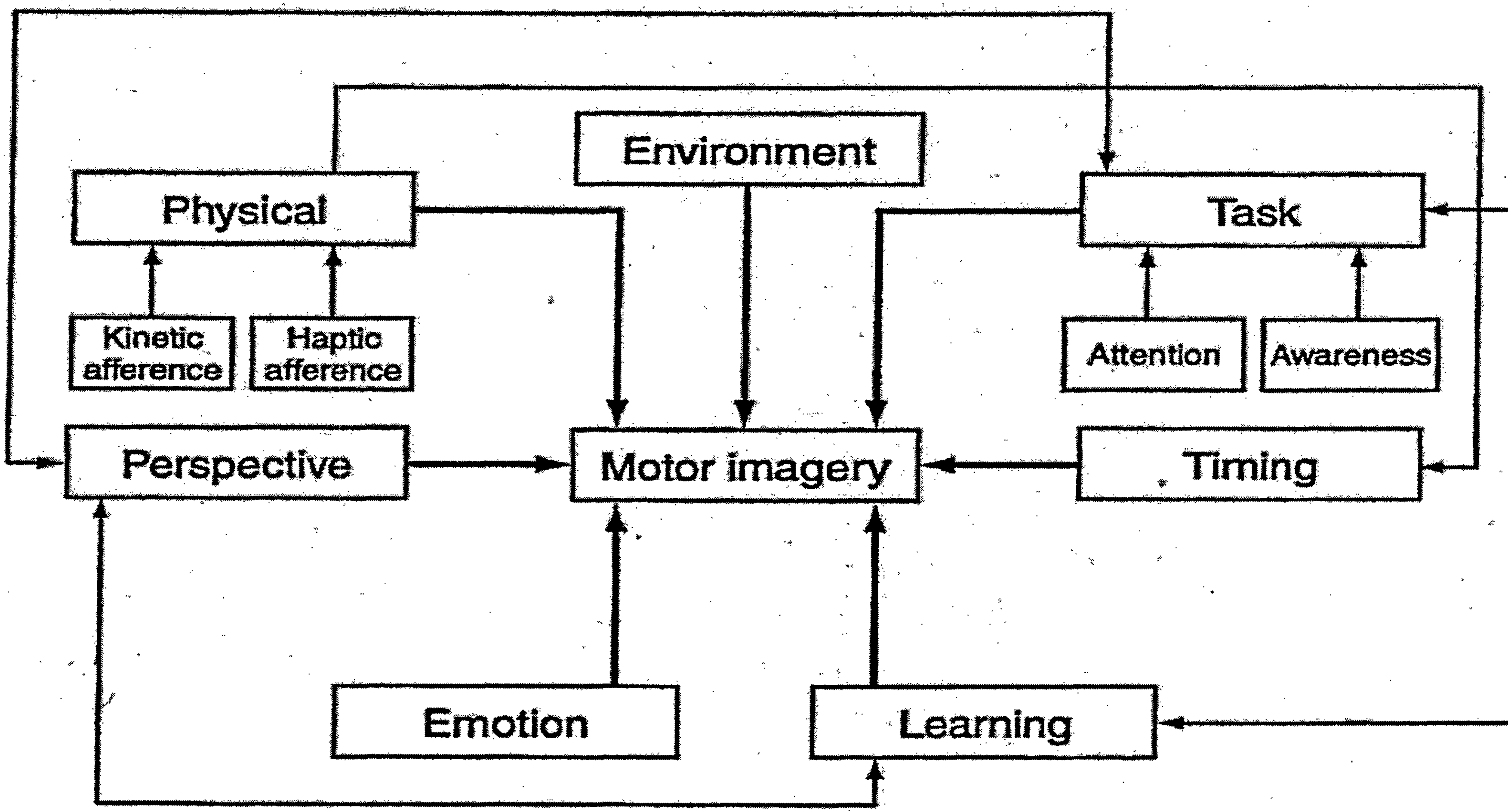

Figure 2.1. The PETTLEP model of motor imagery (Holmes & Collins, 2002)

amount of testing (Holmes & Collins, 2001). Recent research has shown that dynamic imagery interventions, which follow some elements of the PETTLEP model, improve performance and imagery vividness when compared with traditional imagery (Callow et al., 2006; Smith et al., 2007). Recently, Callow and Hardy (2007) highlighted two potential problems with the model. First, they claimed that neuropsychological research that supports functional equivalence is contentious (e.g., Deiber, Ibanez, Honda, Sadato, Raman, & Hallett, 1998). Second, they suggested that using bioinformational theory to explain functional equivalence was conceptually conflicting (i.e., amodal and information processing respectively). However, the balance between literature that supports functional equivalence, and that which does not, is heavily weighted in favour of functional equivalence. In addition, Holmes and Collins do not use bioinformational theory to explain functional equivalence; rather they use both to support their model. Therefore, in general the PETTLEP model has a number of key implications for designing imagery interventions that challenge traditional practices. In particular, imagery effectiveness might be improved by designing imagery programmes that conform to the recommendations of the PETTLEP model. However, it might be difficult for athletes to follow such strict intervention guidelines from the outset. Therefore, incorporating specific element (e.g., *physical, emotional, timing*, and *environmental*) encountered during performance provides a basis for future research. Researchers should also consider the use of specific imagery aids, such as video footage of previous performances or the competition environment, to increase the vividness of the overall imagery experience.

2.3. Summary

This literature review has provided a contemporaneous review of both the collective efficacy and imagery research conducted in sport psychology. The current literature indicates that collective efficacy is an important determinant of team performance (Heuze et al., 2006; Hodges & Carron, 1992; Myers et al., 2004a, 2004b; Watson et al., 2001). Unfortunately, the extant research has lacked both conceptual clarity and viable explanations for the underlying mechanism of collective efficacy perceptions. Accordingly, the review has highlighted the potential role of the MNS and CMS in collective efficacy perception and recommended that future research conceptualises collective efficacy using Bandura's (1997) definition. In addition, the third or fourth operational methods described earlier (section 2.1.2.3) would appear the most appropriate to measure collective efficacy using a unidimensional perspective, measuring the *strength* of the efficacy belief. Finally, it is suggested that the subsequent level of analysis should depend on the research question under investigation (Short et al., 2005). Taken together, the review has highlighted the need for a validated inventory of collective efficacy that can be used across many sports. An inventory such as this can then be used to investigate the potential influence of other psychological variables and interventions (i.e., imagery) upon collective efficacy beliefs.

The review of imagery research first considered the nature of imagery and the specific terminology currently used in the literature. In particular, it has highlighted that studies need to carefully distinguish between the imagery *type, function,* and *outcome*, and use the appropriate terminology accordingly (Short et al., 2006). From a theoretical perspective, bioinformational theory (Lang, 1979), triple code theory (Ahsen, 1984), and recent functional equivalence research have been suggested as the theories most relevant to modern sport imagery research, and those that have influenced specific applied models of imagery. In addition, to support how imagery interventions can hypothetically increase collective efficacy perceptions, the implications of simulation theory (e.g., Uddin et al., 2007) and socio-cognitive research (e.g., Abma et al., 2002) have been discussed. In particular, as MG-M type imagery has been used successfully to increase self-efficacy and confidence before (e.g., Callow et al., 2001), similar interventions may also enhance collective efficacy.

From an applied perspective, the review has also highlighted a number of considerations for the design of imagery interventions appropriate to manipulate collective efficacy. Specifically, as imagery content should match the intended outcome of the imagery (Martin et al., 1999), suitable imagery programmes might contain scenes of other team members and group interactions. In addition, to improve the quality of the imagery experience, the functional equivalence between the imagery and overt behaviour should be considered. Therefore, the elements of the PETTLEP model (Holmes & Collins, 2001) and the principles of bioinformational theory (Lang, 1979) should be adhered to, to help athletes develop clear and vivid images.

The remaining chapters of this thesis will examine the structure and measurement of collective efficacy, before exploring the relationship between collective efficacy and imagery. Specifically, in chapter three, a sport specific measure of collective efficacy is designed and validated using modern confirmatory factor analysis techniques. Once validated, in chapter four, the resultant inventory will be used to examine the relationship between the frequency of different imagery type used by team athletes and the associated individual perceptions of collective efficacy. Subsequently, in chapter five, based on the results found in chapter four, the effects of an applied imagery intervention are tested. Finally, in chapter six, a thesis discussion is provided which provides a detailed analysis of the three experimental chapters, highlighting practical implication and future research recommendations.

3.0 Chapter Three: Development of the Collective Efficacy Inventory

3.1. Introduction

The preceding review of literature has highlighted that the manner in which collective efficacy has been conceptualised and subsequently measured is largely inconsistent (Zacarro et al., 1995). Indeed, it appears that researchers have yet to decide what they are attempting to measure (Maddux, 1999). Furthermore, to date, only one study has attempted to develop a psychometric sport-specific collective efficacy questionnaire that has content, factorial, and construct validity (CEQS; Short et al., 2005). However, while the validation of the CEQS returned some promising results, the fit indices from the confirmatory factor analysis were marginal (cf. Hu & Bentler, 1999; MacCallum et al., 1996) and no attempt was made to quantify and differentiate the strength of the correlations between the CEQS, the criterion, and the construct validation measures. Therefore, scope exists for further inventory development so that researchers can continue to examine how collective efficacy relates to, and influences, other psychological constructs and ultimately sport performance.

Of the four current operational methods suggested (see section 2.1.2.3. and Bandura, 1997; Gist, 1987; Lindsley et al., 1995), two have been shown as equally suitable (Short et al., 2002); the first being individual-centred (e.g., *I believe my team is….*), and the second, team-centred (e.g., *My team believes...*). The appropriateness of both these methods will be examined in this chapter. With regards to dimensional structure, previous sport psychology research has measured collective efficacy using both unidimensional and multidimensional inventories (Carron & Hodges, 1992; Greenlees et al., 1999; Paskevich et al., 1999). Both these methods have been criticised (see section 2.3.3.), and although Bandura (2006) suggests that efficacy inventories should measure both the *strength* and *level* dimensions of efficacy, to do so for a multisport collective efficacy inventory would be overly complex. Therefore, it is suggested that a unidimensional approach, which measures the *strength* (one of three dimensions of self-efficacy) of the efficacy beliefs, may be most appropriate to develop a collective efficacy inventory for all team sports.

This chapter is divided into two studies with separate data samples and analysis. The aims of the first study were twofold: first to test the factorial validity of a unidimensional collective efficacy inventory; and second, to examine which of the two operational methods were more appropriate for measuring collective efficacy in sport (i.e., *I believe...,* or *My team believes...*). In both cases, this was conducted using confirmatory factor analysis techniques that have been recommended for the purpose of inventory design (e.g., Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001). Unlike exploratory factor analysis, confirmatory factor analysis is used to examine the extent to which a data sample matches an *a priori* model. This is done by specifying the desired pattern of constraint on the factor loadings such that items can only load onto to their specified factor (cf. Biddle et al., 2001; Byrne, 2006). In this instance, as the proposed conceptual model was unidimensional no specific hypothesis was made concerning the item structure. However, it was hypothesised that as items using the *My team believes...* operational method required individuals to consider how other team members felt, it would provide the closest match to the hypothesised model.

The aim of the second study in this chapter was to test the construct and criterion validity of the resultant model found in the first study. This was assessed by examining the correlation between scores obtained using the new inventory with those from established inventories of other constructs. These inventories were either pre-existing collective efficacy measures or comprised other psychological constructs that possessed a specific hypothetical relationship with collective efficacy (e.g., team cohesion).

Hypotheses for the second study are presented in the introduction to study two in section 3.5.

3.2. Study one methods

3.2.1. Participants

Participants (*N* = 279; *M* age = 23.57; *SD* = 6.43) were recruited via opportunity sampling from six different team sports (rugby union, football, cricket, netball, hockey, and full-bore rifle shooting[1]). The sample consisted of males (*n* = 179) and females (*n* = 100) and the mean membership with their current team was 2.76 years (*SD* = 3.16). The competitive standard of the participants included amateur (*n* = 159), university (n = 101), semi-professional (*n* = 7), and professional athletes (*n* = 11).

3.2.2. Inventory development

The eight-stage procedure for inventory design outlined by DeVellis (2003) was used as a guide to develop the inventory. First, items were generated based on current theory, reviewed by experts in the field for content validity (i.e., the extent to which the given items reflected the intended content domain), and then allied with an appropriate measurement scale (i.e., likert scale). The proposed factor structure of the items was then tested using a factor analysis technique. The majority of research in psychology now uses confirmatory factor analysis in preference to exploratory factor analysis (see section 3.2.4) as it allows researchers to take a theory-driven approach to inventory design (Biddle et al., 2001). Once factorial validity is confirmed, the resultant inventory is examined for criterion (i.e., predictive) and construct validity. Criterion validity is indicated by the extent to which the inventory has an empirical association with some criterion or gold standard measure. In contrast, construct validity is established when the inventory matches a pre-defined hypothetical relationship with other variables or

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[1] Data taken from shooter and wind coach firing diads

psychological constructs (DeVellis, 2003). Assessment of the overall validity of the inventory can only be made when all these procedures are completed.

Based on the intention to design a collective efficacy inventory for use across all team sports, a pool of 10 items was developed by two experts in the field of group dynamics in sport (Appendix B). Each item was then examined carefully to ensure conceptual relevance and one item considered unsuitable was removed. The nine remaining items were each used twice, with two different operational methods as the stem for each item. The item stems matched operational definitions provided by Lindsley et al. (1995). Specifically, the individuals own perceptions of collective efficacy (e.g., "*I believe that the team is capable of performing at a high level*") and the individual's interpretation of the team's perception of collective efficacy (e.g., "*My team believes it is capable of performing at a high level*"). While these operational definitions were similar to those used by Short et al. (2002), the items themselves were different. For brevity, subsequent reference to these stems and their corresponding items are made using the terms "*I*" and "*My team*". The completed inventory contained 18 items which were answered using a likert scale that measured the strength of agreement with each statement, anchored by 1 (*strongly disagree*) and 5 (*strongly agree*) (Appendix C). This five-point likert scale is similar to that used by Watson et al. (2001) for measuring collective efficacy.

3.2.3. Procedure

Ethical approval was granted by the Sports Science Department ethics committee prior to data collection. Teams were subsequently recruited from a variety of university, amateur, semi-professional, and professional sport teams in Great Britain. Following consent from team management, team members were approached and asked if they would like to volunteer for the study. Prior to beginning, participants completed a written informed consent form (Appendix O) and were told that their involvement was voluntary and that they could withdraw at any time. In addition, they were assured that their responses to the inventory would remain confidential and would not be used for team selection purposes. A demographic sheet and the collective efficacy inventory were given to all volunteers immediately before a midweek training session. A member of the research team remained present at all times to answer any questions the participants had while completing the inventory, and to ensure that the participants did not to confer. After the inventory had been completed, participants were debriefed verbally and thanked for their participation.

3.2.4. Data analysis

Cronbach's alpha scores were calculated for the nine items with the stem "*I*" (α = .71) and for the nine items with the stem "*My team*" (α =.78), indicating adequate internal reliability for both operational methods. A confirmatory factor analysis (CFA) was then used to examine the factorial validity of the nine items for each operational method using the EQS 6.01 software package (Bentler, 2005). CFA is distinct from exploratory factor analysis (EFA) in that it is designed to test an *a priori* conceptual model and only measures the strength of factor covariation for those items and factors defined by the model (Biddle et al., 2001). For each CFA, the data sample was tested for multivariate normality. Specifically, multivariate kurtosis was measured using Mardia's (1970, 1974) normalized coefficient and values greater than 5 were considered to indicate non-normal data (Bentler, 2005). Where the data was non-normal, EQS allows the user to run ROBUST statistics. Specifically, this statistic employs the Satorra-Bentler Chi square (S-B χ^2: Sartorra & Bentler, 1994) and robust standard errors (Bentler & Dijkstra, 1985). In addition, the Maximum Likelihood (ML) estimation process was employed as research has indicated that parameter estimates remain valid even when the data are non-normal (Satorra & Bentler, 1994). Furthermore, the ML estimation can be used when data is missing (Allison, 2003).

Following the initial CFA, further specification searches were completed to reestimate the model accurately. At each stage of the analysis, model assessments were made for the whole model first (i.e., fit indices), and then for each individual parameter estimate. To ensure that each model was tested comprehensively (i.e., model fit, model comparison, and model parsimony), the following fit indices were used; Root Mean Square Error of Approximation (RMSEA: Steiger & Lind, 1980), the Comparative Fit index (CFI: Bentler & Bonett, 1980), the Non-Normed Fit Index (NNFI: Tucker & Lewis, 1973), and the Standardized Root Mean Square Residual (SRMSR: Bentler, 1995). The criterion scores used to indicate a good fit to the proposed model were; < 0.06 for RMSEA, > 0.95 for CFI and NNFI, and < 0.08 for the SRMSR (Hu & Bentler, 1999). In addition, univariate and multivariate Langrange Multiplier tests (LM χ^2) were used to test the viability of specific parameters in the proposed model (Byrne, 2006). This test represents the EQS equivalent of modification indices, where a significant LM χ^2 indicates factor cross loadings, error covariances, and consequently model misspecification. In addition, misspecification is likely when a given parameter set shows incremental univariate χ^2 values that are substantially greater than the other parameter sets (see Byrne, 2006, p. 111). This information can then be used to guide further specification searches before finalising the model.

To test a two-factor model, a correlated traits–correlated uniqueness (CTCU) approach was employed. The CTCU model considers the correlations between variable pairs measured with the same method after removing trait effects (Marsh & Bailey, 1991). In this instance, the two item stems (*"I"* and *"My team"*) were considered as the trait, while the item anchor (i.e., the question) was classed as the method. A CTCU approach is particularly appropriate when there are only two traits (factors), as is the case here (Marsh & Hocevar, 1983). In addition, it is less susceptible to ill-defined solutions than other MTMM models (Marsh, 1989) and has been shown to provide more accurate and precise parameter estimates than other MTMM models (Marsh & Bailey, 1991).

3.3. Results

3.3.1. "I" operational method - nine-items

Normalized Mardia coefficients indicated that the data sample was non-normal (8.11) and so ROBUST statistics were used. In addition, only 71% of the standardised residuals lay between -0.1 and 0.1, indicating a possible model misfit (Byrne, 2006). Fit statistics for the *"I"* operational method (S-Bχ^2 = 225.63, $p < 0.01$, RMSEA = 0.17, CFI = 0.57, NNFI = 0.43, AIC = 425.51, SRMSR = 0.64) indicated a poor fit (Table 3.1). Factor loadings for each item ranged from 0.22 to 0.67 (Table 3.1), while univariate LMχ^2 indicated that items, 8, 10, and 15 had significant error covariances ($p < .001$). Subsequent multivariate LMχ^2 revealed that the incremental univariate χ^2 values for parameters E15-E10 (χ^2=76.18), E10-E8 (χ^2= 62.29), and E15-E8 (χ^2= 66.93), were substantially greater than the remaining parameters (nearest E10-E7, χ^2= 22.47), indicating that they were misspecified in the model.

3.3.2. "My team" operational method - nine-items

Normalized Mardia coefficients indicated that the data sample was normal (3.90) and 86% of standardised residuals lay between -0.1 and 0.1. Despite a closer fit than the *"I"* stem, fit statistics for "*My team*" were also poor (χ^2=122.92, $p < 0.01$, RMSEA = 0.12, CFI= 0.85, NNFI = 0.81, AIC =68.92, SRMSR=0.58). Factor loading ranged from 0.15 to 0.74, while univariate LMχ^2 indicated that items 3, 12, and 14 had significant error covariances (p <.001). Subsequent multivariate LMχ^2 revealed that the incremental univariate χ^2 values for parameters E14-E12 ($\chi^2 = 22.80$) and E16-E14 ($\chi^2 = 24.64$) were substantially greater than the remaining parameters, indicating that items 14 and 12 were particularly problematic.

3.3.3. Model re-specification

Closer inspection revealed that items 3 and 12 ("*My team*" stem) were the respective corresponding items to 15 and 10 ("*I*" stem), all of which were highlighted as problematic in the nine-item models tested above. Consequently, both pairs were removed from further specifications of the model. In addition, as significant error covariances were observed for item 8 ("*I*" stem) and 14 ("*My team*" stem), they were removed along with their respective corresponding items, 13 and 7. Accordingly, items 1, 4, 6, 11, and 18 for the "*I*" stem and items 2, 5, 9, 16, and 17 for the "*My team*" stem were retained for further analysis as separate five-item models.

3.3.4. Single factor models – five-items

Mardia's normalised estimates for the five remaining "*I*" items indicated that the data was still non-normal (5.3) and 93% of standardised residuals were between -0.1 and 0.1. However, this five-item model showed a significant improvement compared with the nine-item model and some of the fit statistics were within acceptable limits (S-Bχ^2 = 11.75, p = 0.02, RMSEA = 0.07, CFI=0. 96, NNFI = 0.91, AIC = 1.75, SRMSR = 0.05). Moderate to good factor loadings (0.31 – 0.76) and univariate LMχ^2 indicated that no further error covariances were problematic. For the five remaining "*My team*" items, Mardia's normalized estimates indicated that the data was normal and 100% of standardized residuals were between -0.1 and 0.1. The fit indices indicated a strong fit to the model, (S-Bχ^2 = 3.44, p = 0.63, RMSEA = 0.00, CFI=1.00, NNFI = 1.02, AIC = -6.56, SRMSR = 0.02) and the factor loading for the five items (0.42 to 0.79) and error covariances indicated that no further items were problematic.

3.3.5. Two factor model – 10 items

Normalised Mardia Coefficients indicated that the sample was non-normal and 95% of standardised residual were within -0.1 and 0.1. A CTCU model confirmatory factor analysis indicated that the 10 items provided a close fit to the model (S-Bχ^2 = 44.65, p = .03, RMSEA = 0.05, CFI = 0.98, -13.34), with loadings for both factors ranging from poor to very good (0.28 – 0.79) (see Table 3.2). Closer inspection of the corresponding item pairs revealed two with non-significant correlated error variances (E17-E11 & E5-E18). Accordingly, the model was re-specified with these item pairs specified as uncorrelated. This revealed an excellent fit to the model (S-Bχ^2 = 44.83, p = 0.05, RMSEA = 0.04; CFI = 0.98, NNFI = 0.96, AIC = -11.07, SRMSR = 0.05), with factor loadings ranging from 0.27 to 0.78 (see Table 3.2). However, the correlation between the two operational methods was very high (r = .94) indicating that the two methods were measuring the same construct. Consequently, the model was re-specified once more with all 10 items loading onto one common factor (S-Bχ^2 = 46.89, p = 0.04, RMSEA = 0.04; CFI = 0.98, NNFI = 0.96, AIC = -17.07, SRMSR = 0.05). Factor loadings ranged between 0.37 and 0.76, with exception of item 6 (0.27). This specification indicated that there was little difference in factorial validity between the two and one factor models.

Table 3.1.

Fit Indices and Factor Loadings for Single Factor models

Factor/ Items	loading	χ^2	df	χ^2 /df	RMSEA	SRMR	AIC	CFI
I believe (9 items)		256.77	27.00	9.51	0.17	0.13	171.63	0.57
A1	0.55							
A4	0.37							
A6	0.37							
A7	0.67							
A8	0.37							
A10	0.22							
A11	0.65							
A15	0.46							
A18	0.58							
Team believes (9 items)		122.92	27.00	4.55	0.12	0.06	68.92	0.85
A2	0.38							
A3	0.66							
A5	0.53							
A9	0.44							
A12	0.69							
A13	0.15							
A14	0.67							
A16	0.74							
A17	0.71							
I believe (5 items)		14.09	5.00	2.82	0.07	0.05	1.75	0.96
A1	0.57							
A4	0.36							
A6	0.31							
A11	0.76							
A18	0.67							
Team believes (5 items)		3.44	5.00	0.69	0.00	0.02	-6.56	1.00
A2	0.42							
A5	0.58							
A9	0.43							
A16	0.61							
A17	0.79							

Note. RMSEA = Root Mean Square Error of Approximation. GFI= Goodness of Fit Index. SRMR = Standardised Root Mean Square Residual. AIC = Akaike Information Criterion CFI= Comparative Fit Index

Table 3.2.

Fit Indices and Factor Loadings for Two Factor Models

Factor/ Items	loading	χ^2	df	χ^2 /df	RMSEA	GFI	SRMR	AIC	CFI	Correlations between factors (Standard errors)
I believe and Team believe		50.75	29.00	1.75	0.05	0.96	0.05	-13.34	0.98	0.94
A1	0.51									
A4	0.37									
A6	0.28									
A11	0.73									
A18	0.74									
A2	0.40									
A5	0.57									
A9	0.42									
A16	0.63									
A17	0.79									
I believe and Team believe *(2 item pairs uncorrelated)*		50.93	31.00	1.64	0.04	0.96	0.05	-17.17	0.98	0.94
A1	0.51									
A4	0.37									
A6	0.27									
A11	0.73									
A18	0.75									
A2	0.40									
A5	0.57									
A9	0.42									
A16	0.63									
A17	0.78									

Note. RMSEA = Root Mean Square Error of Approximation. GFI= Goodness of Fit Index. SRMR = Standardised Root Mean Square Residual. AIC = Akaike Information Criterion CFI= Comparative Fit Index

3.4. Discussion

The intention of the first study in this chapter was to examine the factorial validity of an 18-item collective efficacy inventory, which used two operational methods for nine corresponding item pairs. Following two separate CFAs on the nine items from the "*I*" and "*My team*" models, four corresponding item pairs were removed. Subsequent specification searches indicated that the five "*My team*" items provided a closer fit to the hypothesised model than the corresponding "*I*" items. Specifically, this suggested that the factorial validity of the "*My team*" stem was greater than the "*I*" stem. While the difference was only small, this finding contrasts with Short et al. (2002) who indicated that either of the stems were a suitable operational method of collective efficacy measures. Subsequently, a CTCU approach was used to examine a two factor, 10-item model, where the two factors were represented by the five "*I*" and "*My team*" items. The data provided a good fit to the hypothesised model and this improved further when two pairs of non-significant correlated error terms were uncorrelated. However, although the "*My team*" stem displayed greater factor validity during the five-item single factor CFAs, the two factor CFA revealed that the "*I*" and "*My team*" stems were highly correlated. Consequently, a single factor, 10-item model was tested and little difference was observed in the fit indices when compared to the two-factor version. This indicates that the two factors were measuring the same construct, and that the factorial validity of the single-factor model was equal to the two-factor model.

Although these results are preliminary in nature, it appears that either operational method is appropriate for measuring collective efficacy. Therefore, although different methods were used, the results support those of Short et al. (2002) who found that it made little difference which operational method was used. Although, the intention was not to develop a two factor (dimension) model *per se*, the procedure for testing the difference between the two operational methods meant that this is what, in essence, was done. Specifically, the two operational items formed two separate subscales. Bandura (2001) suggests that when subscales are correlated it is acceptable to use either the total scores or individual subscale scores as dependent measures. Therefore, the implication is that the inventory developed here has preliminary factorial validity as either a 10-item single factor collective efficacy inventory or two separate five-item inventories using each of the two operational methods. However, confirming factorial validity is only the first stage required to test the collective efficacy inventory's overall validity. Indeed, confirmatory factor analysis only measures the extent that the collected data matches the structure of the hypothesised model, and does not indicate whether the inventory is actually measuring the intended construct. Therefore, the aim of the next study in this chapter was to test the subsequent construct validity of the remaining items.

3.5. Study two introduction

In the first study in this chapter, the content and factorial validity of two five-item inventories, using two operational methods of measuring collective efficacy was established (i.e., "*I*" and "*My team*"). In addition, a two factor and one factor model using both operational methods as factors were tested, with both demonstrating strong factorial validity. However, despite these promising results, confirmatory factor analysis only verifies factorial validity and does not demonstrate that the model is a valid representation of the construct (i.e., collective efficacy). Therefore, to ensure the remaining items measure collective efficacy, the criterion and construct validity should be assessed (DeVellis, 2003). Criterion or predictive validity of an inventory is upheld when the scale in question predicts scores on another measure considered as a "Gold Standard." Construct validity is the extent to which the measure matches pre-defined theoretical relationships with established measures of other constructs. Accordingly, criterion and construct validity can often be assessed in the same way (DeVellis, 2003).

The aim of this second study was to test the criterion and construct validity of the five items for the "*I*" and "*My team*" operational methods and the single factor model with all 10 items. At the time of data collection, no "Gold Standard" measure of collective efficacy was available. Therefore, despite the psychometric weaknesses of single-item efficacy measures (Lee & Bobko, 1994), a single-item measure of collective efficacy was chosen to test criterion validity (Similar to Greenlees et al., 1999). This method was considered appropriate, as similar to the collective efficacy inventory, it was not specific to one sport. Furthermore, previous research has demonstrated that this method is predictive of performance in teams and therefore concurrent with the proposed relationship between collective efficacy and performance (Greenlees et al., 1999; Hodges & Carron, 1992). To measure construct validity, the Group Environment Questionnaire (GEQ; Widmeyer et al., 1985) and the State Sport Confidence Inventory (SSCI; Vealey, 1986) were selected. Specifically, previous research has shown that collective efficacy and the task aspects of group cohesion are strongly related (Kozub & McDonnell, 2000; Paskevich et al., 1999). Therefore, those individuals with higher levels of collective efficacy will also portray higher levels of task cohesion. Similarly, Bandura (1997) suggests that collective efficacy is rooted in self-efficacy, therefore, both should change in a reciprocal manner. While there is no standardised measure of self-efficacy in sport, the SSCI has been used previously to represent self-efficacy (e.g., Callow et al., 2001) and was therefore used on this occasion.

Given the theoretical relationships between collective efficacy, cohesion, and self-confidence/self-efficacy, it was generally expected that all the validity measures would be significantly correlated with both operational methods and the single factor model with 10 items. Specifically, with regards to criterion validity, it was hypothesised that the single-item collective efficacy measure would be significantly correlated with the "*I*", "*My team*", and 10-item collective efficacy scores. For construct validity, three specific hypotheses were also made. First, it was hypothesised that ATG-T and GI-T (i.e., the task components of the GEQ) would have the highest correlation with all three collective efficacy scores because of their task specific nature, and that the difference in *r*-values between ATG-T and GI-T would be non-significant. Second, it was hypothesised that the *r*-values for the task components of the GEQ would be significantly greater than those for GI-S subscale (i.e., social component of GEQ), as social cohesion is less related to collective efficacy than task cohesion (e.g., Paskevich et al., 1999). Similarly, research indicates that although collective efficacy is related to self-confidence or self-efficacy (Myers et al., 2004), neither are group specific. Therefore, the third hypothesis was that *r*-values for SSCI would be the lowest of all correlations and would be significantly different to those of ATG-T and GI-T. Finally, as the "*I*" and "*My team*" item stems were highly correlated in the first study, it was expected that they would be highly correlated again.

3.6. Method

3.6.1. Participants

Participants ($N = 235$) were recruited via opportunity sampling from the sports of cricket ($n = 219$) and hockey ($n = 16$). The sample consisted of both males and females with an age range of 16 to 71 ($M = 29.05$, $SD = 10.58$) and the skill level of the participants comprised recreational ($n = 58$), amateur ($n = 125$), semi-professional ($n = 8$), and professional/international ($n = 39$) athletes.

3.6.2. Measures

Collective Efficacy Inventory (CEI). The final 10-item model derived using the confirmatory factor analysis in study one was used again in this study (Appendix D). Alpha coefficients were calculated for the five items with the "*I*" stem (α = 0.78), the five items with the "*My team*" stem (α = 0.82), and finally for all 10 items together (α = 0.90) indicating that both the one and two factor models demonstrated adequate internal consistency.

Group Environment Questionnaire (GEQ). The GEQ (Carron et al., 1985) is an 18-item questionnaire that was developed to measure group cohesion in sports teams and is currently the standard inventory for this purpose (Appendix E). Four components of cohesion are assessed: Group Integration-Task (GI-T; five items), Group Integration-Social (GI-S; four items), Individual Attraction to the Group-Task (ATG-T; four items), and Individual Attraction to the Group-Social (ATG-S; five items). Participants respond to the questionnaire using a nine-point likert scale where 1 indicates "*strongly disagree*" and 9 indicates "*strongly agree*". Previous research has demonstrated that the questionnaire has adequate internal consistency with alpha coefficients ranging from .64 to .76 (Carron et al., 1985). In this study, three of the subscales demonstrated adequate alpha coefficients; ATG-T (.70), GI-T (.72), and GI-S (.62). In contrast, the alpha coefficient for ATG-S was very low, α = .23, and was not used in the analysis.

State Sport Confidence Inventory (SSCI). The SSCI (Vealey, 1986) was used to test the construct validity of the CEI. The SSCI comprises 13 items designed to measure state sport confidence (Appendix F). For each item, participants are required to compare their own confidence with that of the most confident person they know. For example, "*Compare your confidence you feel right now in your ability to achieve your competitive goals to the* *most confident athlete you know".* Participants respond to each item on a nine-point likert scale, where 1 indicates low levels of confidence and 9 indicates high levels of confidence. Previous research has demonstrated that the SSCI has strong internal consistency, with alpha coefficients of $\alpha = .95$ (Vealey, 1986). Similarly, the data collected using the SSCI in this study demonstrated an alpha coefficient of $\alpha = .96$.

Single-item Collective Efficacy measure. The single-item collective efficacy measure was similar to those used by both Hodges and Carron (1992) and Greenlees et al. (2000). Participants were asked to respond to the following statement: "*What do you think your team's chances are of coming 1st on a 100-point scale?*" Although, Lee and Bobko (1994) found that single-item measures of task-specific confidence had the lowest levels of concurrent validity, Greenlees et al. (2000) suggest that this type of question gauges Bandura's notion of the strength of efficacy beliefs.

3.6.3. Procedures

Following approval from the University Sports Science Departments' ethics committee, team managers were asked for permission to approach team members. Once permission was granted, players were asked to volunteer for the study, completed a written informed consent form (Appendix O), and were informed of their right to withdraw from the study at any point. Furthermore, they were assured that their responses would remain confidential and would not be used for team selection purposes. One hour before a match, participants were administered a questionnaire pack which included a demographics sheet, the CEI, SSCI, GEQ, and the single-item collective efficacy measure. Participants were asked not to confer while completing the questionnaire pack and the investigator remained within the room to ensure that this instruction was adhered to. Once all participants had completed the questionnaire pack, the team was de-briefed about the purpose of the study.

3.6.4. Data analysis

All data was screened for normality by calculating z-scores for skewness and kurtosis. The *z*-scores for total collective efficacy and the five items for "*I*" and "*My team*" were all greater than -3.00, which indicated that the data was negatively skewed (Field, 2005). Furthermore, follow-up test using the Kolmogorov-Smirnoff tests indicated that only the 10-item CEI and SSCI scores were normally distributed and all other variables had distributions that were significantly non-normal ($p < .05$). Despite this, Field (2005) notes that with samples of over 200, a z-score of less than 3.29 is satisfactory (i.e., $p > .001$) as significant Kolmogorov-Smirnoff results occur far more easily with larger samples. Further examination of histograms with normality curves for each variable indicated that the deviations from normality were not enough to bias the subsequent analysis.

A bivariate, two-tailed Pearsons correlation was used to examine the relationship between the collective efficacy scores and the criterion and construct validation measures. Specifically, three different scores from the CEI were examined; total score of the five *"I"* items; total of the five "*My team*" items; and the total of all 10 items together. The criterion and construct measures were the mean scores for the subscales of the GEQ (ATG-T, GI-S, & GI-T), the total SSCI score, and the single-item collective efficacy score. Correlations were examined in relation to their direction, magnitude, and significance ($p < .05$). In addition, Meng, Rosenthal, and Rubins' (1992) equation for comparing correlation coefficients was used to examine the significance of differences in the *r*-values obtained in relation to the specific hypotheses.

3.7. Results

3.7.1. Correlations with "I" stem

All correlations were significant between the criterion and construct validation measures, and collective efficacy measured using the "*I*" stem (Table 3.3). Specifically, correlations with ATG-T (r = .528, p < .001) and GI-T (r = .540, p < .001) were the highest and there was no significant difference between the two r-values (p = .428). The GI-S factor had the next highest correlation with the *"I"* stem (r = .405, p < .001), and the r-value was significantly less than those of ATG-T and GI-T (p < .05). For the single collective efficacy item (r = .410, p < .001), r-values were significantly different to both ATG-T (p = .05) and GI-T (p < .05). Finally, r-values for the SSCI (r = .382, p < .001), were not significantly different from ATG-T (p = .081) but were significantly different to the GI-T r-value (p< .05).

3.7.2. Correlation with "My team" stem.

Similar to the "*I*" stem, all correlations were significant between the criterion and construct measures and the *"My team"* stem (Table 3.3). Correlations with ATG-T (r = .504, p < .001) and GI-T (r = .551, p < .001) were the highest and no significant differences were observed between these two r-values (p = .185). Correlations with GI-S (r = .375, p < .001) were the next highest and the r-value was significantly less than ATG-T (p < .05) and GIT (p< *.01)*. The r-value for the single-item collective efficacy measure (r = .363, p < .001) was also significantly less than those of ATG-T (p < .05) and GIT (p < .01). Similarly, r-values for the SSCI (r = .353, p < .001) were also significantly less than the r-values for ATG-T and GIT (p < .05).

Table 3.3.

Correlation Matrix for Pearson's Correlation between CEI, SSCI, GEQ Subscales, and Single Collective Efficacy item

	10 items	"*I*"	"*My team*"	ATG-T	GI-T	GI-S	SSCI	Single-item
10 items	1							
"*I*"	0.971	1						
"*My team*"	0.970	0.883	1					
ATG-T	0.532	0.528	0.504	1				
GI-T	0.562	0.540	0.551	0.525	1			
GI-S	0.402	0.405	0.375	0.421	0.499	1		
SSCI	0.379	0.382	0.353	0.263	0.243	0.182	1	
Single-item Measure	0.399	0.410	0.363	0.221	0.219	0.277	0.253	1

Table 3.4.

Descriptive Statistic for the CEI, GEQ, SSCI, and Single-item Inventory

	Mean Score	SD	Range
10 items Single Factor	37.67	7.49	39.00
"*I*"	18.99	3.88	19.00
"*My team*"	18.65	3.84	20.00
ATG-T	26.58	6.53	24.00
GI-T	29.10	7.12	37.00
GI-S	23.41	5.67	25.00
SSCI	77.25	19.06	95.00
Single-Item Measure	55.59	35.47	100.00

3.7.3. Correlations with 10 CEI items

All correlations were significant between the criterion and construct measures, and the 10 CEI items (Table 3.3). Correlations with ATG-T ($r = .532, p < .001$) and GIT ($r = .562, p < .001$) were highest and greater than the correlation observed with either of the "*I*" or *"My team"* stems alone. In addition, no significant differences were observed for the *r*-values between ATG-T and GIT ($p = .202$). Correlations with GIS were the next highest ($r = .402, p < .001$) and the *r*-value was significantly less than both ATG-T ($p < .05$) and GIT ($p < .001$). The *r*-value for the single collective efficacy item ($r = .399, p < .001$) was also significantly different from ATG-T ($p < .05$) and GIT ($p < .001$). Finally, the *r*-value for the SSCI was the smallest ($r = .379, p < .001$) and was significantly smaller than both ATG-T ($p < .05$) and GIT ($p < .01$).

3.8. **Discussion**

This study sought to test the criterion and construct validity of the CEI developed in the first study in this chapter. As predicted, all of the construct and criterion validation measures (i.e., GEQ, SSCI, and single-item collective efficacy measure) were significantly correlated with the "*I*" and "*My team*" operational definitions, and all ten items of the CEI used together. For criterion validity, while the single-item collective measure was significantly correlated with all three collective efficacy scores, *r*-values were not as high as expected and were significantly less than the *r*-values for the ATGT and GIT subscales. These differences may be explained by the low validity and reliability of single-item measures (Lee & Bobko, 1994). Nonetheless, the significant correlation with the CEI scores supports the criterion validity of all three measurement methods.

For construct validity, significant differences in *r*-values were observed that supported the studies' hypotheses. In particular, regardless of the operational method, the highest correlations with the CEI were with the GI-T and ATG-T subscales. In addition, no significant differences were observed between the *r*-values for GI-T and ATG-T. This finding was expected, as collective efficacy and task cohesion are both task-specific constructs. In contrast, although significantly correlated with all the CEI scores, the *r*-values for GI-S and SSCI were significantly lower than those of ATG-T and GI-T. Once again, this difference was expected, as the GI-S subscale measures social aspects of cohesion, which have been shown to be less related to collective efficacy than the task components of cohesion (Paskevich et al., 1999). In addition, while SSCI scores are likely to be correlated with collective efficacy scores, self-confidence (or self-efficacy) is an individual construct and therefore less related to collective efficacy than task cohesion.

As expected, correlations between the "*I*", "*My team*" and the single factor 10-item model were significant. Therefore, as with the first study, this indicates that both the "*I*" and "*My team*" operational methods are measuring the same construct and therefore equally suitable for the measurement of collective efficacy (cf. Short et al., 2002). Despite this high correlation between the two operational methods, the strongest correlations with the task cohesion subscales occurred when all 10 items were used together. Furthermore, significant differences in *r*-values between the task cohesion subscales and the remaining construct validation measures were greatest when all 10 items were used.

Collectively, the results of this study provide preliminary support for the criterion and construct validity of the CEI. Bandura (2001) suggests that when subscales are correlated with each other and with the total score, either the separate subscales or the total scores can be used as the dependent measure. In addition, it is generally accepted that internal reliability (e.g., Cronbach's Alpha) is reduced for inventories with small numbers of items (cf. Cortina, 1993; DeVellis, 2003; Miller, 1995). Therefore, based on the findings at this stage, it is suggested that the 10-item model provides the most robust inventory and is therefore most appropriate for use as an inventory to measure collective efficacy for the remainder of the thesis. This model therefore provides the basis for investigating potential interventions that may enhance collective efficacy perceptions in sports teams.

4.0 Chapter Four: Imagery Types and Collective Efficacy as a Function of Skill Level

4.1. Introduction

In chapter three, the CEI was preliminarily validated as an inventory for measuring collective efficacy in sport. Given the lack of research investigating interventions that might increase collective efficacy, the CEI now makes it possible to explore potential methods. Therefore, this chapter considers an appropriate intervention for manipulating collective efficacy in sport teams. Specifically, of the four basic psychological skills (i.e., goal-setting, relaxation, self-talk, and imagery), imagery has the strongest socio-cognitive, and neurological links with efficacy beliefs. Specifically, the socio-cognitive literature has shown that certain imagery types predict self-efficacy and self-confidence (e.g., Abma et al., 2002; Beauchamp et al., 2002; Callow & Hardy, 2001; Mills et al., 2001) and that imagery interventions can be used to increase self-efficacy and self-confidence (Callow & Waters 2005; Jones et al., 2002). Furthermore, it has also been demonstrated that self-efficacy predicts individual perceptions of collective efficacy (Magyar et al., 2004; Riggs & Knight, 1994; Watson et al., 2001).. Neurologically, research indicates that representations for action, observation, and imagery of behaviour and social cognition occur in similar areas of the brain (Clark et al., 2004; Uddin et al., 2007). Accordingly, by encouraging athletes to imaging other team-mates' behaviour, sport psychologists can theoretically manipulate individual perceptions of collective efficacy. Given these relationships and the preliminary research that shows that imagery can improve collective efficacy (Munroe-Chandler & Hall, 2004), it is likely that certain individual imagery types will also predict collective efficacy through their influence on self-efficacy perceptions.

The second objective of this thesis was to examine the relationship between collective efficacy and mental imagery. Therefore, the aim of this study was to investigate which types of imagery (Hall et al., 1998) predicted individual perceptions of collective efficacy in elite and non-elite team sport athletes. As previous studies have indicated that MG-M type imagery is significantly associated with self-efficacy scores (e.g., Beauchamp et al., 2002) and that CG type imagery may allow rehearsal of team plays (Callow, 1999), it was proposed that a similar relationship would exist with collective efficacy. Specifically, it was hypothesized that MG-M and CG type imagery would account for the most variance in individual collective efficacy scores. In addition, based on the evidence that suggests those athletes competing at a higher level consider imagery more relevant to performance than those competing at a recreational standard (e.g., Cumming & Hall, 2002), it was also predicted that MG-M and CG type imagery would explain more variance in collective efficacy at a high competitive standard (elite) compared to that of a lower competitive standard (non-elite).

4.2. Method

4.2.1. Participants

Participants (N =141) were recruited for the study via opportunity sampling from three interactive team sports (football, rugby union, and wheelchair basketball). The sample consisted of male athletes ranging in age from 18 to 55 years (M = 24.44, SD = 5.8 years). The competitive standard ranged from recreational to elite/international and professional, as defined by the competitive level of the team they were representing at the time. For the purposes of this study, this sample was divided into elite and non-elite performers. Elite performers (n =70; M = 25.48, SD = 5.71 years) were those individuals currently competing at semi-professional, professional, and international standard and within teams that required professional commitment (i.e., payment or contract). In contrast, non-elite performers (*n* =71; *M* = 23.29, *SD* = 5.50 years) were those individuals that competed at recreational, amateur, or university standard without any formal commitment, contract, or payment. Based on this distinction, it was assumed therefore that the elite sample would be training and competing more regularly than the non-elite sample and as such, they would have higher levels of competitive experience and skill (cf. Hanton, Cropley, Mellalieu, Neil, & Miles, 2007).

4.2.2. Measures

Collective Efficacy Inventory (CEI). The 10-item CEI developed in chapter three was used to measure collective efficacy (Appendix D). The CEI contains five distinct items, each used twice, with two different item stems. The first item stem, "*I*", measures the individual's personal beliefs of the team's collective efficacy. For example, item one, *"I believe that the team is capable of performing at a high level"*. The second item stem, "*My team*", measures the individual's perception of their team's belief of collective efficacy. For example, item five, "*My team believes that the team is capable of performing at a high level"*. In accordance with previous research (e.g., Watson et al., 2001) each item is measured on a five-point likert scale ranging from 1 (*not at all*) to 5 (*very much so*). Preliminary confirmatory factor analyses of the CEI have demonstrated strong factor validity for the 10-item inventory (S-Bχ^2 = 44.83, p = 0.05, RMSEA = 0.04; CFI = 0.98, NNFI = 0.96, AIC = -11.07, SRMSR = 0.05). However, both factors were shown to correlate highly (*r* =.94) which indicated that both factors were measuring the same construct. Indeed, Moritz et al. (2000) and Short et al. (2002) found comparable results using similar item stems. Furthermore, Bandura (2001) suggests that when subscales are correlated it is acceptable to use either the total scores or individual subscale scores as dependent measures. In this instance, scores were aggregated across all 10 items in the inventory.

Sports Imagery Questionnaire (SIQ). The SIQ was developed by Hall et al. (1998) to measure imagery types in sport (see section 2.2.1. for discussion on imagery *type, content, function*, and *outcome*). The questionnaire comprises 30 items designed to measure five different types of imagery, represented by five separate subscales (Appendix G). These subscales are Cognitive General (CG: e.g., *"I image alternative strategies in case my event/game plan fails"*), Cognitive Specific (CS: e.g., *"I can mentally make corrections to physical skills"*), Motivational Specific (MS: e.g., *"I imagine myself winning a medal"*), Motivational General-Arousal (MG-A: e.g., *"I imagine the stress and anxiety associated with competing"*), and Motivational General-Mastery (MG-M; e.g., *"I imagine myself appearing self confident in front of my opponents"*). Participants respond on a seven-point scale with regard to how often they use each imagery type (1 = *rarely* and 7 = *often*). The scores for each subscale are calculated as the sum of the item scores for that subscale. The construct validity of the five SIQ factors was rigorously tested during its development and predictive validity was supported by data that indicated that imagery type predicted performance (Hall et al., 1998). The subscales of the SIQ have demonstrated internal consistency alpha coefficients scores ranging from .68 to .90 (Hall et al., 1998; Abma et al., 2002). In this study, the alpha coefficients for the subscales of the SIQ scores ranged from 0.74 to 0.87, except on the MG-A scale ($\alpha = 0.48$). The formula for coefficient alpha means that the larger the number of items in a scale, the greater its reliability (Miller, 1995). However, all five subscales of the SIQ have six items, therefore, the low alpha score for the MG-A scale could be attributed to the differing emotional content of the items for this factor. Specifically, the MG-A factor is designed to measure the athlete's use of emotional imagery, however the factor contains items that relate to both images of anxiety and excitement, hence confounding positive and negative emotions. Nunnaly (1978) and Bland and Altman (1997) suggest that satisfactory Cronbach's alpha scores range from 0.70 to 0.80, which suggests that 0.70 would be the minimum level. For this reason, MG-A was excluded from the analysis.

4.2.3. Procedure

Following ethical approval from the University Sports Science Department ethics committee, contact was made with a member of each team's management. Zacarro et al. (1995) indicated that a key aspect of collective efficacy is the group member's perceptions of the group's coordinative capabilities. Consequently, only interactive team sports (e.g., rugby) were used in this study, because the emphasis on coordinative capabilities and teamwork is greatest in these sports compared with co-active teams (e.g., a golf team). Following approval from the team management, the athletes were approached and asked to volunteer for a study examining which types of imagery they used for their sport. The exact nature of the study was withheld to prevent any response bias that might occur. All participants completed an informed consent form (Appendix O), were assured that their participation was voluntary, and told they could withdraw from the study at anytime. During a mid-season team training session, volunteers were given the pack of questionnaires, which also included a demographic assessment sheet. Participants were told to read the instructions at the beginning of each questionnaire carefully, and to take their time to ensure they completed them accurately. To protect against socially desirable responses, participants were assured that there were no right or wrong answers to any of the questions and that their responses would remain confidential. The team members were also asked not to confer while completing the questionnaires, which was monitored by a member of the research team. Following completion of the scales, the participants were debriefed about the true nature of the study and thanked for their involvement. The entire procedure lasted approximately 15 minutes.

4.2.4. Data analysis

Data analysis occurred in four stages. First, the entire sample of elite and non-elite data points was screened for the assumptions of univariate and multivariate normality. Second, in order to account for the potential covariates, a between groups ANCOVA was conducted on collective efficacy scores, with skill *level* as the between subjects factor and *sport type* and *age* of participants as potential covariates. Following this, the data were split into the elite and non-elite sub-samples, screened again for normality, and adjusted accordingly. Finally, a multiple hierarchical regression was used to examine which of the four SIQ variables were predictive of mean collective efficacy scores in both the elite and non-elite samples. Based on the study hypothesis that MG-M and CG type imagery would predict the greatest amount of variance in both the elite and non-elite sample, the SIQ variables were entered into the regression model in the following order; MG-M, CG, with MS and CS together. This analysis was used specifically to test the hypothesis that MG-M type imagery would account for the largest amount of variance and this would be highest in the elite sample.

4.3. Results

4.3.1. Preliminary analysis

Both the elite and non-elite samples were examined for the assumptions of multivariate normality. Tabachnick and Fidell (2001) suggest that Mahalanobis distances are used to indicate multivariate outliers with a criterion level of $p < .001$. Therefore, with four predictor variables in both samples, the criterion of $\chi^2 = 18.467$ was used to indicate multiple outliers. For the elite sample no outliers were identified, however, for the non-elite sample, one case had a value greater than 18.47 and this outlier was deleted leaving 70 cases for analysis. Further screening of both the elite and non-elite responses revealed that a number of the variables were non-normal. Specifically, in the elite group, the total CEI scores ($z = -2.35$) and the mean MG-M scores ($z = -3.46$) were both moderately negatively skewed. In the non-elite group, the total CEI scores ($z = -3.37$), the mean imagery scores for CG ($z = -2.32$), and CS ($z = -2.65$) were moderately negatively skewed, while MG-M imagery scores ($z = -4.38$) exhibited a more substantial negative skew. Following the recommendations of Tabachnick and Fidell (2001), before running the multiple regression for the elite group, the total CEI scores and the mean MG-M scores were inversed and squared. For the non-elite sample, the CEI scores and the mean CG, CS, and MG-M imagery scores were inversed and squared. The subsequent re-test *z*-scores revealed that all variables displayed normal distribution, with the exception of MG-M in the non-elite sample, which was positively skewed. The original MG-M means scores were subsequently transformed again (inversed and logged (LG^{10})) and this corrected the skewness.

4.3.2. Collective efficacy across skill level and sport type

An ANCOVA, with *level* as the between subject factor and *sport* and *age* as potential covariates, was used to examine differences in collective efficacy scores (Table 4.1). A significant difference for CEI scores was observed between elite and non-elite athletes ($F\,(1, 127) = 23.51, p < .001; \eta^2 = .16$). This difference was expected, as teams that compete at an elite level may have more performance accomplishments experiences; an antecedent of self-efficacy beliefs (Bandura, 1997). However, as the two samples were analyzed independently of each other, these differences do not affect the regression analysis. For the covariates, neither *sport* played (F (1, 127) = 2.50, $p > 0.05$; $\eta^2 = .12$) or *age* of participants (F (1, 127) = 3.61, $p > 0.05$; $\eta^2 = .03$) significantly influenced collective efficacy scores.

4.3.3. Imagery types as predictors of collective efficacy

Multi-collinearity within a regression model increases the chances that a good predictor will be found non-significant (Field, 2005). Belsey, Kuh, and Welsch (1980) and Field (2005) both provide criteria that indicate whether multicollinearity is a problem within the regression model. Specifically, a problem exists when a predictor variable displays a condition index of > 30 and contributes more than 50% of the variance to two or more of the other predictor variables. For the elite sample, when CS was added to the regression equation it returned a condition index of 31.50. However, it did not contribute more than 50% to two or more of the other predictor variable. As such, all four original predictor variables were included in the regression model. The results of the hierarchical regression analysis for the elite sample suggested that only MG-M type imagery explained a significant proportion of the variance in collective efficacy scores ($R^2 = .172$, F (1, 68) = 14.08, $p < .01$). This indicated that the MG-M type imagery accounted for approximately 17% of collective efficacy scores in the elite athlete sample (Table 4.2). In the non-elite sample, all the collinearity diagnostics fell within the acceptable limits (Belsey et al., 1980; Field, 2005) and therefore all the predictor variables were included in the regression model. The results at step one (MG-M entered : $R^2 = .039$, $F(1, 68) = 2.74$, $p > .05$), step two (MG-M and CG entered: $R^2 = .061$, $F(1, 67) = 1.62$, $p > .05$), and step three (MG-M, CG, MS, and CS entered: $R^2 = .074$, $F(2, 65) = .430$, $p > .05$) indicated that none of the SIQ variables were predictive of collective efficacy (Table 4.3).

Table 4.1.

Means and Standard Deviations for Collective Efficacy and SIQ Subscales

	Mean scores		Standard Deviation	
Variable	Non-elite	Elite	Non-elite	Elite
Collective Efficacy	39.52	43.81	4.88	4.49
CG	4.60	4.53	1.05	0.97
MS	4.47	4.19	1.36	1.57
MG-M	5.25	5.48	1.11	.93
CS	4.81	4.77	1.15	1.13

Table 4.2.

Summary of Hierarchical Regression Analysis for Elite Sample

Variable	R^2	$R^2(adj)$	R^2 Change	B	$SE\ B$	β
Step 1						
MG-M	.17*	.16	.17	1.24	.33	.41
Step 2						
MG-M	.19	.17	.02	1.55	.40	.52
CG				.16	.12	.18
Step 3						
MG-M	.20	.15	.002	1.57	.43	.52
CG				.17	.14	.20
MS				-2.98×10^{-02}	.07	-.05
CS				1.61×10^{-02}	.11	.02

Note: * $p < .05$

Table 4.3.

Summary of Hierarchical Regression Analysis for Non-Elite Sample

Variable	R^2	$R^2(adj)$	R^2 Change	*B*	*SE B*	β
Step 1						
MG-M	.03	.02	.03	.96	.61	.18
Step 2						
MG-M	.06	.03	.03	.23	.80	.05
CG				.65	.46	.22
Step 3						
MG-M	.07	.01	.01	.32	.90	.06
CG				.59	.57	.20
MS				.05	.09	.09
CS				.16	.52	.06

4.4. Discussion

The aim of this study was to investigate which types of imagery (Hall et al., 1998) predicted individual perceptions of collective efficacy in elite and non-elite team sport athletes. The results from the regression analysis provide partial support for the original hypothesis that MG-M and CG type imagery would significantly predict collective efficacy scores. Specifically, the hierarchical regression analysis for the elite performers indicated that the MG-M type imagery explained approximately 17% of the variance in individual collective efficacy scores. The amount of variance explained in this instance is comparable to the variance found in similar regression studies using the subscales of the SIQ as predictor variables of self-confidence and cohesion (e.g., Callow & Hardy, 2001; Hardy et al., 2003). Furthermore, given that many other possible collective efficacy predictors, such as mastery experiences, self-efficacy, and cohesion (cf. Carron & Hausenblas, 1998) were not considered in this instance, the variance explained would appear reasonable. Therefore, the findings for the elite-level athletes suggest that those who use more MG-M type imagery also have greater individual collective efficacy perceptions.

It has been suggested that MG-M type imagery provides performance accomplishment information to enhance efficacy expectations by allowing performers to image previous successful performances (Callow & Hardy, 2001). The increase in individual efficacy expectations through imagery may also increase individual perceptions of collective efficacy. Elite athletes may have a greater number of performance accomplishment experiences and as such will find it easier to generate relevant MG-M type imagery. In contrast to the hypothesis, CG type imagery did not significantly predict any of the variance in collective efficacy scores in the elite sample. One explanation for this is that CG items are operationalized in a very different way to those of the MG-M items.

Specifically, the CG items reflect rehearsal of strategies and plays and are almost entirely devoid of emotional content. For example, *"I imagine each section of an event/game"*. Therefore, any link with collective efficacy is indirect and merely a consequence of the rehearsal afforded by that imagery type. In comparison, MG-M items directly reflect emotion in their construction. For example, *"I imagine myself being mentally tough"*. Therefore, the primary impact of imagery with MG-M content is more likely to occur at an emotional level and as such, more closely predict collective efficacy. Furthermore, although CG type imagery theoretically allows for the rehearsal of strategic plays, it is suggested that this is only likely to predict collective efficacy if the imagery has some level of team content. This is only likely to happen if the individuals are specifically instructed to do so by the practitioner supervising the intervention. However, this study was only interested in the extent to which individual imagery types predicted individual perceptions of collective efficacy.

In contrast to the elite performers, none of the SIQ variables significantly predicted any of the variance in collective efficacy in the non-elite sample. Inspection of the mean SIQ scores indicated that the non-elite group used more CG, MS, and CS type imagery, but used less MG-M type imagery than the elite group. Therefore, despite similar imagery type scores, the results for the non-elite sample suggest that no one specific imagery type predicted collective efficacy better than any other did. This may indicate that, compared to elite athletes, the use of imagery by non-elite athletes is less structured and not used for specific purposes (e.g., to increase general motivation). Indeed, whereas elite athletes may use specific types of imagery to help prepare for performance, the use of imagery by non-elite athletes might be less deliberate. Unfortunately, while the SIQ measures the frequency of specific imagery types it does not indicate whether these images are created in controlled intentional imagery sessions, or occur more as inadvertent cognitive processes (i.e., daydreaming).

Bandura (1997) highlighted that the relationship between imagery and efficacy beliefs is bi-directional. Given that the order of a relationship is not always clear in regression designs (i.e., which comes first? imagery types used or collective efficacy?), an alternative interpretation of the results from this study may be that, rather than assuming that specific imagery types lead to increased collective efficacy, the perceptions of collective efficacy of each participant may have influenced the type of imagery they used. While collective efficacy is not the same as self-efficacy, it is reasonable to assume that an individual's perceptions of collective efficacy will also influence their imagery of team related tasks.

At present, our understanding of how imagery can be used to increase collective efficacy is limited. However, research evidence suggests that MG-M type imagery increases self-efficacy (e.g., Jones et al., 2002; Short et al., 2002), and a close relationship has been established between self-efficacy perceptions and individual perceptions of collective efficacy (Magyar et al., 2004). In addition, neurological evidence indicates that imagery accesses similar representations as those active during action and observation of social behaviours and cognitions (Clark et al., 2004; Uddin et al., 2007), highlighting clear links between imagery and social-cognition. Therefore, when considered with the results of Munroe-Chandler and Hall (2004) and the results of this study, it is tentatively suggested that MG-M type imagery, which has an emphasis on team content, could be used successfully to increase individual perception of collective efficacy in elite athletes. While there are often ethical dilemmas testing interventions programme using traditional experimental designs (e.g., withholding intervention from control group), recent research has used multiple baseline case study designs to overcome these problems (e.g., Callow & Waters, 2005; Munroe-Chandler & Hall, 2004). Consequently, in line with the final objective of this thesis, chapter five employs a multiple baseline case study design to investigate if an MG-M type imagery intervention can be used to successfully manipulate collective efficacy in a team of elite athletes.

5.0 Chapter Five - The Effects of a Video-Generated Imagery Training Programme on Perceptions of Collective Efficacy of an Elite Wheelchair Basketball Team

5.1. Introduction

The previous chapters of this thesis have preliminarily validated an inventory to measure collective efficacy in team sports, and distinguished which imagery types are most closely associated with high level of collective efficacy. Specifically, a 10-item collective efficacy inventory was shown to have robust factorial, criterion, and construct validity. This inventory was subsequently used to demonstrate that MG-M type imagery predicted collective efficacy scores in a sample of elite athletes. Therefore, the findings indicate that MG-M type imagery interventions might be used successfully to increase collective efficacy in team sports. Theoretically, such imagery interventions could enhance collective efficacy either through the influence on self-efficacy beliefs (e.g., Short et al., 2002), or more directly by providing performance accomplishment information relevant to the team (cf. Bandura, 1997). Neurologically, imagery may allow access and manipulation of representations associated with observation and action of behaviours and cognitions associated with collective efficacy (e.g., performance accomplishments).

To date, only one study has examined the effects of an imagery intervention upon collective efficacy. Specifically, Munroe-Chandler and Hall (2004) used a multiple baseline case study design to investigate the effects of imagery on the collective efficacy of a junior soccer team (10-12 years old). Their results indicated that a programme of Motivational General-Mastery type imagery increased collective efficacy scores in two of the three intervention groups. However, while Munroe-Chandler and Hall's results indicate that imagery may be used to successfully increase collective efficacy in young children, the relationship between imagery and collective efficacy appears to be moderated by skill level (see chapter four). Consequently, research is warranted which tests the effects of imagery programmes on collective efficacy perceptions of participants of greater age and skill level.

The use of traditional experimental designs to assess the efficacy of psychological skills training programmes in applied settings present a number of problems. Not only are coaches and athletes likely to resist participation when placed in control groups, but also, withholding interventions from athletes can be considered as serving the needs of the researcher before those of the athlete or client (cf. Hrycaiko & Martin, 1996). Multiple-baseline single case designs overcome this problem and have been used in sport psychology as a method to assess psychological skills training programmes across participants (e.g., Callow et al., 2001; Callow et al., 2005; Landin & Herbert, 1999; Ming & Martin, 1996). Despite the efficacy of this design, few sport psychology studies have utilized the principles of single-case methods to assess the impact of psychological skills training within a team environment. One approach is to adopt a multiple-baseline across-groups design, which entails staggering the start of the intervention across sub-groups within the same team (cf. Barlow & Hersen, 1984; Munroe-Chandler & Hall, 2004). This means that only one team is needed, which not only makes administration of the study more feasible but also removes the potential ethical issues associated when withholding the intervention from participants.

Previous imagery research has been criticised for not acknowledging the functional equivalence between the image and the movement it represents (see section 2.2.2.3 and Holmes & Collins, 2001, 2002). Consequently, the PETTLEP approach to motor imagery was proposed as a mnemonic to guide imagery practitioners when developing imagery interventions (Holmes & Collins, 2001). In this study, the *physical*, *environment*, *timing*, and *emotion* elements were incorporated into the imagery intervention in an attempt to increase the functional equivalence between the image and overt behaviour. Specifically, the *physical* element suggests that participants should image in the same physical position and use sport-specific relevant equipment to generate a vivid image (cf. Callow et al., 2006). The *emotion* element highlights the importance of matching the emotion of the image to that experienced in real life by using relevant stimulus and response propositions (Lang, 1979). Finally, for the *environment* and *timing* element, in place of written imagery scripts, video footage can be used to help participants re-create the competition environment (Hale, 1994; Holmes & Collins, 2001). Indeed, Holmes and colleagues have suggested that written imagery scripts may not be the most effective method for maximizing the functional equivalence of the intervention (Holmes & Collins, 2001, 2002; Smith & Holmes, 2004). Specifically, written or verbal imagery scripts may prevent the temporal access of the representation of the desired skill (Holmes & Collins, 2001, 2002). Although yet untested, this might be particularly true for imagery with team content that contains a greater amount of information. Recent research indicates that imagery, aided by video, improves performance to a greater extent than a written imagery script (Smith & Holmes, 2004). However, by its very nature, a video-generated imagery intervention will also involve observation. While imagery and observation have been shown to exhibit similar changes in corticospinal excitability (Clark et al., 2003), they are inherently different processes. Specifically, whereas observation involves bottom up perceptual processing, imagery involves top down knowledge driven processes (Holmes & Calmels, in press). Therefore, video-generated imagery interventions need to be designed in such a way to allow researchers to distinguish between the effects of imagery and observation. Despite this, video footage should offer a useful method to guide imagery with team content, providing team members with detailed images of their teams' performance.

The aim of this final study was to use a multiple-baseline across-group design to examine the effects of MG-M type video-generated imagery intervention on aggregated group perceptions of collective efficacy within an elite international wheelchair basketball team. Carron, Brawley, and Widmeyer (1998) argue that the appropriate level of analysis depends upon the research question being answered. The present study was specifically designed to investigate if imagery could be used to increase each groups overall levels of collective efficacy. Consequently, it was decided to use a group-level analysis because it was appropriate to the research question and aims. Based on the previous socio-cognitive and neuroscience literature it was expected that collective efficacy would increase for each group following the introduction of the imagery intervention.

5.2. Method

5.2.1. Participants

Initially, 12 members of the Great Britain men's wheelchair basketball team[2] (*M* age = 29.90 years; *SD* = 6.67) were recruited to participate in the study. However, two participants were excluded from the final analysis having withdrawn from the intervention for personal reasons. All participants were funded by the UK Sport World Class Performance Programme as full-time athletes and were therefore able to devote time to participation in the study. The squad was separated into three regional training groups dependent on their geographical location within the United Kingdom (i.e., South, Midland, and North). Each regional group trained together three times every week and the whole squad trained together once every four weeks in a weeklong squad camp. The mean

[2] Team name used with permission

international playing experience of the participants was 7.00 years (*SD* = 4.73) and at the time of data collection the team was beginning a three year programme in preparation for the 2008 Beijing Paralympic games.

5.2.2. Measures

Collective Efficacy Inventory (*CEI*). The 10-item CEI developed in chapter three was used to measure collective efficacy (Appendix D). The CEI contains five distinct items, each used twice, with two different item stems. The first item stem, "*I*", measures the individual's personal beliefs of the team's collective efficacy. For example, item one, *"I believe that the team is capable of performing at a high level"*. The second item stem, "*My team*", measures the individual's perception of their team's belief of collective efficacy. For example, item five, "*My team believes that the team is capable of performing at a high level"*. In accordance with previous research (e.g., Watson et al., 2001) each item is measured on a five-point likert scale ranging from 1 (*not at all*) to 5 (*very much so*). Preliminary confirmatory factor analyses of the CEI have demonstrated strong factor validity for the 10-item inventory (S-Bχ^2 = 44.83, p = 0.05, RMSEA = 0.04; CFI = 0.98, NNFI = 0.96, AIC = -11.07, SRMSR = 0.05). However, both factors were shown to correlate highly (r =.94) which indicated that both factors were measuring the same construct. Indeed, Moritz et al. (2000) and Short et al. (2002) found comparable results using similar item stems. Furthermore, Bandura (2001) suggests that when subscales are correlated it is acceptable to use either the total scores or individual subscale scores as dependent measures. In this instance, scores were aggregated across all 10 items in the inventory.

Collective Efficacy Inventory for Wheelchair Basketball. As the CEI has only undergone preliminary validation and is not specific to wheelchair basketball, a second measure of collective efficacy was also used. Specifically, recent collective efficacy research has advocated the development and use of measures specific to the sport under observation (e.g., Heuze et al., 2006; Paskevich et al., 1999). This approach corresponds well with the situation specific definition of collective efficacy (cf. Bandura, 1997). Therefore, prior to the experiment, a collective efficacy inventory that was specific to wheelchair basketball was developed. In line with previous suggestions for the generation of sport-specific efficacy scales (e.g., Heuze et al., 2006; Magyar et al., 2004; Paskevich et al., 1999), items were generated by players and coaching staff in two stages. First, each player and coach involved with the wheelchair basketball squad completed a team competencies form with four sub-categories headings to help stimulate items (Appendix H). These sub-categories were technical, tactical, physical, and mental. Respondents were asked to list as many competencies as they could for each of the sub-categories in reply to the following statement; *"What are the competencies required for this team to be successful at an international level?"* Following this, items for the inventory were generated in collaboration with coaches, by selecting a list of common items and placing the following pre-fix stem in front of each item: '*My team is confident that we can…*' For example, item one was, '*My team is confident that we can play smart during offence*' (Appendix I). This stem was chosen because it directs the participants to consider the collective efficacy perceptions of the other group members. The final inventory had, 11 items relating to technical factors, 13 for mental factors and 4 items each for both physical and tactical factors (Appendix J). The athletes responded to items on a likert scale ranging from 1 (*not at all*) to 10 (*very much so*). Average Cronbach's alpha scores for each subscale taken at weeks, 1, 11, and 21 revealed high level of internal consistency. These were, .95 (SD = .01) for technical, .89 (SD = .02) for mental, .88 (SD = .04) for physical, and .90 (SD = .01) for the tactical subscale.

Vividness of Movement Imagery Questionnaire and Adapted Vividness of Movement imagery Questionnaire. All participants completed either the Vividness of Movement Imagery Questionnaire (VMIQ; Isaacs, Marks, & Russell, 1986) or an adapted version designed for the study (Appendices K and L). Specifically, as the original VMIQ is designed for able-bodied athletes who have functional ability in all limbs, some of the questions are not relevant to athletes who have loss of lower limb function (e.g., Paraplegia, Spina Bifida, or Polio). In consultation with the relevant athletes, 16 items were amended in order to ensure their relevance. For example, item 17 in the original VMIQ instructs the respondent to imagine "*running down hill*", while for the adapted version this item was changed to '*rolling down hill*'. The original VMIQ was administered to participant who could walk (e.g., Scoliosis, minor nerve damage, and amputees with prosthesis), while those who utilized a wheelchair on a daily basis were administered the adapted version.

The original VMIQ is a 24-item questionnaire that measures the vividness of imagery from and an internal and external perspective. Respondent are asked to score the clearness and vividness of 24 different movements images on a five-point likert scale from 1 (*perfectly clear and as vivid as normal vision*) to 5 (*no image at all, you only "know" that you are thinking of the skill*). A test-retest reliability of .76.has been demonstrated for the VMIQ (Isaac et al., 1986).

Weekly imagery diaries. Participants were requested to complete an online imagery diary for each week of the intervention period to ensure the intervention was adhered to (Shambrook & Bull, 1996; Appendix M). The questionnaire asked four specific questions that were explained to the participants to ensure understanding. The first asked how many times they had completed an imagery session during that week. The second and third questions respectively asked the participants to rate how vivid and controllable their imagery session had been. This was scored on a 10-point likert scale anchored by 1 (*very difficult to see / very difficult to control*) and 10 (*very easy to see / very easy to control*). Finally, an open response question was included which asked if participants had any other comments or questions concerning the intervention for that week. Questionnaire responses were reviewed each week to ensure participants had completed the intervention as instructed and that there were no other procedural problems. The diary was completed at the same time as a pre-existing compulsory online training record. Consequently, a 100 % return rate was recorded throughout the period of the study.

Social validation questionnaire. To further assess the efficacy of the intervention a four-item social validation questionnaire was used based on the measures adopted by Ming and Martin (1996). Specifically, Question one asked *"How important is an improvement in overall team confidence to you?"* with a likert scale from 1 (*not at all important*) through to 7 (*extremely important*). Question two asked *"Do you consider the changes in team confidence to be significant?"* with a likert scale from 1 (*not at all significant*) through 7 (*extremely significant*). Question three asked, *"How satisfied were you with the imagery training programme?"* with a likert scale from 1 (*not at all satisfied*) through 7 (*extremely satisfied*). Finally, question four asked, *"Has the imagery intervention proved useful to you?"* with a likert scale from 1 (*not at all useful*), through 7 (*extremely useful*). In addition to the likert scale items, in order to explore the potential mechanisms for any changes in efficacy, participants were also asked to respond openly to the following question: *"If the* *procedure has contributed to changing your levels of team confidence, can you state why you perceive this to be the case?"*

5.2.3. Procedure

Ethical approval for the study was granted by the university Sports Science Department's ethics committee. Subsequently, the head coach of the wheelchair basketball team was approached to obtain permission to request players' participation. All twelve members of the squad completed written informed consent forms to participate in the study (Appendix O). As participants were located throughout the United Kingdom, questionnaires were administered in a web-based format via the internet. Recent research has found that data collected using a web format was responded to quicker and contained fewer missing responses than data collected via postal paper and pencil tests (Lonsdale, Hodge, & Rose, 2006). When responding to the questionnaire, participants were asked to be honest with their answers and were assured that all information provided to the research team would remain confidential and would not influence team selection. Participants were also informed that they were free to withdraw from the study at any time and for any reason.

Participants were divided into three intervention groups based upon their geographical locations in the United Kingdom. Specifically, the first group were from the South ($n = 4$), the second from the Midlands ($n = 3$), and the third from the North ($n = 3$). A staggered multiple baseline across groups design was adopted over a period of 20 weeks. During this time, all participants completed both the CEI and the wheelchair basketball-specific collective efficacy inventory at the end of every week. In addition, immediately prior to each group's respective intervention periods, imagery ability was measured using the VMIQ or adapted VMIQ questionnaire. In accordance with the recommendations of single-case design methodologists (e.g., Barlow & Hersen, 1984), all groups completed minimum four-week baseline period, although this was longer for the Midland and North group. Following their respective baseline periods, the four-week intervention was then introduced to the South group at week 5, the Midland group at week 9 and the North group at week 13. Participants were also asked to complete a weekly imagery diary during the four-week intervention that measured the frequency of imagery use in addition to the vividness and controllability of the imagery.

After each respective four-week intervention phase, athletes were asked to continue their imagery use, such that the intervention period was defined as the time between the beginning of each formal four-week intervention and week 21. Their imagery use was monitored each week using a combination of telephone calls and contact via email. The use of electronic contact methods (e.g., email, internet, and telephone), has been found to be at least equal to more traditional contact methods (e.g., face-to-face meetings) for gathering sport psychology information (Zizzi & Perna, 2002). In addition, as previous research has suggested that the effects of imagery interventions may be delayed until sometime after the original intervention (Callow et al., 2001; Shambrook & Bull, 1996), after the final group had completed their four-week intervention, collective efficacy measurements continued for three weeks between week 17 and 21. Finally, at the end of the 21 weeks, social validation of the intervention programme was measured using a combination of specific likert scale items together with responses to open ended questions.

5.2.4. Imagery intervention

Recently, Short et al. (2006) discussed the important conceptual distinction between imagery content, function, and outcome. With this in mind, the aim was to provide each participant with a team-based imagery intervention with MG-M content that incorporated the *physical*, *environment, timing*, and *emotional* aspects of the PETTLEP model (cf. Hall et al., 1998; Holmes & Collins, 2001). This entailed the use of imagery with both individual and team performance content, aided by appropriate video footage. In addition, the participants completed the imagery in real time while sat in their wheelchair and holding a basketball. The subsequent expected outcome of this imagery intervention was to increase collective efficacy perceptions in each group of the participants. However, given the team-based nature of the imagery, it was recognised that participants might also use imagery with Cognitive General (CG) content as a means to rehearse team strategies.

The imagery intervention was administered by a British Association of Sport and Exercise Sciences (BASES) Accredited Sport Psychologist who was also the researcher. None of the participants had previously used imagery with team content before, although they had used individual imagery in the past. Immediately prior to each group beginning their respective intervention period, they were given a workshop on imagery with team content. This workshop was based on the suggestions of Hardy and Fazey's (1990) mental rehearsal programme (Appendix N). Initially, the group completed three progressively harder individual imagery tasks. Following this, they were introduced to the concept of using imagery to imagine the whole team playing together. To do this, participants were asked to recall and image their most memorable moment when the team had played well together. In particular, participants were asked to focus on both what was happening to them and to the other players around them. In addition, they were encouraged to imagine the emotions they had experienced at that time.

Imagery of team performance needs to account for the open and interactional nature of team play (Weinberg, Butt, Knight, Burke, & Jackson, 2003). Consequently, it is difficult to reflect accurately separate events that occur simultaneously in a written script (e.g., individual player movements in offence). Recent research has demonstrated that video-aided imagery interventions can increase performance to a greater extent than written imagery scripts (Smith & Holmes, 2004). Therefore, in accordance with the *environment* aspect of the PETTLEP model, immediately after the workshops participants were provided with a Digital Versatile Disk (DVD) to help them develop their imagery. The DVD contained audio and video footage of offensive and defensive plays from the Paralympic World Cup in which the team had won the Gold medal.

In this instance, the purpose of the DVD was to provide each participant with detailed, multisensory environmental and stimulus propositions that occurred in real time (cf. Holmes & Collins, 2001; Lang, 1979). Specifically, the footage on the DVD was filmed from the spectator viewing stands above the court on the halfway line. This allowed participants to see clearly specific court positions, player's movements, and hear the crowd noises in response to on court action. The DVD was 18 minutes long and was separated into 6 chapters, each approximately 3 minutes long and showing the progression of the team throughout tournament. To help generate MG-M type imagery, each chapter showed different positive moments, featuring successful offensive plays, or tough defence, selected by the assistant team coach. To minimise the possible effects of observation, after familiarizing themselves with a chapter, the participants were told only to use the DVD if they felt that they were struggling to generate a vivid image. This was done so that participants were not solely relying on observation of the video and were actively engaging in the imagery process. In addition, as with the *physical* and *timing* aspect of the PETTLEP model, the participants were asked to image in real time while sitting in their wheelchairs and holding a basketball. This was monitored each week during the weekly telephone calls.

The nature of the DVD meant that response propositions were not directly provided (cf. Lang, 1979). However, to incorporate the *emotion* element of the PETTLEP model, video footage was carefully chosen to maximize emotional meaning. For example, some of the footage was taken from the final against the teams' closest rival, in which victory was achieved in the final seconds of overtime. Participants were specifically instructed verbally to focus on the emotions they experienced during each play. In particular, they were instructed to imagine feelings of confidence gained through good team performances and overcoming difficult situations. This focus on emotional content was reemphasized on a weekly basis throughout the formal intervention period during the weekly contact periods.. In addition, they were encouraged to individualize the imagery by using different perspectives and modalities (e.g., internal kinaesthetic) if they preferred it to the external visual aspect of the video footage.

The same DVD was given to all participants, which meant that not every player was portrayed in every clip (only five players are permitted on court at any one time). To ensure that at least some of their imagery was team-focused, participants were instructed to image both situations that occurred while they were on court and while they were on the bench. After the initial session, participants were asked to practice the imagery every day for 10 minutes. Specifically, participants were asked to image at least one scenario in which they featured and one scenario in which they did not. Each week, the participants used a new chapter from the DVD in chronological order, until week four when they were allowed to use any of the chapters. In order to provide a means of assessing programme adherence, the researcher monitored progress via weekly phone calls and supplementary emails. At the end of the four-week period, the supervised sessions ended. However, participants were asked to continue to use the imagery for the entire duration of the study. In addition, from an ethical position, to ensure all participants gained similar benefits from the intervention, all participants were encouraged to continue using the intervention after the end of the 21-week study and were supported in doing so by the experimenter and coaching staff.

5.2.5. Data analysis

Due to the potential for serial dependent data, single case designs have traditionally been analyzed using visual inspection methods (cf. Barlow & Hersen, 1984). Although, researchers (e.g., Callow & Waters, 2005; Fisch, 2001) have recently questioned the accuracy of visual inspection in favour of statistical analyses, such as the ITSACORR (Crosbie, 1993), these methods have themselves been suggested to be problematic (cf. Huitema, 2004). Furthermore, little consensus exists as to which statistical technique, if any, should be used to analyze single case data (cf. Parker & Brossart, 2003). In light of this uncertainly, it was decided to analyze the data utilizing traditional visual inspection method.

Analysis of data was conducted in three stages. Initially, overall mean scores were calculated for the baseline and intervention periods to highlight changes across the two periods. Associated standard deviations were also assessed across the same period for any potential decreases that would indicate an increase in the perceptual consensus within the group (i.e., a shared belief). Next, weekly group mean scores were calculated for the CEI and the technical, tactical, physical, and mental components of the basketball-specific questionnaire and plotted on graphs with standardized axis for easy comparison. Unfortunately, scores for week 10 were not presented, as they had been lost due to a failure in internet submission that week. The following visual inspection criteria for single case designs were then employed to analyze the graphs for experimental effects (Hrycaiko & Martin, 1996; Martin & Pear, 1996): (a) the data portrays a stable baseline; (b) there is an immediate effect following the intervention; (c) there are few or no overlapping data points

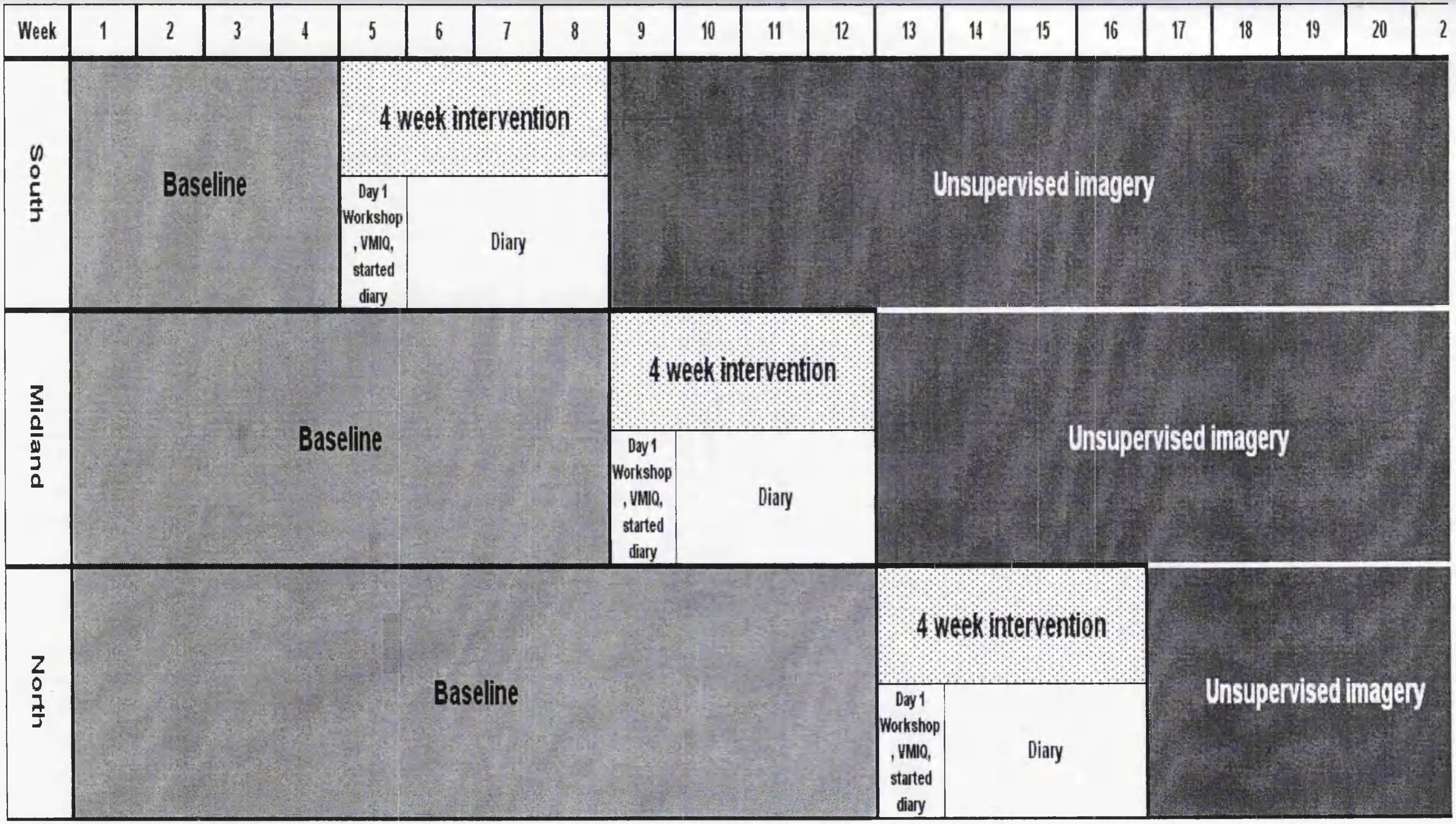


Figure 5.1. Timeline of progression of intervention for the South, Midland, and North groups

between baseline and intervention phase; (d) the effect is replicated a number of times across groups and participants; (e) the larger the size of the effect compared to the baseline; and (f), the results are consistent with existing data and accepted theory.

The final stage of the analysis involved examination of the data from the social validation questionnaire across all ten players. Specifically, group mean scores were calculated for each of the four likert scale items. In addition, this data was also examined to see if scores displayed perceptual consensus and if not, individual scores were highlighted for discussion. Responses regarding the participants' reflections on the effectiveness of the intervention were examined using content analysis and organized into relevant themes for discussion. Specifically, raw data themes were identified from quotes characterising each participant's responses and appropriately coded to produce a set of non-repetitive, non-overlapping themes deemed to represent the information provided.

5.3. Results

5.3.1. VMIQ scores

Previous imagery research has excluded participants whose mean VMIQ scores are greater than three, that is, less than *'moderately clear and vivid'* (e.g., Hardy & Callow, 1999). However, in this instance, it would have been unethical to exclude any of the athletes from the imagery programme as all participants were players in the same team and were competing for positions. Participants 2 (external = 3.96, internal = 3.79), 9 (external = 3.25, internal = 3.28), and 10 (internal = 3.71) had VMIQ scores between 3.00 and 4.00, indicating limited imagery ability. Similar to Callow et al. (2001), these participants were subsequently provided with an extra coaching session on MG-M imagery with team content in order to help them improve the vividness of their images. Following the four week intervention programme, VMIQ scores for participant eight (North group) were still above three, indicating that his reported imagery ability had not improved.

5.3.2. Collective efficacy inventory

A large increase was observed in the CEI scores of all three groups at week three before the intervention phase and the results from the CEI should be evaluated with this in mind. For the South group, mean scores were 35.42 (*SD* = 5.75) at baseline and 46.33 (SD = 1.26) during the intervention period (Table 5.1). Baseline CEI scores were stable from week 1 to 3 and then showed an increase of 12 point immediately pre-intervention. Scores continued to increase following the beginning of the intervention with only one overlapping data point at time 16 (Figure 5.1). For the Midlands group, mean scores were 41.03 (*SD* = 7.90) at baseline and 45.34 (*SD* = 1.27) during the intervention period (Table 6.1). Baseline scores decreased in the week immediately before the intervention, and then increased immediately at the beginning of the intervention period. However, many of the intervention period data points overlapped with data recorded during the baseline period (Figure 5.1). For the North group, mean scores were 40.71 (*SD* = 5.21) at baseline and 42.96 (SD = 1.50) during the intervention period (Table 5.1). A negative trend was evident four weeks before the intervention and was halted for one week at the beginning of the intervention but continued thereafter with all data points overlapping with those during the baseline period. For all three groups, standard deviations decreased from baseline to intervention period (Table 5.1).

5.3.3. Technical collective efficacy scores

For the South group, mean baseline scores were 7.92 (*SD* = 0.20) which increased to 8.29 (*SD* = 0.18) during the intervention period (Table 5.1). Following a variable baseline, scores immediately displayed a positive trend during the first six weeks of the intervention period. However, data points for week five and six overlapped with scores from the baseline period (Figure 5.2). For the Midlands group, mean baseline scores were 7.68 (*SD* = 0.13) and decreased to 7.60 (SD = 0.06) during the intervention phase (Table 5.1). Scores followed a variable baseline and immediately became more stable after the start of the intervention, yet all data points during the intervention overlapped with the scores during the baseline (Figure 5.2). For the North group, mean baseline scores were 7.39 (*SD* = 0.44) and increased to 7.40 (*SD* = 0.20) during the intervention phase (Table 5.1). Scores during both the baseline and intervention period were variable, with all intervention data points overlapping with those during the baseline (Figure 5.2). For all three groups, standard deviations decreased from baseline to intervention period.

5.3.4. Tactical collective efficacy scores

For the South group, overall mean baseline scores were 8.23 (*SD* = 0.24) which increased to 8.62 (*SD* = 0.31) during the intervention period (Table 6.1). Following a variable baseline, an immediate positive trend was observed after the beginning of the intervention. However, the first five data points during the intervention period overlapped with scores from the baseline (Figure 5.3). For the Midlands group overall mean baseline scores were 7.35 (*SD* = 0.15) and decreased to 7.28 (*SD* = 0.05) during the intervention period (Table 5.1). Following a variable baseline period, scores immediately became stable once the intervention started, however these data points did overlap with those during the baseline (Figure 5.3). For the North group, mean scores were 7.07 (*SD* = 0.31) at baseline and 7.29 (*SD* = 0.25) during the intervention period (Table 5.1). Visual inspection of the graph indicated little change from the variable baseline scores once the intervention had started (Figure 5.3). Standard deviations decreased for the Midlands and North group from baseline to intervention period, although increased for the south group.

5.3.5. Physical collective efficacy scores

For the South group, mean baseline scores were 7.00 (*SD* = 0.44) which increased to 7.79 (*SD* = 0.30) during the intervention phase (Table 5.1). Scores increased throughout the baseline period and this continued following the beginning of the intervention. Only a small number of data points overlapped with data recorded during the baseline period (Figure 5.4). For the Midlands group, mean baseline scores were 6.71 (*SD* = 0.23) which increased to 6.84 (*SD* = 0.06) during the intervention period (Table 5.1). Scores displayed a variable trend throughout the baseline period and following the beginning of the intervention immediately became less variable. However, all scores during the intervention period overlapped with scores recorded during the baseline period (Figure 5.4). For the North group, mean baseline scores were 6.93 (SD = 0.51) and increased to 7.30 (*SD* = 0.30) during the intervention period (Table 5.1). The baseline displayed a positive trend and following the beginning of the intervention period this profile became more stable with all points overlapping with the baseline period (Figure 5.4). For all three groups, standard deviations decreased from baseline to intervention period.

5.3.6. Mental collective efficacy scores

For the South group, mean baseline scores were 8.05 (*SD* = 0.22) which increased to 8.41 (*SD* = 0.14) during the intervention phase (Table 5.1). After a variable baseline, scores increased immediately following the intervention, with only one overlapping data point with the baseline period (Figure 5.5). For the Midlands group mean scores were 7.90 (*SD* = 0.08) at baseline and 7.80 (*SD* = 0.04) during the intervention (Table 5.1). While scores following the start of the intervention appeared less variable than during the baseline period, no other effect was observed and all data points overlapped with those taken during baseline (Figure 5.5). For the North group, mean scores were 7.72 (*SD* = 0.39) at baseline, compared to 7.78 (*SD* = 0.15) during the intervention (Table 5.1). Following a variable baseline, no differences were observed in scores following the beginning of the intervention period. All score recorded during this period overlapped with those recorded during the baseline period (Figure 5.5). For all three groups, standard deviations decreased from baseline to intervention period.

5.3.7. Imagery diaries

Weekly mean scores for imagery use, vividness, and controllability during the intervention periods were calculated (Table 5.2). Across all three groups, the mean frequency of weekly imagery use was 3.73 (*SD* = 1.33). For vividness and controllability mean scores were 5.67 (*SD* = 1.12) and 5.58 (*SD* =1.24) respectively. No additional comments were made in the diaries during the formal 4-week intervention periods.

5.3.8. Social validation measures

Means and standard deviations were calculated across all 10 participants for the first four questions of the social validation measure. For question one ("*How important is an improvement in overall team confidence to you?*"), a mean score of 6.10 (*SD* = 0.88) indicated that improvements in overall team confidence were important for all the members. For question two ("*Do you consider the changes in team confidence to be significant?*"), the mean score was 5.20 (*SD* = 1.23), which indicated that the groups' perceptions were that collective efficacy had changed. For question three ("*How satisfied were you with the imagery training programme?*"), responses ranged from 3.00 to 7.00 with a mean score of 5.00 (*SD* =1.05), which indicated that most players were reasonably satisfied with the imagery training programme. Finally, for question four ("*Has the imagery intervention proved useful to you?*"), mean scores were 4.70 (SD = 1.34) with a range from

2.00 to 7.00. However, as only one of the players provided a rating less than 4, this indicated that imagery was helpful for most of the players.

Question five (*"If the procedure has contributed to changing your levels of team confidence, can you state why you perceive this to be the case?"*) was an open response question designed to explore the participants' reasons regarding the underlying mechanisms for any intervention effects. Content analysis of the responses produced three themes relating to positive and negative reflections of the utility of the imagery programme, and individual reflections on how the intervention had functioned.

With regard to the theme discussing positive reflections of the imagery programme, some athletes made statements that indicated that the imagery had a positive influence upon the team's collective efficacy. For example, participant six stated that, "I think that this has helped build team confidence to a degree and through the imagery sessions people have been made to put themselves in situations and consider how they would deal with it…" Participant five also indicated that the imagery had a positive effect, stating that, "Individuals are more confident which has made the team more confident". With regards to participants' negative reflections of the imagery programme some athletes made statements that indicated that the imagery had not improved or increased their levels of collective efficacy. For example, participant two stated that, "I found it a lot harder to control images of team play and would say that the jury is still out on the benefits of imagery for this purpose". Furthermore, participant eight said that the intervention, "Not necessarily changed my levels of team confidence. I think we are a confident team and always will be, the imagery programme can help different people in different ways which is great news for the team." Participant nine explained how other factors influenced his level of collective efficacy,

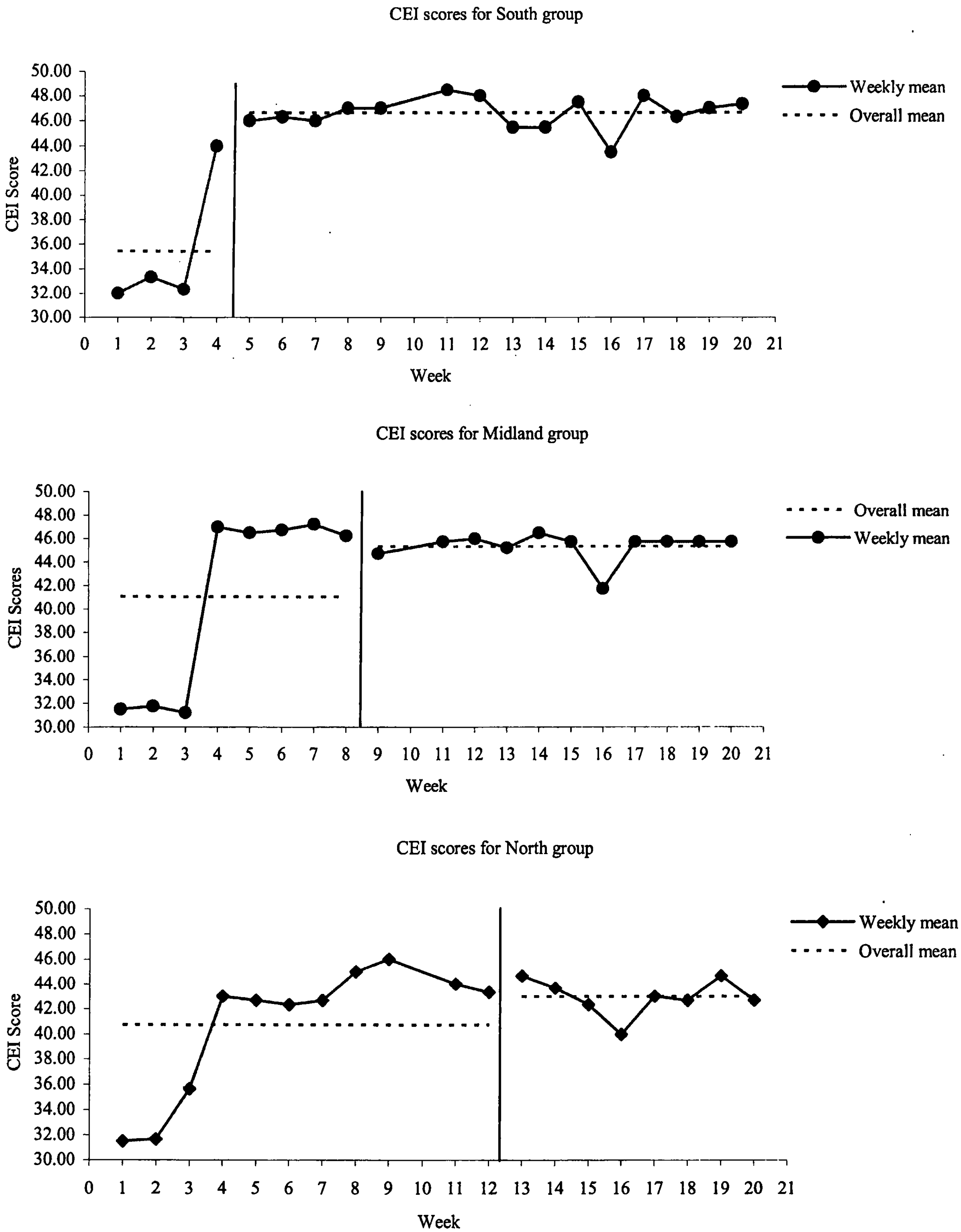


Figure 5.2. Weekly and overall mean CEI scores for the South, Midlands, and North groups respectively.

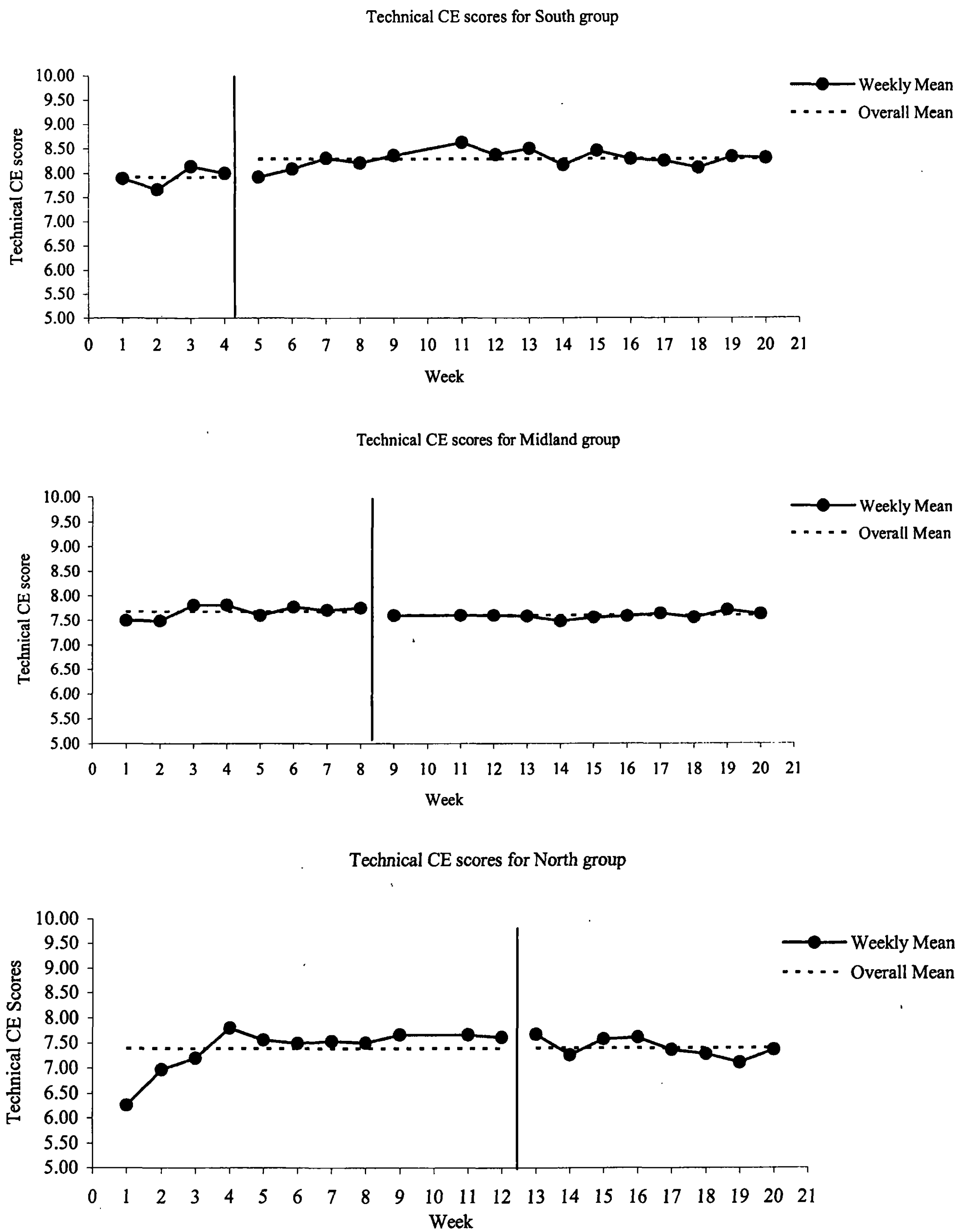


Figure 5.3. Weekly and overall mean technical collective efficacy scores for the South, Midlands, and North groups respectively.

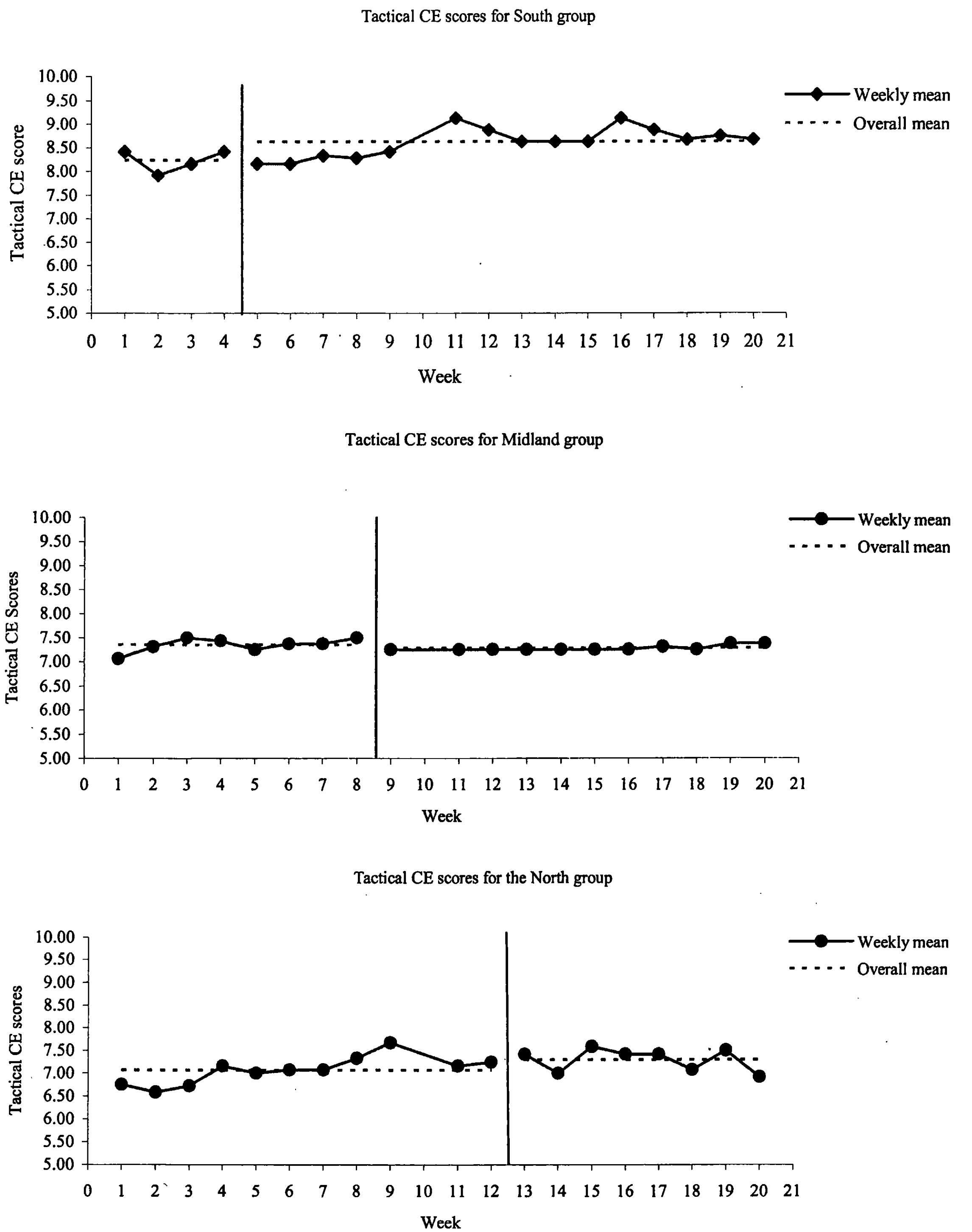
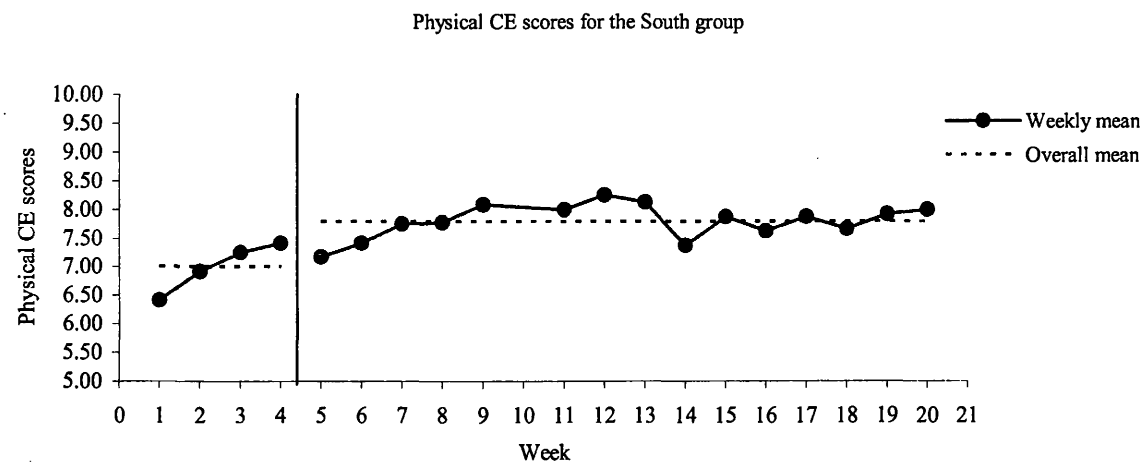
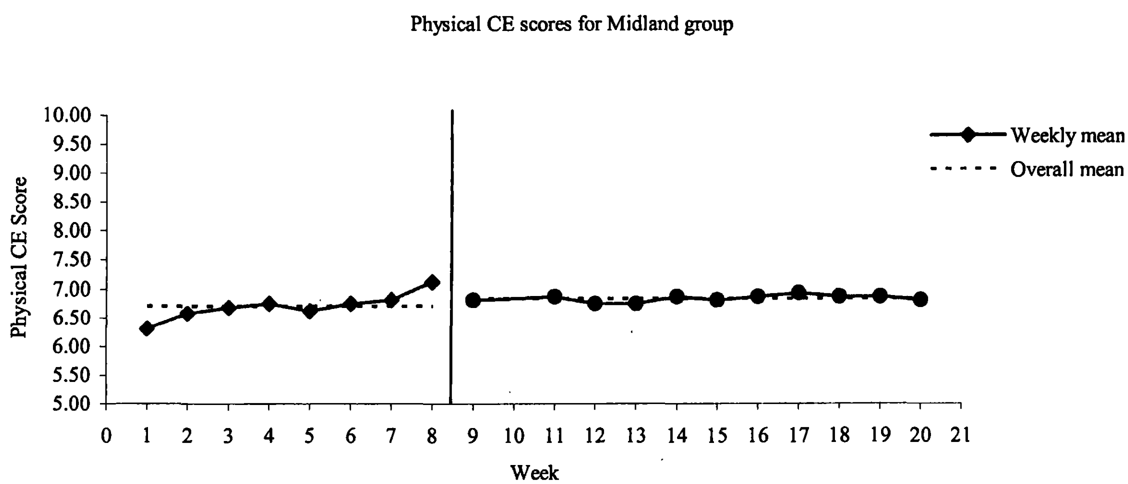


Figure 5.4. Weekly and overall mean tactical collective efficacy scores for the South, Midlands, and North groups respectively.





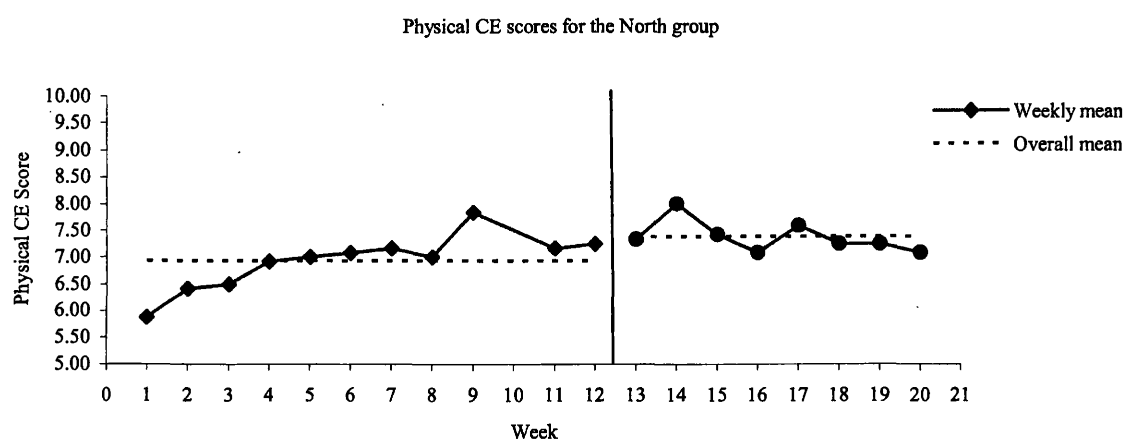


Figure 5.5. Weekly and overall mean physical collective efficacy scores for the South, Midlands, and North groups respectively.

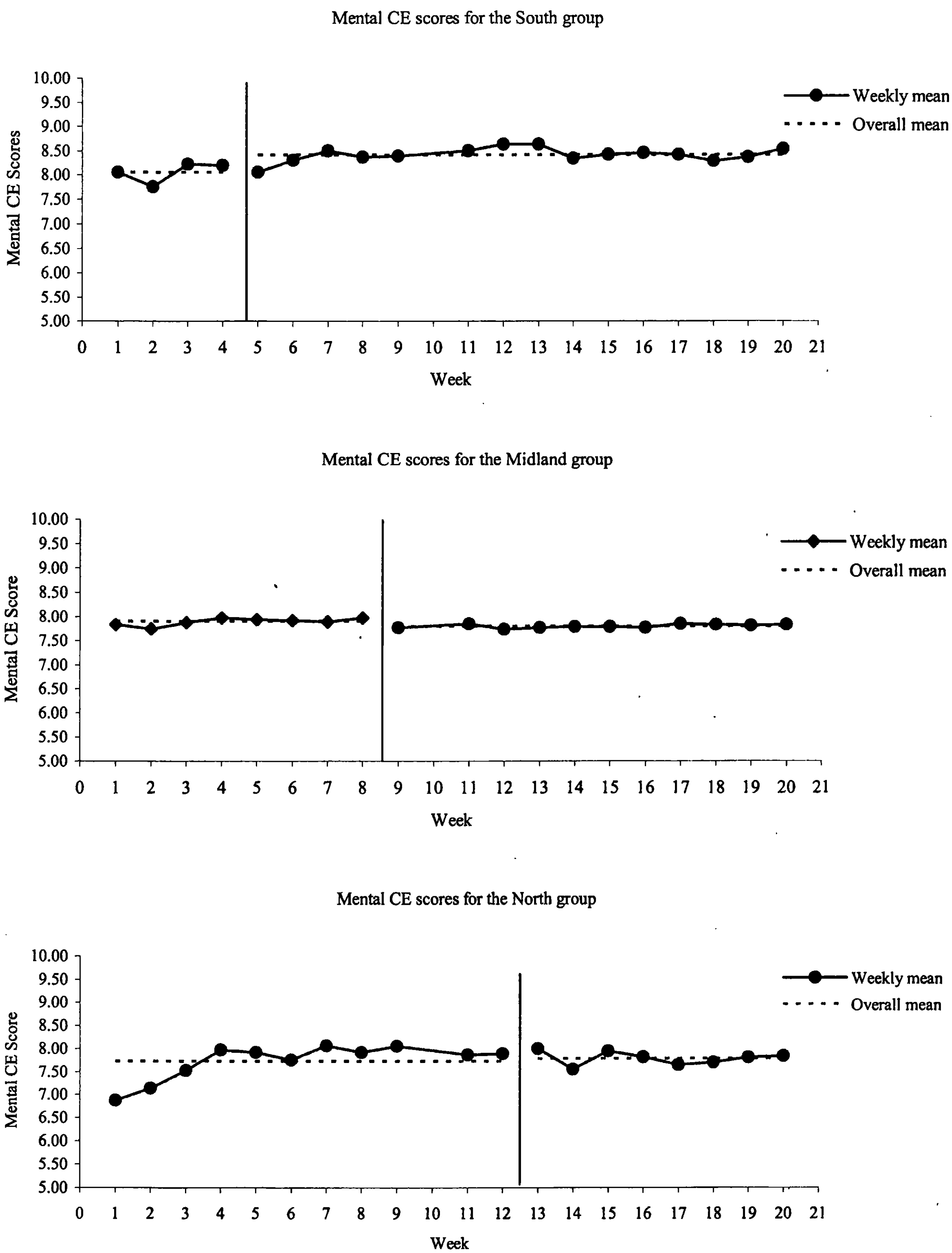


Figure 5.6. Weekly and overall mean mental collective efficacy scores for the South, Midlands, and North groups respectively.

Table 5.1.

Group Mean Scores for each Collective Efficacy Measure at Baseline and Intervention

	Baseline		Intervention	
Group	Mean	SD	Mean	SD
South				
CEI	35.42	5.75	46.63	1.26
Technical	7.92	0.20	8.29	0.18
Tactical	8.23	0.24	8.62	0.31
Physical	7.00	0.44	7.79	0.30
Mental	8.05	0.22	8.41	0.14
Midlands				
CEI	41.03	7.90	45.34	1.27
Technical	7.68	0.13	7.60	0.06
Tactical	7.35	0.15	7.28	0.05
Physical	6.71	0.23	6.84	0.06
Mental	7.90	0.08	7.80	0.04
North				
CEI	40.71	5.21	42.96	1.50
Technical	7.39	0.44	7.40	0.20
Tactical	7.07	0.31	7.29	0.25
Physical	6.93	0.51	7.38	0.30
Mental	7.72	0.39	7.78	0.15

Table 5.2

Group Means for the Numbers of Weekly Imagery Sessions, Vividness and Controllability of Imagery, and how Often Imagery DVD Was Used

Group	No. of Sessions		Vividness		Controllability		DVD use	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
South	5.27	0.42	5.20	0.72	5.27	0.64	2.93	0.76
Midland	3.00	0.37	6.95	1.28	6.95	1.06	1.85	1.15
North	2.93	0.61	4.87	0.23	4.53	0.64	1.73	0.12

> The only example I can give you is because we filled out the questionnaires week in week out, I had different levels of confidence, due to 1 week training with buddy sessions and another week we had camp where all the players were there.

The final theme reported individual reflections concerning the imagery programme. Here, not all participants provided a response that directly answered the question, instead, they focused more on what the imagery had done for them individually. For example, participant 10 said, I found the imagery hard at the start but did get better the more I did it. Not sure if my confidence has improved but I can now remember how good I can play and what it feels like which has helped in tough games. Participant four explained, "I feel a lot more confident in my ability (i.e., my free throw has raised a lot). I image I can score now, go to the line and think positive things like always scoring which then becomes habit". In addition, participant six commented,

> This has meant that I personally can appreciate the strength of character it takes, for example, to be completely focused while taking free throws to win an important game. By spending the last few months simulating these kinds of situations you can help prepare yourself better for when you are the one taking the shots.
>
> Finally, participant three stated, "On a personal note, imagery for me was something I didn't really consider until you brought it in to the GB programme. It is now something that is just everyday life to me, for basketball and life aspects".

5.4. **Discussion**

This study measured the effects of a video-aided imagery intervention with team content on group perceptions of collective efficacy. Participants were directed to use MG-M type imagery that focused on sequences of good team offensive play and tough defence. In general, while the results from both the CEI and the wheelchair basketball specific collective efficacy questionnaire suggested marginal effects for the intervention for any of the groups, the social validation data indicated that the intervention increased collective efficacy and self-efficacy in some participants. Specifically, for the South group, although all five measures of collective efficacy increased following the introduction of the intervention, these increases were a continuation of baseline trends and overlapped with baseline scores. For the Midlands group, no increase was observed, although all scores except mental collective efficacy appeared to become more stable following the intervention. Similarly, no changes occurred in collective efficacy scores for the North group following the intervention. However, with the exception of tactical collective efficacy scores for the South group, standard deviations decreased for all measures across groups from the baseline to the intervention period, indicating that perceptual consensus had increased within each group.

The social validity data suggested that the majority of participants were satisfied with the intervention and had found it useful, although, the responses from the North group were the least positive of all participants. Nonetheless, examination of the responses to the open-ended item from all participants indicated that the intervention had influenced both individual and group-level perceptions of collective efficacy. Indeed, while the data collected using the CEI and the wheelchair basketball-specific inventory indicated no effect of the intervention, the social validation data tentatively indicated that the MG-M type imagery intervention enhanced individual collective efficacy perceptions of some of the participants.

Two possible explanations are proposed for the social validation comments that indicated increases in collective efficacy. The first is through the mastery experiences provided by using MG-M type imagery. Specifically, Bandura (1997) suggested that collective efficacy has similar antecedents to self-efficacy, and research has shown that performance accomplishments/mastery experiences are the most powerful source of self-efficacy (e.g., Wise & Trunnell, 2001). Therefore, by imaging sequences of offence and defence in which the team were successful, participants are likely to have gained mastery experiences, which in turn increased their levels of collective efficacy. In particular, the social validation data indicated that collective efficacy increased because the imagery allowed participants to imagine different scenarios and how they would deal with them successfully. Alternatively, from a neurological perspective, it is possible that the imagery intervention accessed similar representations in the MNS and CMS usually active during action and observation of team-related activities (cf. Uddin et al., 2007). As in simulation theory, using imagery to 'mind-read' team-mates feeling and emotions, may have altered each participants' perceptions of the groups collective efficacy (Gallese & Goldman, 1998). However, while this neurological explanation seems plausible, these mechanisms were not directly tested in this study.

The social validation data also indicated that collective efficacy increased because the MG-M type imagery intervention improved the participant's levels of self-efficacy. Bandura (1997) claimed that before making a judgment about their team's collective efficacy, an individual must first consider their own and their team member's self-efficacy. Recent research supports this proposition with self-efficacy having been demonstrated to predict individual perceptions of collective efficacy (Magyar et al., 2004). In addition, a wealth of evidence indicates that imagery can be used to increase self-efficacy beliefs (e.g., Jones et al., 2002; Short et al., 2002). Consequently, it is possible that the intervention increased self-efficacy beliefs, which in turn increased individual perceptions of collective efficacy. Indeed, accounts by most participants from the social validation data indicated that they focused on what the imagery had done for them personally rather than for their team.

Three potential factors appear to have contributed to the equivocal effects of the intervention. First, pre-intervention VMIQ scores of three of the participants indicated that their imagery vividness was '*vague and dim*'. Two of these participants were in the North group, and post-intervention VMIQ scores for one of these participants showed no improvement. In addition, the North group also recorded a lower overall mean vividness and controllability score in their weekly imagery diaries, further supporting the lack of imagery ability within this group. Imagery vividness has previously been shown to influence sport performance (Isaac, 1992). Therefore, the imagery ability of the North group was likely to have influenced the effectiveness of the intervention for them.

The second potential factor relates to the participants' ability to generate vivid images with team content. Specifically, while participants were explicitly instructed and trained to focus on imagery with team content, responses taken from the social validation questionnaire indicated that some participants focused more on individual imagery. For example, Athlete four explained, "I feel lot more confident in my ability (i.e., my free throw, my percentage has risen a lot). I image I can score now, go to the line and think positive things like always scoring which then becomes a habit". Experiences throughout the study suggest that athletes found imagery with team content more challenging than the individual imagery they had used previously. Indeed, participant two described how he found it difficult to control images of team plays. Weinberg et al. (2003) suggest that team imagery is more challenging for athletes to image due to the open and unpredictable nature of most team-based sports. It is possible therefore, that the participants used individual imagery because they lacked the requisite imagery ability needed to develop imagery with team content. Martin et al.'s, (1999) imagery model proposed that imagery ability mediates both the type of imagery used and the outcome of that imagery. If imagery with team content can be considered an advanced imagery skill, some participants may therefore have found it difficult to generate images with team content.

A third explanation for the equivocal results relates to the frequency of the imagery use. Specifically, while participants were instructed to use imagery every day, the data from the imagery diaries indicated that this was not achieved (see Table 6.2.). In particular, the North group, for whom the intervention had no effect, reported a mean frequency of 2.93 across the 4 weeks of the intervention. While there is little consensus concerning the dose-response relationship for imagery (see Morris et al., 2005), it is plausible that the North group in particular simply did not use enough imagery. However, the overall frequency of imagery recorded across the three groups may be indicative of what is realistic for elite athlete. Consequently, it may be more pertinent to increase the effectiveness of imagery sessions, rather than their frequency.

Given the video-based nature of the imagery used in this study, the intervention initially required the participants to observe video-footage both of themselves and their team-mates. As highlighted in the introduction to the chapter, although imagery and observation involve and effect similar neural mechanisms (e.g., Clark et al., 2004), they are in fact different processes (Holmes & Calmels, in press). Therefore, to minimise the influence of observation on the imagery intervention, participants were instructed only to use the video when they felt that their imagery was not clear and vivid. Indeed, in all groups the mean DVD usage was less than the mean weekly imagery sessions completed (Table 5.2), indicating that this instruction was followed. It is clear however, that it is not possible to remove observation completely as a covariate when using this type of intervention. That said, the same is also true for more traditional written imagery scripts, where it could be argued that the instructional guidance provided by the script also acts as a covariate in the intervention. Therefore, in this instance it is felt that reasonable steps were taken to ensure that participants were focused on the imagery intervention rather than the process of observing the video.

An additional factor when considering the study outcomes is the sharp increase in CEI scores for all groups between weeks three and four. Interestingly, this sudden change was not accompanied by similar changes in the basketball-specific collective efficacy inventory. However, this artefact does only appear to have affected the data for the South group, as a more stable baseline was re-established for the Midland and North groups shortly after week four. While there appears no plausible explanation from the social validation as to why this change may have occurred, it reinforces the need for researchers to consider the control of potential situational influences at the group-level, even when conducting individual-based interventions.

Overall, the results of this study indicate that an imagery intervention may be of use to increase levels of collective efficacy in certain athletes. However, the lack of significant quantitative evidence and the amount of inter-individual variability that exists suggests that the ability to generate images with team content and the amount of programme adherence contributed to the equivocal success of the intervention. Consequently, more research is needed before imagery is advocated to applied practitioners as a method of manipulating collective efficacy in team sports. However, in light of the preliminary evidence highlighting the link between collective efficacy and imagery use, the final chapter of this thesis will discuss the findings of the experimental chapters in relation to the thesis objectives and the implications for research into the measurement and manipulation of collective efficacy. In addition, the applied implications for sport psychology practitioners who wish to monitor and manipulate collective efficacy will also be considered, together with the specific limitations of the thesis and suggestions for future research.

6.0 Chapter Six: General Discussion

6.1. Introduction

Previous research has lacked consistency in the way in which collective efficacy has been conceptualised, operationalised, measured, and analysed. Furthermore, limited investigations have considered how collective efficacy might be manipulated to improve overall team performance. Therefore, the broad aim of this thesis was to advance the understanding of collective efficacy measurement and its application in sport psychology. The following sub-sections discuss the findings of the three experimental chapters in relation to the existing literature that has examined collective efficacy and imagery. Initially, reflecting on the experiences gained developing the CEI in chapter three, the true nature of collective efficacy is considered. Conclusions are offered concerning the conceptual and operational issues surrounding the measurement of collective efficacy in sport including the appropriate level of analysis and the notion of a "shared belief". Based on the results from chapters four and five, the relationship between collective efficacy and imagery use is then considered. Specifically, the most appropriate types of imagery for increasing collective efficacy are discussed together with the utility of video-aided MG-M type imagery interventions in this process. Finally, this chapter concludes with a discussion of the practical implications of the thesis findings, the limitations of the research programme, and recommendation for future research examining the relationship between collective efficacy and imagery.

6.2. Discussion

6.2.1. The true nature of collective efficacy

When beginning this thesis, no sport-specific collective efficacy inventory existed. Therefore, the first objective was to develop and preliminarily validate an inventory suitable for measuring collective efficacy across a range of sports. In chapter three, Bandura's (1997) definition of collective efficacy was chosen as a starting point to guide the development of an inventory that could be used. It was decided to measure collective efficacy using a unidimensional approach that assessed the *strength* of the collective efficacy perception. Two different operational methods (i.e., "*I*" and "*My team*") were also examined to consider which was the most appropriate for measuring collective efficacy in sport. Preliminary results from the confirmatory factor analysis revealed that either operational method was suitable to measure collective efficacy. Consequently, the five items for each operational method were used to develop a 10-item inventory that demonstrated robust factorial, construct, and criterion validity. Further support of the criterion validity of the CEI was found in chapter four, where scores were significantly higher for the elite sample than the non-elite sample, indicating that the inventory was able to distinguish between individuals with varying degrees of mastery experiences (cf. Bandura, 1997).

Despite the robust factorial, construct, and criterion validity of the CEI, the validation process highlighted some important issues for the measurement of collective efficacy in the future. Bandura (1997) suggested that efficacy beliefs vary along the dimensions of *strength*, *level*, and *generality*. However, for the CEI, a unidimensional approach that measured the *strength* of the efficacy belief was chosen. This approach was preferred, as it was felt that an inventory that encompassed all three dimensions, across all team sport, would be overly complex. For example, the *level* dimension of efficacy beliefs reflects the degree of challenge experienced within the domain of function. Bandura (2006, p. 311) suggested that these challenges might be graded in terms of, for example, ingenuity, exertion, accuracy, and productivity. As the challenges encountered by teams are different for all sports, it would have been difficult to devise items that represented a level of challenge relevant to all team sports collectively. Therefore, a list of items was generated that reflected specific aspects of team performance in all sports (e.g., performance, teamwork, and unity). While a unidimensional approach was adopted in this instance, multidimensional approaches are not without merits. However, as multidimensional collective efficacy has been defined in different ways (see section 2.1.2.4., cf. Bandura, 1997; Paskevich et al., 1999), researchers should ensure that a consistent approach is used. Accordingly, it is recommended that Bandura's (2006) most recent recommendations are used to guide the design of such inventories.

In addition to the dimensionality of the CEI, it also important to consider the domain specificity of efficacy scales (cf. Bandura, 2006). Specifically, at a macro-level, all team sports have common aspects (e.g., teamwork or unity), at a micro-level however, each team sport is different. For example, in basketball it would be important to gauge collective efficacy to maintain focus in overtime, whereas in rugby union overtime is rarely played. Unfortunately, Bandura gives little guidance concerning the exact definition of *domain specificity* in the sporting context. That is, to what extent the sports should be broken down into constituent challenges. The CEI is specific to the domain of sport, but is not specific to a particular sport. In some team sports, different field positions and units (e.g., front row and three quarters line in rugby union) will have a very different set of challenges to face. Therefore, it could be argued that an inventory should be as specific to the purpose it is intended. In this instance, the intention of the current thesis was to design a collective efficacy inventory that could be used to measure collective efficacy across a wide range of team sports.

A secondary objective of chapter three was to examine which of two operational methods should be used as a stem for the pool of items generated. The results supported previous research that suggested there was little difference in the two stems (Short et al., 2002). However, although no significant difference was found between the two operational methods, intuitively the face validity of the "*My team*" stem appears more appropriate to operationalise the items. This is because the stem focuses on what others on the team feel about the team. Consequently, this may give a better indication of what the team feels than the "*I*" stem. In reality however, when the *"My team"* stem is used, an individual can only provide an opinion of what the rest of the team feels. This opinion may, or may not accurately reflect the current levels of collective efficacy within the group. For example, in the early stages of team development, an individual's opinion of the collective efficacy beliefs held by other team-mates might be very different from those of the team-mates themselves. In contrast, as the "*I*" stem is directed at the "self", it attempts to access what each individual feels about the team and therefore is more likely to be a true reflection of what the statement is trying to measure. Despite this, from a neurological perspective the parity between both operational methods makes perfect sense. Specifically, research suggests that the MNS and CMS are active during action and observation of behaviours and social cognition (Decety & Grezes, 2006; Uddin et al., 2007), indicating that both self and other perceptions are created in similar areas brain. As such, it is likely that both operational methods stimulate similar neural pathways and can therefore be used interchangeably. Therefore, given the close correlation observed between the two methods in this thesis and by Short et al. (2002), it would seem that both methods could be used to operationalise measures of collective efficacy.

6.2.2. Level of analysis and the existence of a shared belief

In recent years, a strong emphasis has been placed on the most appropriate level of analysis for collective efficacy and the notion of a "shared belief" (e.g., Magyar et al., 2004; Moritz & Watson, 1998). Indeed, the majority of the literature suggests that collective efficacy is a "shared belief" (e.g., Bandura, 1997). This "shared belief" can be calculated using a group-level analysis where individual collective efficacy scores are aggregated and perceptual consensus is assessed using a statistical agreement index (e.g., intra-class correlations or standard deviations). This approach was used in chapter five alongside an individual social validation measure that gave a strong indication of each sub-group's overall level of collective efficacy. However, some researchers have criticised the utilisation of individual or group-level analysis alone, instead recommending the use of a multi-level analysis (Magyar et al., 2004; Watson et al., 2001). Moritz and Watson (1998) suggested that a multi-level analysis should be used to ensure that cross-level effects are accounted for, such that the effects of the individual on the group and the group on the individual are considered. In general, this would seem a sensible approach to the analysis of collective efficacy as Bandura describes it as an emergent group property (i.e., it emerges from individual perceptions). However, it would appear that the relative informative value that the individual and group-level approaches provide is different. Specifically, while an aggregation at the group-level gives an overall picture of what is happening across the team, it does not provide any information about the idiosyncratic differences that occur at an individual-level within the team. Given that collective efficacy is ultimately measured by tapping individual cognitions, it would seem that the individual-level analysis would have the greatest sensitivity to measure small changes within a group. Furthermore, the group-level analysis merely reduces the individual cognitions into a mathematical score that represents the "shared belief" of the team. This "shared belief" is an abstract construct and only exists because psychologists have created it (cf. Maddux, 1999). The term conjures images of a shared team brain that sits in the changing room, pulsating with collective efficacy before every game. The thought of such an organism is clearly biologically and scientifically inaccurate. In reality, a belief (i.e., cognition) is generated in the billions of neurons that exist in each human's brain, and this belief is as unique as the brain that created it (cf. Edelman, 1992; Glenberg, 2006). In other words, team members hold a belief about collective efficacy that may or may not be similar to their other team-mates. According to simulation theory, when humans attempt to "mind-read" or empathise what others are feeling, similar brain areas are active to those when the emotion is experience personally (i.e., MNS and CMS: Gallese & Goldman, 1998). However, the accuracy of these predictions will likely depend on our ability to perceive certain cues correctly, and could even differ according to sex (e.g., Baron-Cohen, Knickmeyer, & Belmonte, 2005). Therefore, it is recommended that when a group-level analysis is used, either alone or within a multi-level analysis, the true nature of this method is recognised (i.e., a statistical score). In addition, from a semantic perspective, the terms *aggregated collective efficacy* or *agreed collective efficacy* would be scientifically more accurate than "shared belief". This discussion is also relevant to the other areas of group dynamics (e.g., team cohesion), where the notion of a "shared belief" is also used (e.g., Carron et al., 2003).

6.2.3. Imagery types associated with collective efficacy

Of the four basic psychological skills (cf. Hardy et al., 1996), imagery interventions have the strongest socio-cognitive and neurological links with collective efficacy (see section 2.1.3.3). Previous research has used the SIQ (Hall et al., 1996) in an attempt to understand the relationship between self-efficacy or self-confidence and the different types of imagery used by athletes (e.g., Abma et al., 2002; Beauchamp et al., 2002; Callow & Hardy, 2001; Mills et al., 2001; Short & Short, 2005; Strachan & Munroe-Chandler, 2006). However, other than Munroe-Chandler and Hall's (2001) finding that an MG-M imagery intervention improved collective efficacy beliefs, no previous research has examined the types of imagery most appropriate for increasing collective efficacy. Theoretically, MG-M imagery types allow athletes to image scenarios of mastery experiences and the associated positive emotions of overcoming difficult situations as a team. Equally, CG type imagery should allow athletes to rehearse team specific strategies that in turn should enhance collective efficacy. Therefore, in line with the second thesis objective, chapter four examined the types of imagery that predicted collective efficacy in both elite and non-elite athletes from a range of different sports. Overall, the results indicated that MG-M type imagery was predictive of collective efficacy scores in the sample of elite athletes, but not the non-elite athletes. In addition, CG type imagery did not predict any of the variance in collective efficacy scores from either sample.

The results from chapter four indicated that MG-M type imagery was the most appropriate imagery type to use as an intervention for improving collective efficacy. This provides support for Munroe-Chandler and Hall's (2004) decision to use MG-M type imagery intervention to manipulate collective efficacy. However, despite the lack of relationship between CG type imagery and collective efficacy, the conceptual basis for this imagery type to improve collective efficacy remains strong. As highlighted in chapter four, the lack of emotional and team content in the CG items on the SIQ may have meant that it did not predict collective efficacy. That is, at an individual-level, collective efficacy manifests itself similar to other emotions and therefore items that reflect emotional content are likely to have a stronger relationship with collective efficacy (e.g., MG-M items). Similarly, given the team nature of collective efficacy, items that reflected individual strategies (i.e., CG items) were unlikely to be significantly predictive of collective efficacy.

Previous researchers have proposed that imagery is less relevant for amateur or recreational athletes (Cumming & Hall, 2002), and that task experience moderates the effectiveness of an imagery intervention for that individual (Lang, 1979; Mulder, Zijlstra, Zijlstra, & Hochstenbach, 2004). Therefore, the lack of a significant finding for the non-elite athletes in chapter four was expected. In addition, although previous imagery education was not assessed in this instance, this too may explain the differences between the two samples. The modern nature of elite sport in the UK means that sport psychology support is often readily available to top athletes (e.g., through home country institutes or private consultants), and research indicates that exposure to just one educational workshop can increase the use of imagery in athletes (Cumming, Hall, & Shambrook, 2004). In contrast, it is unlikely that many non-elite athletes have access to sport psychology support. This is not to say that non-elite athletes do not use imagery, rather, in this instance, their patterns of imagery usage were not predictive of collective efficacy. Indeed, the finding of Munroe-Chandler and Hall (2004) attest to the benefits of an MG-M imagery intervention for improving collective efficacy perception of young non-elite soccer players. Finally, in addition to the proposal here that frequency of MG-M type imagery use predicted collective efficacy, it is also feasible that participants' levels of collective efficacy may have influenced the type of imagery used by each participant (cf. Bandura, 1997). That is, the extent to which participants used different imagery types may have depended on their existing levels of collective efficacy.

6.2.4. Imagery as an intervention to increase collective efficacy

Having identified MG-M type imagery as the most suitable for increasing collective efficacy, the final objective of this thesis was to assess the use of an appropriate imagery intervention for increasing collective efficacy. In chapter five, the results for the CEI and wheelchair basketball-specific questionnaire indicated that the MG-M type imagery intervention did not improve collective efficacy for any of the three groups. However, the social validation data indicated that in some cases the intervention was successful in influencing individual perceptions of collective efficacy.. Therefore, although the experiment provided some positive results, the effectiveness of MG-M type imagery for increasing collective efficacy, and the true nature of the associated mechanism is still uncertain.

In chapter two it was suggested that changes in collective efficacy through the use of an imagery intervention would result either as a direct influence on collective efficacy or indirectly through the interventions impact upon self-efficacy. The qualitative data in chapter five would seem to indicate that either mechanism is still a possibility. Indeed, Bandura (1997) suggested that collective efficacy is rooted in self-efficacy and that individuals must first consider their own self-efficacy before making a judgement about their team's collective efficacy. Given this close association, from the results of chapter five it is difficult to distinguish whether the mastery experience provided through the imagery intervention (cf. Callow & Hardy, 1999) acted on self-efficacy first and subsequently collective efficacy, or on collective efficacy directly. Nonetheless, the social validation data in chapter five indicated participants focussed on what the imagery did for them individually. Therefore, given the already established strong relationship between imagery use and self-efficacy/self-confidence (e.g., Callow et al., 2005, 2006; Jones et al.,

2002) it is suggested that the indirect mechanism is the most likely explanation of the observed effects in chapter five.

An alternative explanation for how imagery and collective efficacy are linked is provided in recent neuroscience research. Specifically, findings indicate that the action and observation of behaviours and social-cognitions activate similar neural pathways in the MNS and CMS (Calmels, Holmes, Jarry, Hars et al., 2006; Calmels, Holmes, Jarry, Lévèque, et al., 2006; Fadiga et al., 1995; Gallese et al., 2006; Hommel et al., 2001; Muthukumaraswamy & Johnson, 2004; Schilbach et al., 2006). Simulation theory suggests that we 'mind-read' or empathise with how others feel by imagining how we would feel in the same situation (Gallese & Goldman, 1998). Indeed, similar neural pathway activity has been identified during imagery as that observed during the same overt actions and observations (e.g., Clark et al., 2004). Furthermore, common neural activity recorded in the motor cortex, and distinct activity in separate brain areas during first and third person imagery, suggests individuals can distinguish the agent of the action in the image (Anquetil & Jeannerod, 2007; Fourkas et al., 2006; Ruby & Decety, 2001). Consequently, perceiving both self and other collective efficacy perceptions may require individuals to image both their own and other team-mates behaviours. Accordingly, it should be possible to manipulate collective efficacy beliefs, by providing imagery interventions that highlight the team as successful or mentally tough.

The MG-M type imagery intervention developed for the players was based on the principles of the PETTLEP model (Holmes & Collins, 2001, 2002). Specifically, the intervention was completed in a non-relaxed state and participants sat in their competition wheelchairs to complete their imagery sessions. Participants were also encouraged to recreate the emotions experienced during the actual competition and to image in real time without a written imagery script. Finally, to remind athletes of the performance situation and provide environmental and stimulus propositions, video footage of the competition was used. Therefore, the intervention encompassed the *physical, emotional, timing*, and *environment* components of the model. As only one other study (Munroe-Chandler & Hall, 2004) has measured the effects of an imagery intervention upon collective efficacy, it is unclear if using elements of the PETTLEP model was anymore effective than a traditional script-based approach. However, given the advanced nature of imagery with team content (cf. Weinberg et al., 2003), it makes intuitive sense that an intervention that maximises the functional equivalence between the image and the overt behaviour will enable athletes to generate vivid and controllable images. Indeed, support for using specific elements of the PETTLEP model is growing (see e.g., Callow et al., 2006; Smith et al., 2007). In addition, the social validation feedback from the participants concerning the intervention used in chapter five implies that it provides a strong basis for the development of imagery interventions to improve collective efficacy.

Previous researchers have suggested that video footage can be used to support or enhance the effectiveness of imagery interventions (Hale, 1994; Holmes & Collins, 2001). Indeed, although it can be difficult to distinguish between the effects of modeling provided by the video and those of the imagery itself (Ram, Riggs, Skaling, Landers, & McCullagh, 2007) recent research indicates that imagery, aided by self-modelled video, improves performance to a greater extent than a written imagery script alone (Smith & Holmes, 2004). In chapter five, video footage of team performance was used to convey, quickly and effectively, the vast amount of information required when using imagery with team content (Weinberg et al., 2003). Not only were the participants required to image themselves, but they were also asked to image other players and the interactions and coordination within the team. In essence, the video provided environmental and stimulus propositions (Lang, 1979), from which the participants were then encouraged to recall their physical and emotional responses. Participants informally commented that they found the video helpful when trying to image the sequences of play required. Indeed, given the number of events that occur simultaneously in team sports, had imagery scripts been used, these would not have been represented in real time, thus confounding the *timing* component of the PETTLEP model.

6.3. Practical implications

This sub-section considers the direct practical implications that arise from the findings of this thesis, and is structured around each of the experimental chapters. Initially, specific recommendations are taken from chapters three and five for the assessment of collective efficacy in an applied setting. Then the applied implications of the relationship between collective efficacy and imagery, investigated in chapters four and five, are discussed. Specifically, the advantages of using imagery interventions over more traditional group-based team-building interventions are highlighted. Finally, guidelines are proposed for the design of tailored imagery interventions, so that applied practitioner can provide clients with imagery interventions that are effective for increasing collective efficacy.

In addition to the CEI's robust factorial, construct, and criterion validity, the results from chapter five indicate that the CEI is a valid measure of collective efficacy in an applied context. The CEI is 10-items long, making it relatively short and simple to complete. Given that short inventories are preferable to longer ones in an applied domain (cf. Cox, Russell, & Robb, 1998), it is ideal for measuring collective efficacy in team sports. For example, following team selection at the start of the season, a baseline of collective efficacy can be established and continuously monitored in the build up to important games or competitions. This allows coaching staff to identify changes in collective efficacy and respond accordingly with interventions to address problems (e.g., more specific training). However, there are occasions when an inventory is needed that measures collective efficacy relevant to the sport-specific challenges faced by that team. For example, a rugby union coach who wants to measure the levels of collective efficacy for a sequence of three-quarter line plays. In such instances, the micro-level of specificity needed cannot be provided by inventories such as the CEI. Therefore, as with the wheelchair basketball-specific inventory used in chapter five, coaches can develop sport-specific inventories that measure the collective efficacy for the challenges encountered in their particular sport. The data obtained can be analysed from both a team and individual perspective, so that coaches gain an overall picture of the teams' collective efficacy, and identify athletes who lack collective efficacy in their team. This subsequently allows practitioners to explore and identify the specific reasons for the low levels of collective efficacy (e.g., a lack of communication between two players), and develop suitable interventions.

Traditionally, sport psychologists have used group interventions, such as personal-disclosure/mutual sharing exercises, to improve team dynamics (e.g., Crace & Hardy, 1997; Dunn & Holt, 2004). However, the findings of chapters four and five tentatively suggest that an individual imagery intervention might also be used to increase team dynamic functions such as collective efficacy. Imagery used for this purpose has a number of advantages over more traditional group methods. First, it allows team members to increase collective efficacy levels without directly interacting with other team-mates. This is particularly useful for teams in some sports that spend limited time with each other and only meet before major tournaments (e.g., national and representative teams). Second, it allows for a more individualised response to increasing collective efficacy. For example, when new members join a team, their lack of shared experiences with that team may mean that their collective efficacy is lower than those of their team-mates. Therefore, new players can be provided with an imagery programme that focuses on team processes and team success to increase their individual perceptions of collective efficacy.

The findings from chapter five also present a number of specific design implications for sport psychologists wishing to use imagery interventions to increase collective efficacy. First, the PETTLEP model (Holmes & Collins, 2001) provides a suitable guide for the design of imagery interventions that attempt to optimise functional equivalence with the movement and emotions experienced while playing. In particular, as imagery with team content is more challenging than that focused on the individual (cf. Weinberg et al., 2003), film footage is useful to depict the scenes imaged, providing the multisensory environmental and stimulus propositions needed for the imagery (cf. Holmes & Collins, 2001; Lang, 1979). In chapter five, video footage of the team playing in an international competition in which they had won the gold medal was used to aid the imagery process. Consequently, the footage depicted scenes in which the team had succeeded despite tough competition. This was undertaken to maximize the emotional meaning of the imagery and to increase the multisensory involvement of the participants (Smith & Holmes, 2004). Despite this video footage, the social validation data suggests that some athletes may have reverted to using imagery with only individual content. Therefore, to combat this tendency, an extensive training period and continual monitoring is needed to ensure that athletes remain focused on imaging team content. This can be further enhanced by including verbal keywords relating to response and meaning propositions that are individualised to each athlete (cf. Lang, 1979, 1985). Accordingly, it is recommended that individuals are encouraged to personalise their imagery, taking account of factors such as individual team roles, the individual meaning of each imagined scene, and the individual's preferred imagery perspective (cf. Holmes & Collins, 2001).

6.4. Thesis limitations and future research recommendations

The following sub-sections discuss the thesis limitations and the associated recommendations for future research. First, issues specific to the structure of the CEI are highlighted to ensure that the measurement of collective efficacy continues to evolve in future research. Then, continuing with measurement issues, the limitations of how the SIQ and the VMIQ are used in chapters four and five are considered. Finally, limitations of the intervention design used in chapter five are discussed, to ensure future research adequately measures the effects of imagery interventions on collective efficacy. Specifically, the use of single case designs, electronic data collection methods, imagery ability, and intervention adherence are considered.

6.4.1. Overview of the CEI

The first objective of this thesis was to develop an inventory to measure collective efficacy in sport, which was subsequently used to test the relationship between imagery and collective efficacy. In chapter three, the factorial, construct, and criterion validity of the inventory was supported. However, further testing is still required to ensure the overall validity of the inventory. From a content validity perspective, if the inventory is used to measure collective efficacy across different sports, in line with Bandura's (2006) guidelines for measuring efficacy, closer examination is needed of the common challenges that all sport teams face. The 10-item CEI reflected four different aspects of team sports; namely, performance, collective capability, teamwork, and unit effectiveness. However, other common team challenges were not considered, such as communication, coordination, and effort. Indeed, while the initial pool of items was sufficient for the purpose of confirmatory factor analysis, it did not encompass the wide range of group dynamic challenges that all teams face that affect performance.

Although it was not possible to consider the *level* of challenge as a dimension in the CEI, future studies should consider doing so. Specifically, Bandura (2006) suggests that *level* reflects the challenges within the specific domain. In sport, the main challenge to teams and individuals is to maintain performance in situations of increasing pressure. This pressure could be operationalised within an inventory by adding situations of increasing pressure to the items on the CEI. For example, item one, "*I believe that the team is capable of performing at a high level*", could have "*...in training*", "*...in a friendly match*" or "*...in a cup match*" added at the end of the item. With the current inventory, this would result in 30 items that would probably also increase its internal reliability (Miller, 1995). Finally, it is possible that some of the items on the CEI were in fact measuring team potency rather than collective efficacy. Gully et al. (2002), define potency as the generalised beliefs about the capabilities of the team across tasks and contexts. As the generalised aim of team sports is performance, those items that refer specifically to performance may have measured team potency rather than collective efficacy.

The issues addressed in this section and the matter of domain specificity reflects the reasons why it was decided to also use a wheelchair basketball-specific measure of collective efficacy in chapter five. For future research, it is recommended that within reason, the notion of domain specificity can be flexible dependent on the research question under observation and providing the domain is clearly defined. Therefore, it is entirely reasonable to design a validated collective efficacy inventory specific to sport in general. While Short et al. (2005) have recently attempted this, neither the CEI in this thesis or their CEQS have been entirely successful in this endeavour. Alternatively, where inventories are developed that are specific to certain sports (e.g., Magyar et al., 2004), attempts should be made to validate these through confirmatory factor analysis techniques. Finally, although some research has examined the relationship between collective efficacy and team potency (e.g., Gully et al., 2004), none has examined this relationship in the sporting context. Given the more global nature of team potency, it may be easier to design a potency inventory specific to all team sports than one for collective efficacy. Subsequently, if team potency has similar predictive power regarding performance as collective efficacy does, such a measure would be useful in an applied setting, allowing coaches to measure potency prior to important competition and intervene as necessary.

6.4.2. Collective efficacy, imagery, and neuroscience

Despite the strong evidence for the link between MNS, CMS, and imagery (e.g., Clark et al., 2004), to date, no research has specifically investigated the neurological processes involved with collective efficacy perceptions. While simulation theory provides a probable account of how individuals form collective efficacy perceptions, and how imagery may be used to influence these perceptions, because specialist neuroscience facilities were not available, it was not possible to test these mechanisms in this thesis. Consequently, it is recommended that future research should investigate if brain areas associated with the MNS and CMS are activated during team-related behaviours and observations. While it may not be possible to isolate collective efficacy *per se*, by examining MNS and CMS activity in the context of team sports or other team-based activities, it should be possible to show if simulation theory can be used to explain perceptions of team constructs such as collective efficacy or cohesion. Neuroscience research of this nature would not only provide a clearer understanding of the nature of collective efficacy beliefs but would serve to establish a stronger basis for developing conceptually accurate tools to measure the construct.

6.4.3. Measurement in imagery research

Currently, very little is known about how or what team sport athletes image. However, it seems plausible that the content of their imagery would portray both individual and team elements. Although chapter four demonstrated that the MG-M type imagery significantly predicted collective efficacy in elite-level athletes, the lack of any other finding is likely to be a consequence that the use of imagery with team content was not measured. While the SIQ is the standard inventory used to measure the usage of individual imagery types in sport, it does not contain any specific items that directly reflect team-based processes. Consequently, research would benefit from the development of an adapted version of the SIQ that uses stems such as "I image myself *and my team...*". An adapted version of the SIQ, with a greater emphasis on the team would not only allow a better understanding of the relationship between collective efficacy and imagery with team content, but could also be used to examine relationships with other team variables, such as cohesion.

In chapter five it was necessary to adapt the VMIQ for use with athletes with a disability. This was because many of the movements represented in the VMIQ are impossible for individuals who have impaired spinal function. To adapt the items, the athletes from the wheelchair basketball team were consulted for suitable alternatives. This approach ensured that the adapted VMIQ was relevant to the participants under study. However, future research should consider validating adapted versions of the VMIQ, so that it can be used with confidence in the specific population of interest. In many respects, elite athletes with a disability seem to have been largely ignored by research in sports science.

Although a large amount of research has been conducted on issues surrounding rehabilitation, limited research has considered elite performance issues in Paralympians. This is despite most British athletes, who have medalled at previous Paralympics, receiving funding from UK sport to train as full-time professional athletes. Subsequently, in imagery research there is a clear need for valid measures of imagery ability that account for the functionality of different sub-groups.

6.4.4. Imagery intervention design limitations

A single case design was used in chapter five to successfully monitor the effects of the MG-M type imagery intervention. This approach was chosen in preference to traditional experimental designs that are often inappropriate for elite athlete groups, where withholding a potentially useful intervention is unethical (cf. Hrycaiko & Martin, 1996). However, one advantage of traditional experimental designs is that they allow for the examination of statistical significance and effect. Consequently, the majority of sport psychology research has used these designs in preference to single case methodologies. As experimental design are inappropriate for elite athletes, future research should also consider using experimental designs that use non-elite athlete populations in an applied setting, or conduct laboratory-based studies where experimental conditions can be tightly controlled (cf. Greenlees et al., 1999, 2000). A combination of both single case and experimental studies within the research literature will further support the relationship between collective efficacy and imagery.

The geographical membership of the Great Britain wheelchair basketball team meant that traditional face-to-face methods of collecting data and monitoring the intervention were not possible. Specifically, team members were located throughout the United Kingdom and trained together as regional training groups three times a week (i.e., South, Midlands, and North). Consequently, for chapter five all data was collected via a website hosted on the homepage of the Great Britain wheelchair basketball association. In addition, face-to-face contact was only possible at the beginning of each intervention phase. Thereafter, all contact with members from the groups was via telephone conversation and emails. The positive experiences of using these methods in chapter five supports recent research regarding internet data collection (Lonsdale et al., 2006) and electronic contact methods in sport psychology consulting (Zizzi & Perna, 2002). Given the growth of electronic communication in modern society, it is likely that these methods will become fully integrated into research and practice in sport psychology. However, as very little sport psychology research has used these methods, further testing is warranted. More specifically, research needs to clarify that the reliability and validity of data collected using these methods is unaffected when compared to traditional paper and pencil data collection and face-to-face consultations and interviews.

The imagery intervention in chapter five was guided using video footage of the team performing in international competition. Previous research has shown that video-generated imagery increases performance to greater extent than written imagery scripts (Holmes & Collins, 2004). However, it is also clear that such interventions involve an element of observation in addition to the intended imagery, therefore involving both top-down and bottom-up processing (Holmes & Calmels, in press). Accordingly, when using such interventions it is not clear whether the imagery alone, or the act of observing the video has the greatest influence over the variable of interest. In chapter five, the potential for observation to act as a covariate was minimised by instructing the participant to use the DVD only when initially beginning each phase of the imagery intervention. However, future research should examine the extent to which observation acts as a covariate in video-generated imagery interventions. In addition, given the research evidence, that links action, observation, and imagery to similar neural mechanisms (e.g., Clark et al., 2003; Uddin et al., 2007), research should also consider whether imagery and observation should be used in combination to maximise the effectiveness of both interventions.

In chapter five, three limitations may have resulted in the equivocal findings of the study. The first of these was the lack of imagery ability of certain members of the participant sample. In experimental research designs, these participants would usually have been excluded from the data analysis. However, given the multiple baseline case study design used in this instance, removing these participants would have made the study unfeasible, leaving the North group with only one member. In addition to general imagery ability, it was not possible to measure the ability of the participants to generate images with team content. Consequently, it is suggested that future research should consider designing measures of imagery ability that include not only individual images, but also interactions with other team members. Finally, although all participants completed weekly intervention diaries, the remote manner in which the intervention was conducted (i.e., through telephone, email, and internet) meant that it was not possible to verify each participants recorded imagery use. Future research could control imagery intervention adherence more tightly by using professional team sports that train together in the same place everyday (e.g., professional club sport teams), where the sport psychologist is able to monitor the intervention face-to face on a daily basis. Indeed, as most sport psychology support is provided to elite or professional athletes, future research should endeavour to use these populations to examine further the relationship between collective efficacy and imagery.

7.0 Chapter Seven: References

Abma, C. L., Fry, M. D., Li, Y., & Relyea, G. (2002). Differences in imagery content and imagery ability between high and low confident track and field athletes. *Journal of Applied Sport Psychology, 14*, 67-75.

Ahsen, A. (1984). ISM: The triple code model for imagery and psychophysiology. *Journal of Mental Imagery, 8*, 15-42.

Allison, P. D. (2003). Missing data techniques for structural equation modeling. *Journal of Abnormal Psychology, 112*, 545-557.

Anquetil, T., & Jeannerod, M. (2007). Simulated actions in the first and in the third-person perspectives share common representations. *Brain Research, 1130*, 125-129.

Atienza, F., Balaguer, I., & Garcia-Merita, M. L. (1998). Video modelling and imagery training on performance of tennis service of 9 to 12 year-old children. *Perceptual and Motor Skills, 87*, 519-529.

Backley, S. (2007). *Robust performance – Performing when it matters*. Guest speaker at UK Sport High Performance Seminar, The Belfry, UK.

Baker, D. F. (2001). The development of collective efficacy in small task groups. *Small Group Research, 32*, 451-474.

Bakker, F. C., & Boschker, M. S. J. (1998). Creating your own imaginary world: A reply to Collins and Hale (1997). *Journal of Sport and Exercise Psychology, 20*, 321-327.

Bandura, A. (1977). Self efficacy: Toward a unifying theory of behavioural change. *Psychological Review, 84*, 191–215.

Bandura, A. (1982). Self-efficacy mechanisms in human agency. *American Psychologist, 37*, 122-147.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*, 117-148.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A. (1998). Personal and collective efficacy in human adaptation and change. In J. G. Adair, D. Belanger, & K. L. Dion (Eds.), *Advances in psychological science: Vol. 1. Personal, social and cultural aspects* (pp. 51-71). Hove, UK: Psychology Press.

Bandura, A. (2001, June 15). *Guide for constructing self-efficacy scales.* Retrieved August 15, 2005, from Emory University, Division of Educational Studies, from http://www.emory.edu/EDUCATION/mfp/self-efficacy.html#effguide.

Bandura, A. (2006). Guide for creating self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT: Information Age Publishing.

Bandura, A., & Cervone, D. (1986). Differential engagement of self-reactive influences in cognitive motivation. *Organizational Behaviour and Human Decision Processes, 38*, 92-113.

Bandura, A., & Jourden, F. J. (1991). Self-regulatory mechanisms governing the impact of social comparison on complex decision making. *Journal of Personality and Social Psychology, 60,* 941-951.

Barlow, D. H., & Hersen, M. (1984). *Single case experimental designs: Strategies for studying behavior change* (2nd Ed). New York: Pergamon.

Baron-Cohen, S., Knickmeyer, R. C., & Belmonte, M. K. (2005). Sex differences in the brain: Implications for explaining autism. *Science, 310*, 819-823.

Beauchamp, M. R., Bray, S. R., & Albinson, J. G. (2002). Pre-competition imagery, self-efficacy, and performance in collegiate golfers. *Journal of Sports Sciences*, *20*, 697-705.

Beisteiner, R., Höllinger, P., Lindinger, G., Lang, W., & Berthoz, A. (1995). Mental representations of movements. Brain potentials associated with imagination of hand movements. *Electroencephalography and Clinical Neurophysiology, 96*, 183-193.

Belsey, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics identifying influential data and sources of collinearity*. New York, USA: Wiley.

Bentler, P. M. (1995). *EQS structural equations programme manual*. Encino, CA: Multivariate Software.

Bentler, P. M. (2005). *EQS 6 structural equations programme manual*. Encino, CA: Multivariate Software (www.mvsoft.com).

Bentler, P. M., & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 107*, 238-246.

Bentler, P. M., & Dijkstra, T. (1985). Efficient estimation via linearization in structural models. In P. R. Krishnaiah (Ed.), *Multivariate analysis VI* (pp. 9-42). Amsterdam: North Holland.

Biddle, S. J. H., Markland, D., Gilbourne, D., Chatzisarantis, N. L. D., & Sparkes, A. C. (2001). Research methods in sport and exercise psychology: Quantitative and qualitative issues. *Journal of Sports Sciences, 19*, 777–809.

Blair, A., Hall, C., & Leyshon, G. (1993). Imagery effects on the performance of skilled and novice soccer players. *Journal of Sports Sciences*, *11,* 95-101.

Bland, M. J., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *British Medical Journal*, *314*, 572-572.

Burhans, R. S., Richman, C. L., & Bergey, D. B. (1988). Mental imagery training: Effects on running speed performance. *International Journal of Sport Psychology, 19*, 26-37.

Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

Callow, N. (1999). *The cognitive and motivational effects of imagery on sport performance*. Unpublished doctoral dissertation, University of Wales, Bangor, UK.

Callow, N., & Hardy, L. (2001). Types of imagery associated with sport confidence in netball players of varying skill level. *Journal of Applied Sport Psychology, 13*, 1-17.

Callow, N., & Hardy, L. (2007). A critical analysis of applied imagery research. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed., pp. 21-42). UK: Wiley.

Callow, N., Hardy, L., & Hall, C. (2001). The effect of a motivational general-mastery imagery intervention on the confidence of high-level badminton players. *Research Quarterly for Exercise and Sport, 72*, 389-400.

Callow, N., Roberts, R., & Fawkes, J. (2006). Effects of dynamic and static imagery on vividness of imagery, skiing performance, and confidence. *Journal of Imagery Research in Sport and Physical Activity, 1*, 1-13.

Callow, N., & Waters, A. (2005). The effects of kinaesthetic imagery on the sports confidence of flat-race horse jockeys. *Psychology of Sport and Exercise, 6*, 443-459.

Calmels, C., Berthoumieux, C., & d'Arripe-Longueville, F. (2004). Effects of an imagery training programme on selective attention of national softball players. *The Sport Psychologist, 18*, 272-296.

Calmels, C., Holmes, P., Jarry, G., Lévèque, J., Hars, M., & Stam, C. J. (2006). Cortical activity prior to and during, observation and execution of sequential finger movements. *Brain Topography, 19*, 77-88.

Calmels, C., Holmes, P., Jarry, G., Hars, M., Lopez, E., Paillard, A., & Stam, C. J. (2006). Variability of EEG synchronisation prior to and during observation and execution of a sequential finger movement. *Human Brain Mapping, 27*, 251-266.

Carron, A. V., Brawley, L. R., Eys, M. A., Bray, S., Dorsch, K., Estabrook, P., et al. (2003). Do individual perceptions of group cohesion reflect shared beliefs? An empirical analysis. *Small Group Research, 34*, 468-496.

Carron, A. V., Brawley, L. R., & Widemeyer, W. N. (1998). The measurement of cohesiveness in sport groups. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 213-226). Morgantown, WV: Fitness Information Technology.

Carron, A. V., Colman, M. M., Wheeler, J., & Stevens, D. (2002). Cohesion and performance in sport: A meta-analysis. *Journal of Sport and Exercise Psychology, 24*, 168-188.

Carron, A. V., & Hausenblas, H. A. (1998). *Group dynamics in sport* (2nd ed.). Morgantown, WV: Fitness Information Technology.

Carron, A. V., Widemeyer, W. N., & Brawley, L. R. (1985). The development of an instrument to assess cohesion in sports teams: The Group Environment Questionnaire. *Journal of Sport Psychology, 7*, 244-266.

Cervone, D., & Palmer, B. W. (1990). Anchoring biases and the perseverance of self-efficacy beliefs. *Cognitive Therapy and Research, 14*, 401-416.

Chen, G., & Bliese, P. D. (2002). The role of different levels of leadership in predicting self- and collective efficacy: Evidence for discontinuity. *Journal of Applied Sport Psychology, 87,* 549-556.

Clark, S., Tremblay, F., & Ste-Marie, D. (2004). Differential modulation of corticospinal excitability during observation, mental imagery and imitation of hand actions. *Neuropsychologia, 42,* 105–112.

Collins, D., & Hale, B. D. (1997). Getting closer...But still no cigar! Comments on Bakker, Boscher, and Chung (1996). *Journal of Sport and Exercise Psychology, 19,* 207-212.

Cortina, J. M. (1994). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78,* 98-104.

Cox, R. H., Russell, W. D., & Robb, M. (1998). Development of a CSAI-2 short form for assessing competitive state anxiety during and immediately prior to competition. *Journal of Sport Behavior, 21,* 31-40.

Crace, R. K., & Hardy, C. J. (1997). Individual values and the team building process. *Journal of Applied Sport Psychology, 9,* 41-60

Crosbie, J. (1993). Interrupted time-series analysis with brief single-subject data. *Journal of Consulting and Clinical Psychology, 6,* 966–974.

Crundall, I., & Foddy, M. (1981). Vicarious exposure to as task as a basis of evaluative competence, *Social Psychology Quarterly, 44,* 331-338.

Cumming, J., & Hall, C. (2002). Athletes' use of imagery in the off-season. *The Sport Psychologist, 16,* 160-172.

Cumming, J., & Hall, C. (2002b). Deliberate imagery practice: The development of imagery skills in competitive athletes. *Journal of Sports Sciences, 20,* 137-145.

Cumming, J., Hall, C., & Shambrook, C. (2004, March). The influence of an imagery workshop on athletes' use of imagery. *Athletic Insight, 6, Article 4*. Retrieved June 21, 2007, from http://www.athleticinsight.com/ Vol6Iss1/InfluenceofImagery Workshop.htm.

Cumming, J., Nordin, S. M., Horton, R., & Reynolds, S. (2006). Examining the direction of imagery and self-talk on dart throwing performance and self-efficacy. *The Sport Psychologist, 20*, 257-274.

Cuthbert, B. N., Vrana, S. R., & Bradley, M. M. (1991). Imagery: Function and physiology. *Advances in Psychophysiology, 4*, 1-42.

Decety, J. (1996). Do imagined and executed actions share the same neural substrate? *Cognitive Brain Research, 3*, 87-93.

Decey, J., & Ingvar, D. H. (1990). Brain structures participating in mental simulation of motor behaviour: a neuropsychological interpretation. *Acta Psychologica, 73*, 13-34.

Decety, J., Jeannerod, M., Germain, M., & Pastène, J. (1991). Vegetative response during imagined movement is proportional to mental effort. *Behavioral Brain Research, 42*, 1–5.

Decety, J., Jeannerod, M., & Prablanc, C. (1989). The timing of mentally represented actions. *Behavioural Brain Research, 34*, 35-42.

Decety, J., Perani, D., Jeannerod, M., Bettinardi, V., Tadary, B., Woods, R., Mazziota, J., & Fazio, F. (1994). Mapping motor representations with PET. *Nature, 371*, 600-602.

Decety, J., Sjoholm, H., Ryding, E., Stenberg, G., & Ingvar, D. (1990). The cerebellum participates in mental activity: Tomographic measurements of regional cerebral blood flow. *Brain Research, 535*, 313-317.

Decety, J., & Sommerville, J. A. (2003). Shared representations between self and other: A social cognitive neuroscience view. *Trends in Cognitive Science, 7*, 527-533.

DeFrancesco, C., & Burke, K. L. (1997). Performance enhancement strategies used in a professional tennis tournament. *International Journal of Sport Psychology, 28*, 185-195.

DeVellis, R. F. (2003). *Scale development: Theory and applications*. Thousand Oaks, CA: Sage Publications.

Dieber, M. P., Ibanez, V., Honda, M., Sadato, N., Raman, R., & Hallett, M., (1998). Cerebral processes related to visuomotor imagery and generation of simple finer movements studies with positron emission tomography. *Neuroimage, 7*, 73-85.

Driskell, J. E., Copper, C., & Moran, A. (1994). Does mental practice enhance performance? *Journal of Applied Psychology, 79*, 481-491.

Duda, J. L., & Nicholls, J. G. (1992). Dimensions of achievement motivation in schoolwork and sport. *Journal of Educational Psychology, 84*, 290-299.

Dunn, J. G. H., & Holt, N. L. (2004). A qualitative investigation of personal-disclosure mutual-sharing team building activity. *The Sport Psychologist, 18*, 363-380.

Edelman, G. (1992). *Bright air, brilliant fire: On the matter of mind.* New York: Penguin.

Evans, L., Jones, L., & Mullen, R. (2004). An imagery intervention during the competitive season with an elite rugby union player. *The Sport Psychologist, 18*, 252-271.

Eys, M. A., & Carron, A. V. (2001). Role ambiguity, task cohesion, and task self-efficacy. *Small Group Research, 32*, 356-373.

Fadiga, L., Fogassi, L., Pavessi, G., & Rizzolatti, G., (1995). Motor facilitation during action observation: A magnetic stimulation study. *Journal of Neurophysiology, 73*, 2608-2611.

Feltz, D. L. (1992). Understanding motivation in sport: A self-efficacy perspective. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (p. 93-106). Leeds, UK: Human Kinetics

Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and performance: A meta-analysis. *Journal of Sport Psychology, 5*, 25-57.

Feltz, D. L., & Lirgg, C. D. (1998). Perceived team and player efficacy in hockey. *Journal of Applied Sport Psychology, 83,* 557-564.

Feltz, D. L., & Reissinger, C. A. (1990). Effect of in vivo emotive imagery and performance feedback on self-efficacy and muscular endurance. *Journal of Sport and Exercise Psychology, 12*, 132-143.

Field, A. (2005). *Discovering statistics using SPSS for windows* (2nd ed.). London, UK: Sage.

Fisch, G. S. (2001). Evaluating data from behavioral analysis: Visual inspection or statistical models? *Behavioural Processes, 54*, 137-154.

Fourkas, A. D., Avenanti, A., Urgesi, C., & Aglioti, S. M. (2006). Corticospinal facilitation during first and third person imagery. *Experimental Brain Research, 168*, 143-151.

Gallese, V., & Goldman, A. (1998). Mirror neurons and the simulation theory of mind-reading. *Trends in Cognitive Sciences, 2*, 493-501.

Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A unifying view of the basis of social cognition. *Trends in Cognitive Neuroscience, 8*, 396-403.

George, T. R., Feltz, D. L., & Chase, M. A. (1992). Effects of model similarity on self efficacy and muscular endurance: A second look. *Journal of Sport and Exercise Psychology, 14*, 237-248.

Gist, M. E. (1987). Self-efficacy: Implications for organisational behaviour and human resource management. *Academy of Management Review, 12*, 472-485.

Glenberg, A. M. (2006). Naturalising cognition: The integration of cognitive science and biology. *Current Biology, 16*, 802-804.

Goddard, R. D., Hoy, W. K., & Woolfolk, A. (2000). Collective teacher efficacy: Its meaning, measure, and effect on student achievement. *American Education Research Journal, 37*, 479-507.

Goginsky, A. M., & Collins, D. (1996). Research design and mental practice. *Journal of Sports Sciences, 14*, 381-392.

Goss, S., Hall, C. R., Buckholz, E., & Fishburne, G. (1986). Imagery ability and the acquisition and retention of movement. *Memory and Cognition, 14*, 469-477.

Gray, S. W., & Fernandez, S. J. (1990). Effects of visuomotor behaviour rehearsal with videotaped modeling on basketball shooting performance. *Psychology: A Journal of Human Behaviour, 26*, 41-47.

Greenlees, I. A., Graydon, J. K., & Maynard, I. W. (1999). The impact of collective efficacy beliefs on effort and persistence in a group task. *Journal of Sports Sciences, 17*, 151-158.

Greenlees, I. A., Graydon, J. K., & Maynard, I. W. (2000). The impact of individual efficacy beliefs on group goals selection and group goal commitment. *Journal of Sports Sciences, 18*, 451-459.

Grezes, J., & Decety, J. (2001). Functional anatomy of execution, mental simulation, observation, and verb generation of actions: A meta-analysis. *Human Brain Mapping, 12*, 1-19.

Griffith, C. R. (1926). *The psychology of coaching*. New York: Scribners.

Griffith, C. R. (1928). *The psychology of athletics*. New York: Scribners.

Gully, S. M., Incalcaterra, K. A., Aparna, J., & Beaubien, J. M. (2002). A meta-analysis of team-efficacy, potency, and performance: Interdependence and level of analysis as moderators of observed relationships. *Journal of Applied Psychology, 87*, 819-832.

Hale, B. (1982). The effects of internal and external imagery on muscular and ocular concomitants. *Journal of Sport Psychology, 4,* 379-387.

Hale, B. (1994). Imagery perspective and learning in sport performance. I A. Sheikh & E. Korn (Eds.), *Imagery in sport and physical performance* (pp 75-96). Farmingdale, NY: Baywood.

Hall, C., Mack, D., Paivio, A., & Hausenblas, H. (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport Psychology, 29*, 73-89.

Hall, C. R., & Martin, K. A. (1997). Measuring movement imagery abilities: A revision of the Movement Imagery Questionnaire. *Journal of Mental Imagery, 21*, 143-154.

Hanton, S., Cropley, B., Mellalieu, S. D., Neil, R., & Miles, A. (2007). Experience in sport and its relationship with competitive anxiety. *International Journal of Sport and Exercise Psychology, 5,* 28-53.

Hanton, S., & Mellalieu, S. D. (Eds.) (2006). *Literature reviews in sport psychology.* Hauppauge, NY: Nova Science.

Hardy, L., & Callow, N. (1999). Efficacy of external and internal visual imagery perspectives for the enhancement of performance on tasks in which form is important. *Journal of Sport and Exercise Psychology, 21*, 95-112.

Hardy, J., Eys, M. A., & Carron, A. V. (2005). Exploring the potential disadvantages of high team cohesion. *Small Group Research, 36,* 166-187.

Hardy, L., & Fazey, J. (1990). *Mental rehearsal.* Leeds, UK, National Coaching Foundation.

Hardy, J., Hall, C. R., & Carron, A. V. (2003). Perceptions of team cohesion and athletes' use of imagery. *International Journal of Sport Psychology, 34*, 151-167.

Hardy, L., Jones, G., & Gould, D. (1996). *Understanding psychological preparation for sport: Theory and practice of elite performers*. Chichester, UK: Wiley.

Harris, P. L. (1989). *Children and emotion: The development of psychological understanding.* Oxford, UK: Basil Blackwell.

Hecker, J. E., & Kaczor, L. M. (1988). Application of imagery theory to sport psychology: Some preliminary findings. *Journal of Sport and Exercise Psychology*, *10*, 363-373.

Heuze, J., Raimbault, N., & Fontayne, P. (2006). Relationship between cohesion, collective efficacy, and performance in professional basketball teams: An examination of mediating effects. *Journal of Sports Sciences*, *24*, 59-68.

Heuze, J., Sarrazin, P., Masiero, M., Raimbault, N., & Thomas, J. (2006). The relationships of perceived motivational climate to cohesion and collective efficacy in elite female teams. *Journal of Applied Sport Psychology, 18*, 201-218.

Hodges, L., & Carron, A. V. (1992). Collective efficacy and group performance. *International Journal of Sport Psychology*, *23*, 48-59.

Holt, N., & Sparkes, A. (2001). An ethnographic study of cohesiveness in a college soccer team over a season. *The Sport Psychologist, 15*, 237-259.

Holmes, P. S. (2006). The psychophysiology of imagery in sport. In E. O. Acevedo, & P. Ekkekakis (Eds.), *Psychobiology of physical activity* (pp. 251-263). Leeds: Human Kinetics.

Holmes, P. S., & Collins, D. J. (2001). The PETTLEP approach to motor imagery: A functional equivalence model for sport psychologists. *Journal of Applied Sport Psychology, 13*, 60-83.

Holmes, P. S., & Collins, D. J. (2002). The problem of motor imagery: A functional equivalence solution. In I. Cockerill (Ed.), *Solutions in sport psychology* (pp. 120-140). London: Thomson Learning.

Hommel, B., Musseler, J., Aschersleben, G., & Prinz, W., (2001). The theory of event coding: A framework for perception and action. *Behavioral and Brain Science, 24*, 849-878.

Hrycaiko, D., & Martin, G. L. (1996). Applied research studies with single-subject designs: Why so few? *Journal of Applied Sport Psychology, 8*, 183-199.

Hu, L. T., & Bentler, P. M. (1999). Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1-55.

Huitema, B. E. (2004). Analysis of interrupted time-series experiments using ITSE: A critique. *Understanding Statistics, 3*, 27-46.

Iacoboni, M., Lieberman, M. D., Knowlton, B. J., Molnar-Szakacs, I., Moritz, M., Throop, J., & Fiske, A. P. (2004). Watching social interaction produces dorsomedial prefrontal and medial parietal BOLD fMRI signal increases compared to a resting baseline. *Neuroimage, 21*, 1167-1173.

Isaac, A. R., Marks, D. F., & Russell, D. G. (1986). An instrument for assessing the imagery of movement: The vividness of movement imagery questionnaire. *Journal of Mental Imagery, 10*, 23-30.

Jackson, R. C., & Baker, J. S. (2001). Routines, rituals and rugby: case study of a world-class goal kicker. *The Sport Psychologist, 15*, 48-65.

Jeannerod, M., & Decety, J. (1995). Mental motor imagery: A window into the representational stages of action. *Current Opinions in Neurobiology, 5*, 727-732.

Johnson, U. (2006). Sport psychology – past, present and future: The perceptions of Swedish sport psychology students. *Athletic Insight, 8*. Retrieved on May 12, 2007 from http://www.athleticinsight.com/Vol8Iss3/PastPresentFuture.htm.

Jones, M. V., Mace, R. D., Bray, S. R., MacRae, A. W., & Stockbridge, C. (2002). The impact of motivational imagery on the emotional sate and self-efficacy levels of novice climbers. *Journal of Sport Behavior, 25*, 57-73.

Jowdy, D. P., & Harris, D. V. (1990). Muscular responses during mental imagery as a function of motor-skill level. *Journal of Sport and Exercise Psychology, 12*, 191-201.

Kozub, S. A., & McDonnell, J. F. (2000). Exploring the relationship between cohesion and collective efficacy in rugby teams. *Journal of Sport Behavior, 23*, 120-129.

Kuczka, K. K., & Treasure, D. C. (2005). Self-handicapping in competitive sport: Influence of the motivational climate, self-efficacy, and perceived importance. *Psychology of Sport and Exercise, 6*, 539-550.

Landers, D. M. (1980). The arousal-performance relationship revisited. *Research Quarterly for Exercise and Sport, 51*, 77-90.

Lang, P. J. (1977). Imagery in therapy: An informational processing analysis of fear. *Behaviour Therapy, 8*, 862-886.

Lang, P. J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 17*, 179-192.

Lang, P. J. (1985). Cognition in emotion: Concept and action. In C. Izard, J. Kagan, & R. Zajonc (Eds.), *Emotion, cognitions, and behavior* (pp. 192–226). New York: Cambridge University Press.

Lee, C., & Bobko, P. (1994). Self-efficacy beliefs: Comparison of five measures. *Journal of Applied Psychology*, *79*, 364-369.

Lewin, K. (1943). Forces behind food habits and methods of change. *Bulletin of the National Research Council*, *108*, 35-65.

Lindsley, D. H., Brass, D. J., & Thomas, J. B. (1995). Efficacy performance spirals: A multilevel perspective. *Academy of Management Review*, *20*, 645-678.

Lirgg, C. D., & Feltz, D. L. (1991). Teacher versus peer model revisited: Effects on motor-performance and self-efficacy. *Research Quarterly for Exercise and Sport, 62,* 217-224.

Livesay J. R., & Samras M. R. (1998). Covert neuromuscular activity of the dominant forearm during visualization of a motor task. *Perceptual and Motor Skills*, *86*, 371-374.

Lonsdale, C., Hodge, K., & Rose, E. A. (2006). Pixels vs. paper: Comparing online and traditional survey methods in sport psychology. *Journal of Sport and Exercise Psychology*, *28*, 100-108.

Loughead, T. M., & Hardy, J. (2006). Team cohesion: From theory to research to team building. In S. Hanton & S. D. Mellalieu (Eds.), *Literature reviews in sport psychology* (pp. 257-287). Hauppauge, NY: Nova Science.

Louis, M. R., & Sutton, R. I. (1991). Switching cognitive gears: From habits of mind to active thinking. *Human Relations, 44,* 55-76.

MacCullum, R. C., Brown, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structural modeling. *Psychological Methods, 1*, 130-149.

MacIntyre, T., & Moran, A. (1996). Imagery use amongst canoeists: A worldwide survey of novice intermediate and elite slalomists. *Journal of Applied Sport Psychology, 8*, 132.

Maddux, J. E. (1999). The collective construction of collective efficacy: Comment on Paskevich, Brawley, Dorsch, and Widemeyer (1999). *Group Dynamics: Theory, Research and Practice, 3*, 223-226.

Magyar, M. T., Feltz, D. L., & Simpson, I. P. (2004). Individual and crew level determinants of collective efficacy in rowing. *Journal of Sport and Exercise Psychology, 26*, 136-153.

Mahoney, M. J., & Avener, M. (1977). Psychology of the elite athlete: An exploratory study. *Cognitive Therapy and Research, 3*, 361-366.

Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. *Biometrika, 57*, 519-530.

Mardia, K. V. (1974). Applications of some measures of multivariate skewness and kurtosis in testing normality and robustness studies. *Sankhya, 36*, 115-128.

Marks, M. A. (1999). A test of the impact of collective efficacy in routine and novel performance environments. *Human Performance, 12,* 295-309.

Marsh, H. W. (1989). Confirmatory factor analyses of multitrait-multimethod data: Many problems and few solutions. *Applied Psychological Measurement, 15*, 47-70.

Marsh, H. W., & Bailey, M. (1991). Confirmatory factor analyses of multitrait-multimethod data: A comparison of alternative models. *Applied Psychological Measurement, 15*, 47-70.

Marsh, H. W., & Hocevar, D. (1985). The application of confirmatory factor analysis to the study of self-concept: First and higher order factor structures and their invariance across age groups. *Psychological Bulletin, 97*, 562-582.

Martens, R. (1979). About smocks and jocks. *Journal of Sport Psychology, 1*, 94-99.

Martin, G. L., & Pear, J. (1996). *Behavior modification: What it is and how to do it.* Englewood Cliff, NJ: Prentice-Hall.

Martin, J. J. (2002). Training and performance self-efficacy, affect, and performance in wheelchair road racers. *The Sport Psychologist, 16*, 384-395.

Martin, K. A., & Hall, C. R. (1995). Using mental imagery to enhance intrinsic motivation. *Journal of Sport & Exercise Psychology, 17*, 54-69.

Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery use in sport: A literature review and applied model. *The Sport Psychologist, 13*, 245-268.

Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon.

Meng, X., Rosenthal R., & Rubin D. B. (1992).Comparing correlated correlation coefficients. *Psychological Bulletin 111*, 172-175.

Midgley, C., Feldlaufer, H., & Eccles, J. S. (1989). Change in teacher efficacy and student self and task-related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology, 81*, 247-258.

Miller, M. B. (1995). Coefficient alpha: A basic introduction from the perspective of classical test theory and structural equation modeling. *Structural Equation Modeling, 2*, 255-273.

Mills, K. D., Munroe, K. J., & Hall, C. R. (2001). The relationship between imagery and self-efficacy in competitive athletes. *Imagination, Cognition, and Personality, 20*, 33-39.

Ming, S., & Martin, G. L. (1996). Single-subject evaluation of a self-talk package for improving figure skating performance. *The Sport Psychologist, 10*, 227-238.

Montoya, P., Lotze, M., Grodd, W., Larbig, W., Erb, M., Flor, H., & Birbaumer, N. (1998). *Brain activation during executed and imagined movements using fMRI.* Paper presented at the 3rd European Congress of Psychophysiology: Konstantz.

Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research Quarterly for Exercise and Sport, 71*, 280-294.

Moritz, S. E., Hall, C., Martin K. A., & Vadocz, E. (1996). What are confident athletes imaging? An examination of image content. *The Sport Psychologist, 10*, 171-179.

Moritz, S. E., Sullivan, P. J., & Feltz, D. L. (2000). The development of the collective efficacy questionnaire for sport. *Journal of Sport and Exercise Psychology, 22*, S11-S11.

Moritz, S. E., & Watson, C. B. (1998). Levels of analysis issues in group psychology: Using efficacy as an example of a multilevel model. *Group Dynamics: Theory, Research and Practice, 2*, 285-298.

Morris, T., Spittle, M., & Watt, A. P. (2005). *Imagery in sport.* Leeds, UK: Human Kinetics.

Mulder, T., Zijlstra, S., Zijlstra, W., & Hochstenbach, J. (2004). The role of motor imagery in learning a totally novel movement. *Experimental Brain Research, 154*, 211-217.

Mullen, B., & Copper, C. (1994). The relationship between group cohesiveness and performance: An integration. *Psychological Bulletin, 115*, 210-227.

Munroe. K., Giacobbi, P. R., Hall, C., & Weinberg, R. (2000). The four Ws of imagery use: Where, when, why and what. *The Sport Psychologist, 14*, 119-137.

Munroe-Chandler, K. J., & Hall, C. R. (2004). Enhancing the collective efficacy of a soccer team through motivational general-mastery imagery. *Imagination, Cognition, and Personality, 24*, 51-67.

Munroe-Chandler, K. J., Hall, C. R., Fishburne, G. J., & Shannon, V. (2005). Using cognitive general imagery to improve soccer strategies. *European Journal of Sport Science, 5*, 41-49.

Murphy, S. M., & Martin, K. A. (2002). The use of imagery in sport. In T. Horn (Ed.), *Advances in sport psychology*. Champaign, IL: Human Kinetics.

Muthukumaraswamy, S. D., & Johnson, B. W. (2004). Changes in rolandic mu rythym during observation of a precision grip. *Psychophysiology, 41*, 152-156.

Myers, N. D., Feltz, D. L., & Short, S. E. (2004). Collective efficacy and team performance: A longitudinal study of collegiate football teams. *Group Dynamics: Theory, Research, and Practice, 8*, 126-138.

Myers, N. D., Payment, C., & Feltz, D. L. (2004). Reciprocal relationships between collective efficacy and team performance in women's ice hockey. *Group Dynamics: Theory, Research, and Practice, 8*, 182-195.

Nunnaly, J. (1978). *Psychometric theory*. New York, USA: McGraw-Hill.

Oslin, J. L. (1985). *A meta-analysis of mental practice research: Differentiation between intent and type of cognitive activity utilised.* Unpublished master's thesis, Kent State University, Kent, OH.

Page, S. J., Sime, W., & Nordell, K. (1999). The effects of imagery on female college swimmers' perceptions of anxiety. *The Sport Psychologist, 13*, 458-469.

Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Science, 10*, 22S-28S.

Parker, R. I., & Brossart, D. F. (2003). Evaluating single-case research data: A comparison of seven statistical methods. *Behavior Therapy, 34*, 189-211.

Pascual-Leone, A., Dang, N., Cohen, L. G., Brasil-Neto, J., Cammarota, A., & Hallet, M. (1995). Modulation of motor responses evoked by transcranial magnetic stimulation during the acquisition of fine new motor skills. *Journal of Neurophysiology, 74*, 1037-1045.

Paskevich, D. M., Brawley, L. R., Dorsch, K. D., & Widemeyer, W. N. (1999). Relationship between collective efficacy and team cohesion: Conceptual and measurement issues. *Group Dynamics: Theory Research and Practice, 3*, 210-222.

Piaget, J. (1952). Jean Piaget. In E. G. Boring (Ed.), *A history of psychology in autobiography* (Vol. 4). New York: Russell and Russell.

Richardson, A. (1967). Mental practice: A review and discussion (Part 2). *Research Quarterly, 38*, 263-273.

Riggs, M. L., & Knight, P. A. (1994). The impact of perceived group success-failure on motivational beliefs and attitudes: A causal model. *Journal of Applied Psychology, 79*, 755-766.

Rizzolatti, G. (2005). The mirror neuron system and its function in humans. *Anatomy and Embryology, 210*, 419-421.

Rizzolatti, G., Carmada, R., Fogassi, L., Gentilucci, M., Luppino, G., & Matelli, M. (1988). Functional organisation of inferior area 6 in the macaque monkey. II. Area F5 and the control of distal movements. *Experimental Brain Research, 71*, 491-507.

Ruby, P., & Decety, J. (2001). Effect of subjective perspective taking during simulation of action: A PET investigation of agency. *Natural Neuroscience, 4*, 546-550.

Ryan, E. D., & Simons, J. (1981). Cognitive demand, imagery, and frequency of mental practice as factors influencing the acquisition of mental skills. *Journal of Sport Psychology, 3*, 35-45.

Sartorra, A., & Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye & C. C. Clogg (Eds.). *Latent variable analysis: Applications for developmental research* (pp. 399-419). Thousand Oaks, CA: Sage.

Savoy, C., & Bietel, P. (1996). Mental imagery for basketball. *International Journal of Sport Psychology, 27*, 454-462.

Schaubroek, J., Lam, S. S. K., & Xie, J. L. (2000). Collective efficacy versus self-efficacy in coping responses to stressors and control: A cross-cultural study. *Journal of Applied Psychology, 83,* 512-525.

Schilbach, L., Wohlschlaeger, A. M., Kramer, N. C., Newen, A., Shah, J., Fink, G. R., & Vogeley, K., (2006). Being with virtual others: Neural correlates of social interaction. *Neuropsychologia, 44*, 718-730.

Seijts, G. H., Latham, G. P., & Whyte, G. (2000). Effect of self and group efficacy on group performance in a mixed motive situation. *Human Performance, 13*, 279-278.

Shambrook, C., & Bull, S. (1996). The use of single-case research design to investigate the efficacy of imagery training. *Journal of Applied Sport Psychology, 8*, 27-43.

Short, S. E., Apostal, K., Harris, C., Poltavski, D., Young, J., Zostautas, N., Sullivan, P., & Feltz, D. L. (2002). Assessing collective efficacy: A comparison of two approaches. *Journal of Sport and Exercise Psychology, 24,* S115-S116.

Short, S. E., Bruggeman, J. M., Engel, S. G., Marback, T. L., Wand, L. J., Willadsen, A., & Short, M. W. (2002). The effect of imagery function and imagery direction on self-efficacy and performance on a golf putting task. *The Sport Psychologist, 16,* 48-67.

Short, S., Monsma, E., & Short, M. (2004). Is what you see really what you get? Athletes' perceptions of imagery's functions. *The Sport Psychologist, 18,* 341-349.

Short, S. E., Ross-Stewart, L., & Monsma, E. V. (2006, September). Onwards with the evolution of imagery research in sport psychology. *Athletic Insight, 8.* Retrieved January 12, 2007, from http://www.athleticinsight.com /Vol8Iss3 /ImageryResearch.html.

Short, S. E., & Short, M. W. (2005). Differences between high and low-confident football player on imagery function: A consideration of the athletes' perceptions. *Journal of Applied Sport Psychology, 17,* 197-208.

Short, S. E., Sullivan, P., & Feltz, D. L. (2005). Development and preliminary validation of the collective efficacy questionnaire for sports. *Measurement in Physical Education and Exercise Science, 9,* 181-202.

Slade, J. M., Landers, D. M., & Martin, P. E. (2002). Muscular activity during real and imagined movements: A test of inflow explanations. *Journal of Sport and Exercise Psychology, 24,* 151-167.

Smith D., Holmes, P., Whitemore, L., Collins, D., & Devonport, T. (2001). The effect of theoretically-based imagery scripts on field hockey performance. *Journal of Sport Behavior, 24,* 408-419.

Smith, D., & Holmes, P. (2004). The effects of imagery modality on golf putting performance. *Journal of Sport and Exercise Psychology, 26*, 385-395.

Smith, D., Wright, C., Allsop, A., & Westhead, H. (2007). It's all in the mind: PETTLEP-based imagery and sport performance. *Journal of Applied Sport Psychology, 19*, 80-92.

Spink, K. S. (1990). Collective efficacy in the sport setting. *International Journal of Sport Psychology, 21*, 380-395.

Steiger, J. H., & Lind, J. C. (1980). *Statistically based tests for the number of common factors*. Paper presented at the Psychometric Society Annual Meeting, Iowa City, IA.

Stephan, K. M., Fink, G. R., Passingham, R. E., Silbersweig, D., Ceballos-Baumann, A. O., Frith, C. D., & Frackowiak, R. S. J. (1995). Functional anatomy of the mental representation of upper extremity movements in healthy subjects. *Journal of Neurophysiology, 73*, 373-386.

Strachan, L., & Munroe-Chandler, K. (2006). Using imagery to predict self-confidence and anxiety in young elite athletes. *Journal of Imagery Research in Sport and Physical Activity, 1*. Retrieved January 9, 2007, from: http://www.bepress.com/jirspa/vol1/iss1/art3.

Swain, A. (1996). Social loafing and identifiability: The mediating role of achievement goal orientations. *Research Quarterly for Exercise and Sport, 67*, 337-344.

Ram, N., Riggs, S. M., Skaling, S., Landers, D. M., & McCullagh, P. (2007). A comparison of modeling and imagery in the acquisition and retention of motor skills. *Journal of Sports Sciences, 25*, 587-597.

Riggs, M. L., & Knight, P. A. (1994). The impact of perceived group success-failure on motivational beliefs and attitudes: a causal model. *Journal of Applied Psychology, 79*, 755-766.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (2nd ed.). New York, USA: Harper Collins.

Treasure, D. C., Monson, J., & Lox, C. L. (1996). Relationship between self-efficacy, wrestling performance, and affect prior to competition. *The Sport Psychologist, 10*, 73-83.

Triplett, N. (1898). The dynamogenic factors in pacemaking and competition. *The American Journal of Psychology, 9*, 507-533

Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38*, 1-10.

Vadocz, E. A., Hall, C. R., & Moritz, S. E. (1997). The relationship between competitive anxiety and imagery use. *Journal of Applied Sport Psychology, 9*, 241-253.

Vealey, R. (1986). Conceptualisation of sport-confidence and competitive orientation: Preliminary investigation and instrument development. *Journal of Sport Psychology, 8*, 221-246.

Voight, M., & Callaghan, J. (2001). A team building intervention programme: Application and evaluation with two university soccer teams. *Journal of Sport Behavior, 24*, 420-431.

Uddin, L. Q., Lacaboni, M., Lange, C., & Keenan, J. P. (2007). The self and social cognition: The role of cortical midline structures and mirror neurons. *Trends in Cognitive Sciences, 11*, 153-157.

Watson, C. B., Chemers, M. M., & Preiser, N (2001). Collective efficacy: A multilevel analysis. *Personality and Social Psychology Bulletin, 27*, 1057-1068.

Weinberg, R., Butt, J., Knight, B., Burke, K. L., & Jackson, A. (2003). The relationship between the use and effectiveness of imagery: An exploratory investigation. *Journal of Applied Sport Psychology, 15*, 26-40.

Widemeyer, W. N., Brawley, R. L., & Carron, A. V. (2002). Group dynamics. In T. S. Horn (Ed.), *Advances in Sport Psychology* (pp. 285-308). Champaign, IL: Human Kinetics.

Wise, J. B., & Trunnell, E. P. (2001). The influence of sources of self-efficacy upon efficacy strength. *Journal of Sport and Exercise Psychology, 23*, 268-280.

Wolmer, L., Laor, N., & Torne, P. (1999). Image control from childhood to adolescence. *Perceptual and Motor Skills, 89*, 471-485.

Zaccaro, S. J., Blair, V., Peterson, C., & Zazanis, M. (1995). Collective efficacy. In J. E. Maddux (Ed.) *Self-efficacy, adaptation, and adjustment: Theory, research, and application*. New York: Plenum Press.

Zizzi, S. J., & Perna, F. M. (2002). Integrating web pages and e-mail into sport psychology consultations. *The Sport Psychologist, 16*, 416-431.

Appendices

Appendix A: Ethics Application Form

Ethical Considerations for PhD Programme of Research

Student: David Shearer

DoS: Dr Rob Thomson **Supervisor:** Prof. Leo Hendry

External Supervisor: Dr Stephen Mellalieu (University of Wales, Swansea)

Title: Effects of imagery on perceptions collective efficacy in team sports.

Based on the ethical guidelines prescribed by the British Psychological Society (BPS), the British Association of Sport and Exercise Sciences (BASES) and those of the University of Glamorgan, a number of ethical issues have been highlighted for the current programme of research. These can be subdivided into four key areas; autonomy of individuals, avoiding harm, treating participants fairly and acting with integrity. Presented below are the specific issues and the suggested solutions for them.

Outline of Research to be Undertaken

The intended programme of research below is a continuation of research already completed with colleagues at the University of Wales, Bangor. Specifically, this research designed and preliminarily validated a collective efficacy inventory for sport. In study one, the factorial validity of the scale was examined and confirmed using confirmatory factor analysis. In the second study, a separate data sample was used to test the construct and criterion validity of the inventory. This inventory shall now be used for the remainder of the thesis programme.

Study three

This study will examine which types of imagery use (e.g. Motivational General-Mastery; Hall et al. 1998) predict individuals with perceptions of high and low collective efficacy. This study will follow a similar design to that of Callow and Hardy (1999) examination of imagery use and self-confidence and Hardy et al. (2003) examination of perceptions of cohesion and imagery use.

Methodology

Over one hundred participants, from a variety of team sport and different levels of competition (e.g. University, County, international) will be asked to complete two questionnaires. These questionnaires will include the recently developed Collective Efficacy Inventory for Sport (CEIS; Callow, Hardy, Markland & Shearer, 2003) and the SIQ (Hall et al. 1998). These questionnaires will be used specifically to examine imagery use in relation to individuals' perceptions of collective efficacy. Data obtained from the questionnaires will be analysed using a hierarchical regression analysis. It is hypothesised that both Cognitive General and Motivational General – Mastery will predict individuals who have high perceptions of their teams collective efficacy.

1.1. Study Four

This study shall use an experimental laboratory design to investigate which forms of imagery have the greatest impact upon collective efficacy in a laboratory setting. Specifically, a comparison of Cognitive General and Motivational General – Mastery will be made. The laboratory environment will allow the relationship between imagery and collective efficacy to be examined in a controlled environment.

Methodology

More than eighty Participants will be recruited from students studying at the University of Glamorgan. The sample shall consist of both males and females, and participants with sporting and non-sporting backgrounds will be used as the experimental task will not require specialist skills.

Participants will be divided into teams of three and assigned to one of three rehearsal groups; i) cognitive general imagery ii) motivational general – mastery imagery and iii) a control group. Each team will be asked not to discuss their rehearsal methods with participants in other teams. The two imagery rehearsal groups will be given an imagery workshop, specific to the type of imagery they are to use. The workshop will ensure that all participants have equivalent knowledge levels regarding the nature of imagery. Afterwards, participants shall complete the Movement Imagery Questionnaire – Revised (Hall and Martin, 1997) to test and control for imagery ability. Following this, all teams will be introduced to the task and told that the purpose of the experiment is to test the effect of different types of practice on performance. The real purpose of the study shall be kept blind from the participants so as not to affect their collective efficacy scores.

The task requires the team to move golf balls on a spoon across an obstacle course. The obstacle course will consist of a 3 upturned wooden benches combined to form a continuous zigzag and a large cargo net or play tunnel. The teams will be required to move three eggs from end of the course to the other as fast as possible. However, teams will be constrained to specific sections of the obstacle course and will only be able to complete the task by transferring the eggs from one person to the next. Specifically, the first person carries an egg across the obstacle course to the end of their defined section, whereupon they transfer the egg to the next person's spoon, the second person completes their defined section before transferring to the final person who completes the course. This process is repeated until all three eggs have been transferred from one end of the course to the other. To manipulate collective efficacy, teams will be given three opportunities to practice the course, each time receiving false feedback concerning their performance. Collective efficacy scores will be taken at this point using the CEIS (Callow et al, 2003) as a baseline measure and to ensure the manipulation has been successful.

Over four weeks, each experimental group will attend one, 1 hour session a week. During these sessions, the two imagery training groups (Motivational General – Mastery or Cognitive General) will mentally rehearse the task, whilst the control group will perform stretching exercises. Stretching exercises have been used successfully as a control exercise in previous studies (Hardy and Callow, 1999; Jones et al. 2002). After four weeks, all groups shall return and complete the CEIS before repeating the obstacle course exercise again. Collective efficacy scores for the pre and post test will then be analysed to see if any differences between the groups exist.

1.2. Study Five

Study five will examine the effects of motivational general-mastery and cognitive general imagery on collective efficacy in wheel chair basketball. This study will seek to support the findings of study four in an applied setting. As the final study in the programme this will provide ecologically valid support from a real life setting. Studies of this nature are very important to ensure that athletes continue to receive the best possible service from sport psychologists.

1.2.1. Methods

Over one hundred participants will be recruited from two universities in south Wales. Participants will be drawn from two different sports and separated into those high and low in relevant sporting experience/competitive level. The experiment will use a between subjects, multi-factorial, 2 (imagery type) x 2 (sport type) x 2 (competitive level) design. Over a period of six weeks participants will be asked to engage in two, fifteen-minute directed imagery sessions per week. It is envisaged that these imagery session will run before or after regular training sessions. Participants will be asked to image their most challenging play/move using a directed imagery script. The content of the imagery script will depend on the imagery group to which the participant is assigned. Those assigned to the *cognitive general* imagery group will be require to image their most difficult move play and the specific components of that play. In addition, they will need to image their individual contribution to that play and the specific roles which they perform. Those assigned to the *motivational general-mastery* imagery group will be required simply to imagine completing the move successfully during a game, and the emotions felt as a result of a successful outcome. Individual perceptions of collective efficacy will be measured (CEIS, Callow et al. 2003) before the onset of the intervention and once again at the end of the six week period.

Result will be examined using a multi- factorial ANOVA and any main effect and interaction will be discussed. It is hypothesised that collective efficacy will increase the most in those participants using *motivational general-mastery*. It is also hypothesised that an interaction will be found between imagery type and competitive level, with *cognitive general* imagery increasing collective efficacy of those at a low competitive level and *motivational general-mastery* imagery increasing collective efficacy of those competing at a higher competitive level.

Ethical Considerations of Programme of Research

Autonomy of individuals:

- In all studies, participant's involvement will be entirely voluntary and they reserve the right to withdraw from the study at any point. In addition, all participants will maintain the right to anonymity, if this is their wish. In any instance of publication, none of the participants shall be named unless express permission is given to do so.

- In some instances, participants may not be fully informed about the purposes of the study, but they will be fully informed about what they are required to do. For example, in study four participants will not be told that the purpose of the study is to measure the effects of imagery on collective efficacy as this may affect the results. Instead, participants will be lead to believe that the study is investigating the effects of imagery on overall performance. To counter this problem, participants will be thoroughly de-briefed about the purpose of the study after their involvement in the study has concluded. Participants will also be given the opportunity to ask questions and permission will be requested to continue to use the data collected.
- All data collected during any of the studies will be kept securely by the researchers for the period necessary to support any publications. During this period, no external body/individual will be granted access to any participant's data, unless express permission is given by the participant in question. When the period required to maintain the raw data expires, all data will be disposed using the University's confidential waste system.

Avoiding Harm:

- Some of the studies will involve some sport participation. The physical nature of sport means that injury is always a possibility. However, a number of measures will be taken to ensure the risk is minimised:

1. Participation will be entirely voluntary and participants will be required to sign a consent form before beginning.
2. When completing laboratory based physical activity, participants will be required to complete an injury risk appraisal form, which assesses current risk of injury and health related issues (e.g. asthma). Those deemed high risk will be de-briefed and excluded from the study. This is in accordance with the British Association of Sport and Exercise Sciences (BASES) code of conduct.
3. Where necessary (fast dynamic exercise) an appropriate warm-up and stretching session will be run prior to any testing.
4. Outside of the laboratory setting, a safe, functional environment, appropriate to the particular sport in question will be used for testing (e.g. for basketball, a basketball court will be used).

- It is possible that the manipulation of collective efficacy to low levels during study four may cause some individuals distress. As this manipulation is essential to answer the research question, a full de-brief and question session will be provided for all individuals at the conclusion of the study. This will ensure that any distress is minimised.

Treating fairly:

- It is likely that when testing different styles of imagery in an applied setting, one style of imagery will be more successful at improving collective efficacy than the other. If this is the case, then the team/group who uses the less successful style of imagery may feel disadvantaged. In such event, the group will be given the opportunity to follow the same imagery intervention as the other group to compensate.

Acting with integrity:

- The principal researcher in this programme of research is a BASES accredited sport and exercise psychologist, with many years experience of working with elite level athletes. As such, he is subject to the very strict code of conduct implemented by BASES. Any assistant researcher involved with the programme will be closely supervised by the principal researcher
- The research will genuinely strive to seek the relationship between collective efficacy and imagery use. To ensure this objective is successfully achieved, the methods used for the research will be based upon sound theoretical and empirical design.
- In many cases, the participants will gain personal benefits from involvement with the study. Specifically, teams involved will have the opportunity to have the team construct of collective efficacy measured using a valid and reliable measure of collective efficacy. In addition, in some studies individuals will be given expert training in the use of imagery/mental rehearsal, an important mental skill not only in sport but also other life domains.

Appendix B: Original 20 Collective Efficacy Items

Group collective Efficacy questions

1) The team thinks that they can perform well
2) My team feel confident in their ability to complete plays and moves
3) My team thinks they are effective as a unit
4) My team have little confidence in their collective capabilities
5) The team can feel that belief is lacking.
6) My team expect to win competitions.
7) My team play with confidence.
8) My team think that they cannot perform well
9) My team thinks that their teamwork is very good
10) The believes team it is capable of performing at a high level

Individual collective efficacy questions

11) I think that the team can perform well
12) I am confident in the team's ability to complete plays and moves.
13) I believe my team are effective as a unit
14) I think my team have little confidence in their collective capabilities
15) I can feel that team belief is lacking.
16) I expect my team to win competitions
17) I think we play with confidence.
18) I think that we cannot perform well
19) I consider our teamwork to be very good
20) I believe that the team is capable of performing at a high level

Appendix C: 18-item Collective Efficacy Inventory

COLLECTIVE EFFICACY INVENTORY FOR SPORT

This inventory examines confidence within a team.

You are requested to respond to each statement as honestly as possible. There is no right or wrong way to respond to these statements, and your responses shall remain **entirely confidential**.

Use the following information as a guide when filling out the inventory.

When questions start with "I believe that ..." answer the question with regards to what **YOU** think. However, when the question starts "My team believes that…" answer the question with regard to what you think the **TEAM** thinks.

Please work through the inventory with reference to the above instructions, and pause or rest it you feel a loss of concentration.

Name: Age:

Sex: Sport:

Number of years playing the sport: Number of years playing with current team:

Point in season: Pre / mid / post season *(please select one)*

Current level of participation: Recreational

Amateur
University
Semi Professional
Professional *(Please select one)*

	Not at all				Very much
1. I believe that the team is capable of performing at a high level.	1	2	3	4	5
2. My team has little confidence in their collective capability.	1	2	3	4	5

3. **My team plays with confidence.**	1	2	3	4	5
4. **I think my team has little confidence in their collective capability.**	1	2	3	4	5
5. **My team thinks that their teamwork is very good.**	1	2	3	4	5
6. **I think that we cannot perform very well.**	1	2	3	4	5
7. **I expect my team to be successful.**	1	2	3	4	5
8. **I feel that team belief is lacking.**	1	2	3	4	5
9. **My team thinks they cannot perform well.**	1	2	3	4	5
10. **I think that the team can perform well.**	1	2	3	4	5
11. **I believe my team is effective as a unit.**	1	2	3	4	5
12. **My team thinks they can perform well.**	1	2	3	4	5
13. **My team can feel that belief is lacking.**	1	2	3	4	5
14. **My team expects to be successful.**	1	2	3	4	5
15. **I think we play with confidence.**	1	2	3	4	5
16. **My team believes it is capable of performing at a high level.**	1	2	3	4	5
17. **My team thinks we are effective as a unit.**	1	2	3	4	5
18. **I consider our teamwork to be very good.**	1	2	3	4	5

Appendix D: Final 10-item Collective Efficacy Inventory

COLLECTIVE EFFICACY INVENTORY FOR SPORT

This inventory examines confidence within a team.

You are requested to respond to **questions A and B** and then to each of the 10 statements as honestly as possible. There is no right or wrong way to respond to these statements, and your responses shall remain **entirely confidential**.

Use the following information as a guide when filling out the inventory.

Respond to each statement by circling the number that represents your agreement with that statement (1 = not at all, 5 = very much so)

When questions start with "I believe that .." answer the question with regards to what **YOU** think. However, when the question starts "My teams believes that.." answer the question with regard to what you think the **TEAM** thinks.

Please work through the inventory with reference to the above instructions, and pause or rest it you feel a loss of concentration.

Name: Team name: Age:
Sex: Sport:

Number of years playing the sport: Number of years playing with current team:

Point in season: Pre / mid / post season *(please select one)*

Current level of participation:
- Recreational
- Amateur
- University
- Semi Professional
- International
- Professional
- International and Professional *(Please select one)*

	Not at all				Very much so
1. I believe that the team is capable of performing at a high level.	1	2	3	4	5
2. My team has little confidence in their collective capability.	1	2	3	4	5
3. My team thinks that their teamwork is very good.	1	2	3	4	5
4. I think that we cannot perform very well.	1	2	3	4	5
5. My team believes it is capable of performing at a high level.	1	2	3	4	5

	Not at all				Very much so
6. My team thinks they cannot perform well.	1	2	3	4	5
7. I believe my team is effective as a unit.	1	2	3	4	5
8. I think my team has little confidence in their collective capability.	1	2	3	4	5
9. My team thinks we are effective as a unit.	1	2	3	4	5
10. I consider our teamwork to be very good.	1	2	3	4	5

Appendix E: Group Environment Questionnaire (Carron et al., 1985)

Group environment questionnaire.

The following questions are designed to assess your feelings about YOUR PERSONAL INVOLVEMENT with this team. Please circle a number from 1 to 9 to indicate your level of agreement with each of the statements.

1. I do not enjoy being part of the social activities of this team

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

2. I'm not happy with the amount of playing time I get

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

3. I'm not going to miss the members of this team when the season ends

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

4. I'm unhappy with my team's level of desire to win

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

5. Some of my best friends are on this team

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

6. This team does not give me enough opportunities to improve my personal performance

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

7. I enjoy other parties better than team parties

1 2 3 4 5 6 7 8 9

Strongly Disagree — Strongly Agree

8. I do not like the style of play on this team

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

9. For me this team is one of the most important social groups to which I belong

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

The following questions are designed to assess your perception of YOUR TEAM AS A WHOLE. Please circle a number from 1 to 9 to indicate your level of agreement with each of the statements.

10. Our team is trying to reach its goals for performance

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

11. Members of our team would rather go out on their own than get together as a team

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

12. We all take responsibility for any loss or poor performance by our team

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

13. Our team members rarely party together

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

14. Our team members have conflicting aspirations for the team's performance

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

15. Our team would like to spend time together in the off season

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

16. If members of our team have problems in practice, everyone wants to help them so we can get back together again

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

17. Members of our team do not stick together outside of practices and games

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

18. Our team members do not communicate freely about each athlete's responsibilities in competition or practice

1	2	3	4	5	6	7	8	9	
Strongly Disagree									Strongly Agree

Appendix F: State Sport Confidence Inventory (Vealey, 1986)

State Sport Confidence Inventory

Think about how confident you feel right now about performing successfully the upcoming competition.
Answer the questions below based on how confident you feel right now about competing in and winning the upcoming contest.
When responding, compare your self-confidence to the most self-confident athlete you know.
Please answer as you really feel, not how you would like to feel. Your answers will be kept completely confidential.
How confident are you right now about competing in and winning the upcoming contest? (circle number).

1. Compare the confidence you feel right now in your ability to execute successful strategy to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
2. Compare the confidence you feel right now in your ability to concentrate well enough to be successful to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
3. Compare the confidence you feel right now in your ability to achieve your competitive goals to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
4. Compare the confidence you feel right now in your ability to be successful to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
5. Compare the confidence you feel right now in your ability to perform consistently enough to be successful to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
6. Compare the confidence you feel right now in your ability to adapt to different competitive situations and still be successful to the most confident athlete you	Low Medium High 1 2 3 4 5 6 7 8 9
7. Compare the confidence you feel right now in your ability to be successful based on your preparation for this event to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
8. Compare the confidence you feel right now in your ability to perform under pressure to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
9. Compare the confidence you feel right now in your ability to meet the challenge of competition to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
10. Compare the confidence you feel right now in your ability to bounce back from performing poorly and be successful to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
11. Compare the confidence you feel right now in your ability to make critical decisions during competition to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9
12. Compare the confidence you feel right now in your ability to think and respond successfully during competition to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9

13. Compare the confidence you feel right now in your ability to execute the skills necessary to be successful to the most confident athlete you know	Low Medium High 1 2 3 4 5 6 7 8 9

Appendix G: Sport Imagery Questionnaire (Hall et al., 1998)

Sport Imagery Questionnaire

This questionnaire was designed to assess the extent to which you incorporate imagery into your athletic training. Imagery involves "mentally" seeing yourself performing. The image in your mind should approximate the actual physical performance as closely as possible. Imagery may also include sensations, and/or feeling associated with the performance itself. Imagery can also be used in conjunction with mood states, attentional focus, game plans etc. your rating will be made on a seven-point scale, where one is the rarely or never engage in that kind of imagery end of the scale and seven is the often engage in that kind of imagery end of the scale. Read each statement below and fill in the blank the appropriate number from the scale provided to indicate the degree to which the statement applies to you when you are practising or competing in your sport. Remember, if you rarely or never engage in the type of imagery depicted in the statement, then a rating of 1 should be given; if you often engage in the type of imagery depicted in the statement, a rating of 7 should be given; frequencies of imagery that fall within these two extremes should be rated accordingly along the rest of the scale. Don't be concerned about using the same number repeatedly if you feel they represent your true feelings. For example, the statement "imagine other athletes congratulating me on a good performance" should be rated according to how often you imagine other athletes congratulating you on a good performance. Remember, there are no right or wrong answers, so please answer as accurately as possible.

Rarely							**Often**
1	2	3	4	5	6	7	

1. I make up new plans/strategies in my head

   ____

2. I Image the atmosphere of winning a championship (e.g., the excitement that follows winning a championship).

   ____

3. I image giving 100% during an event/game

   ____

4. I can recreate in my head the emotions I feel before I compete.

   ____

5. I image alternative strategies in case my event/game plans fails.

   ____

6. I imagine myself handling the stress and excitement of competitions and remaining calm.

   ____

7. I imagine other athletes congratulating me on a good performance.

   ____

8. I can consistently control the image of a physical skill.

____

9. I image each section of an event/game (e.g. offence vs. defense, fast vs. slow).

____

10. I image the atmosphere of receiving a medal (e.g., the pride, the excitement, etc).

____

11. I can easily change an image of a skill.

____

12. I image the audience applauding my performance.

____

13. When imaging a particular skill, I consistently perform it perfectly in my mind.

____

14. I image myself winning a medal.

____

15. I imagine the stress and anxiety associated with competing.

____

16. I imagine myself continuing with my game/event plan, even when performing poorly.

____

17. When I imagine a competition, I feel myself getting emotionally excited.

____

18. I can mentally make corrections to physical skills.

____

19. I imagine executing entire plays/programmes/sections just the way I want them to happen in an event/game.

____

20. Before attempting a particular skill, I imagine myself performing it perfectly.

____

21. I imagine myself being mentally tough.

____

22. When I imagine an event/game that I am to participate in, I feel anxious.
____

23. I imagine myself appearing self-confident in front of my opponents.
____

24. I imagine the excitement associated with competing.
____

25. I image myself being interviewed as a champion.
____

26. I image myself to be focused during a challenging situation.
____

27. When learning a new skill, I imagine myself performing it perfectly.
____

28. I imagine myself being in control in difficult situations.
____

29. I imagine myself successfully following my game/event plan.
____

30. I imagine myself working successfully through tough situations (e.g. a power play, sore ankle etc.).
____

Appendix H: Wheelchair Basketball Competence Sheet

I am trying to develop an idea of what things we need to be able to do AS A TEAM in order to be successful. These are separated into 4 broad categories: Technical, physical, mental and tactical. You can refer both to general (e.g. playing well as a team) or specific aspects (e.g. ability to run the RED 12 defence). I have provided an example for each of the categories to get you started and you can use these examples if you wish.

Present all your suggestions by responding to the following statement:

In order to be successful at an international level AS A TEAM we must............

Technical	
	e.g., learn to react quickly to offensive opportunities
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Physical	
	e.g., faster in the chair than our opposition
1	
2	
3	
4	

5	
6	
7	
8	
9	
10	
Mental	
	e.g., Maintain focus in pressure situations
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Tactical	
	e.g., We must understand the tactics needed to win
1	
2	
3	

4	
5	
6	
7	
8	
9	
10	
Other factors	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Appendix I: Wheelchair Basketball Competence List with Coach Amended Items

Competencies generated:

Technical

learn to react quickly to offensive opportunities
Have a controlled, comfortable and natural shooting technique
Have an ability to read what is happening on the court
Be able to communicate effectively with team mates and coaching staff
Have a good pushing technique
Be able to control the opposition rather than be controlled ourselves
Do we understand what coach t wants on court.
Learn to read the defence.
Keep hands on wheels.
Stop giving away silly fouls.
Start picking more.
When we do pick, do it correctly, the way we were taught.
Are we set up correctly in our chairs.
Learn to set up a pick and correctly use the pick
Read and React to all defensive plays
Communication at all times
Always practice chair skills
Keep turnovers to a minimum, protect the basketball
Rebound and keep chair on offensive player
Listen carefully to technical instructions, ask questions
Work Smart offensive, be patient in half court sets
Work on shooting skills,5,10,15,foot shots lay-ups, free-throws, 3 pointers
Everyone know there role with the team

Physical

Be faster in the chair than our opposition
Have the best power to weight ratio possible
Have better hand eye co-ordination than our opposition
Have better depth perception than our opposition
Have more control over our chairs than our opposition
Have faster reactions than our opposition
We should look fitter as a team.
Are we over weight as a team.
Am I giving it 100% on court.
Improve chair / ball skills under pressure.
we as individuals should be training harder than our opponents.
We need to work on fundamentals more
We need to be sharper and faster as a team.
Work to get in the best physical shape that you can!
Eating and sleeping habits are consistent
Work on our weakness harder while training
Prefect our strengths

Cross train, swim, track, weight lifting etc.
Work on hand and eye coordination
Know your body and limitations while training
Always push harder than your opposition
Stick to our training schedule

Mental

not allow our emotions to adversely affect our performance
not allow external factors to adversely affect our performance e.g. away crowd
not allow uncontrollable factors affect our performance e.g. referee decisions
Put time aside to evaluate the game and our performance and make conscious decisions as to how we will improve by the next match/training session
Encourage team mates at all times
Show leadership both on and off court
Improve vision and awareness on court.
Do our rolls on court better.
Keep focused while on the bench.
Keep confidence high as a team
Learn the set plays inside out.
We need to be more professional off court.
Get the right balance on and off court.
Always try to learn while training.
Maintain team concept at all times
Always accept responsibility for your actions
Act and think like a Champion
Set team goals
Be coach able
Play with enthusiasm-show the world you want to win
Be leaders
Get self motivated
Must always have a positive attitude
Control your fear and stress

Tactical

understand the tactics needed to win
understand the oppositions tactics in order to counteract them
Know our own tactics from every position on court
Be aware of what possibilities may come from each different type of offence
Learn to understand what other people are doing on court
Listen to the coach more while playing.
Try to create more space on court.
Be more a team player.
Try not to do our own things while playing.
Slow down mentally on court.
Do I know the difference between 12, and red.

Make sure coach t doesn't go over points on court.
When watching films or games study your opponent
Make suggestions to better the team
Know and understand the rules of the game
Let officials call the game, don't argue?
Understand game plan and execute
Listen to staff

Others

Have a greater desire to win than our opposition
Have a better support structure in place than our opposition
Take every opportunity to help improve our team mates
Play hard in training in order to make each other better
Help others at all times
Listen to coaching staff
Praise others, Respect others
Keep equipment in the best of shape
Enjoy playing the game, Have fun
Show Sportsmanship at all times
Keep team problems with the team, work them out
Never quit at anything
Don't stress about things you have no control over
Always talk to coaching staff if you have problems

Final Items selected with coaches:

Technical

1) My team is confident that we can play smart during offence (o).
2) My team is confident that we can play smart in defence (d).
6) My team is confident that we can minimize turnovers (g).
7) My team is confident that we can protect the basketball effectively (g).

13) My team is confident that we can read the opposition defence (o).
17) My team is confident that we can read the opposition offence (d).
18) My team is confident that we can react quickly to offensive opportunities (o).
23) My team is confident that we can react quickly to defensive opportunities (d).
24) My team is confident that we can control the opposition offensively (o).
28) My team is confident that we can control the opposition defensively (d).
32) My team is confident that we can create space on court.
29) My team is confident that we completely understand what the coach wants on court (g).

Physical

5) My team is confident that we are all fit enough to play effectively as a team.
10) My team is confident that we are faster in our chairs that our best opposition.

16) My team is confident that we all have good power to weight ratio.
21) My team is confident that we all have more control over our chairs than our best opposition.

Mental

3) My team is confident that we can effectively control our emotions during performance.
4) My team is confident that we can effectively deal with external distractions during performance (e.g. Crowd noise).
8) My team is confident that we effectively cope with uncontrollable factors during games (e.g. referee decisions).
9) My team is confident that we have superior vision and awareness than our best opponents.
12) My team is confident that we can communicate effectively at all times.
14) My team is confident that we remain focused as a team while on the bench.
19) My team is confident that we can maintain a positive attitude at all times.
20) My team is confident that we can effectively cope with pressure situations.
26) My team is confident that we all give 100% effort in training.
25) My team is confident that we have a greater desire to win than our best opposition.
30) My team is confident that we will never quit in tough situations.
31) My team is confident that we all give 100% effort in games.

Tactical

11) My team is confident we understand the tactics needed to win.
22) My team is confident we understand our opposition's tactics so that we can counteract them.
27) My team is confident that we understand our tactics from every position on court.
15) My team is confident that we know how to run set plays correctly.

Appendix J: Final Wheelchair Basketball-Specific Collective Efficacy Inventory

Great Britain Wheelchair Basketball Association
World Class Performance Squad

Collective Efficacy Inventory for Sport

Name: Date:

This next questionnaire measures your team's confidence specific to situations encountered in international games.

These situations were those that you and the coaches selected as important factors for success.

Please consider each question carefully and indicate your level of agreement from 1 (not at all) to 9 (very much so) on the scale to the right of each question

		Not at All									**Very much so**
1.	My team is confident that we can play smart during offence (o).	1	2	3	4	5	6	7	8	9	10
2.	My team is confident that we can play smart in defence (d).	1	2	3	4	5	6	7	8	9	10
3.	My team is confident that we can effectively control our emotions during performance	1	2	3	4	5	6	7	8	9	10
4.	My team is confident that we can effectively deal with external distractions during performance (e.g. Crowd noise).	1	2	3	4	5	6	7	8	9	10
5.	My team is confident that we are all fit enough to play effectively as a team	1	2	3	4	5	6	7	8	9	10
6.	My team is confident that we can minimize turnovers (g).	1	2	3	4	5	6	7	8	9	10
7.	My team is confident that we can protect the basketball effectively (g).	1	2	3	4	5	6	7	8	9	10

8. My team is confident that we effectively cope with uncontrollable factors during games (e.g. referee decisions).	1	2	3	4	5	6	7	8	9	10
9. My team is confident that we have superior vision and awareness than our best opponents	1	2	3	4	5	6	7	8	9	10
10. My team is confident that we are faster in our chairs that our best opposition	1	2	3	4	5	6	7	8	9	10
11. My team is confident we understand the tactics needed to win.	1	2	3	4	5	6	7	8	9	10
12. My team is confident that we can communicate effectively at all times (g).	1	2	3	4	5	6	7	8	9	10
13. My team is confident that we can read the opposition defence (o).	1	2	3	4	5	6	7	8	9	10
14. My team is confident that we remain focused as a team while on the bench.	1	2	3	4	5	6	7	8	9	10
15. My team is confident that we know how to run set plays correctly	1	2	3	4	5	6	7	8	9	10
16. My team is confident that we all have good power to weight ratio.	1	2	3	4	5	6	7	8	9	10
17. My team is confident that we can read the opposition offence (d).	1	2	3	4	5	6	7	8	9	10
18. My team is confident that we can react quickly to offensive opportunities (o).	1	2	3	4	5	6	7	8	9	10
19. My team is confident that we can maintain a positive attitude at all times.	1	2	3	4	5	6	7	8	9	10
20. My team is confident that we can effectively cope with pressure situations.	1	2	3	4	5	6	7	8	9	10
21. My team is confident that we all have more control over our chairs than our best opposition.	1	2	3	4	5	6	7	8	9	10
22. My team is confident we understand our opposition's tactics so that we can counteract them.	1	2	3	4	5	6	7	8	9	10
23. My team is confident that we can react quickly to defensive opportunities (d).	1	2	3	4	5	6	7	8	9	10

24. My team is confident that we can control the opposition offensively (o).	1	2	3	4	5	6	7	8	9	10
25. My team is confident that we have a greater desire to win than our best opposition.	1	2	3	4	5	6	7	8	9	10
26. My team is confident that we all give 100% effort in training.	1	2	3	4	5	6	7	8	9	10
27. My team is confident that we understand our tactics from every position on court.	1	2	3	4	5	6	7	8	9	10
28. My team is confident that we can control the opposition defensively (d).	1	2	3	4	5	6	7	8	9	10
29. My team is confident that we completely understand what the coach wants on court (g).	1	2	3	4	5	6	7	8	9	10
30. My team is confident that we will never quit in tough situations.	1	2	3	4	5	6	7	8	9	10
31. My team is confident that we all give 100% effort in games	1	2	3	4	5	6	7	8	9	10
32. My team is confident that we can create space on court.	1	2	3	4	5	6	7	8	9	10

Please ensure that you have answered all questions above.

When you have done so please click the SEND bottom below.

The final page of Questions will be available after you press "SEND"

Appendix K: Vividness of Movement Imagery Questionnaire (Issacs et al., 1986)

Vividness of Movement Imagery Questionnaire

Movement imagery refers to the ability to imagine a movement. The aim of this test is to determine the vividness of your movement imagery. The items of the test are designed to bring certain images to your mind. You are asked to rate the vividness of each item be reference to the five point scale. After each question, write the appropriate number in the box provided. The first box is for an image obtained watching somebody else and the second box is obtained for an image obtained doing it yourself. Try to do each item separately, independently of how you may have done other items. Complete all items obtained watching somebody else and then return to the beginning of the questionnaire and rate the image obtained doing it yourself. The ratings for any given question, may not be the same in all cases. For all items please have your eyes closed.

Think of each of the following acts, and classify the images according to the degree of clearness and vividness as shown on the RATING SCALE below:

Perfectly clear and as vivid as normal vision	=	**1**
Clear and reasonably vivid	=	**2**
Moderately clear and vivid	=	**3**
Vague and dim	=	**4**
No image at all, you only "know" that you are thinking of the skill	=	**5**

		Watching somebody else	Doing it yourself
1.	Standing.		
2.	Walking.		
3.	Running.		
4.	Jumping		
5.	Reaching for something on tiptoe.		
6.	Drawing a circle on paper.		
7.	Kicking a stone.		
8.	Bending to pick up a coin.		
9.	Falling forwards.		
10.	Running up stairs.		
11.	Jumping sideways.		
12.	Slipping over backwards.		
13.	Catching a ball with two hands.		
14.	Throwing a stone into water.		
15.	Kicking a ball in the air.		
16.	Hitting a ball along the ground.		
17.	Running downhill.		
18.	Climbing over a wall.		
19.	Sliding on ice.		
20.	Riding a bike.		
21.	Jumping into water.		
22.	Swinging on a rope.		
23.	Balancing on one leg.		

24.	Jumping of a high wall.		

Appendix L: Adapted Vividness of Movement Imagery Questionnaire

Adapted Vividness of Movement Imagery Questionnaire

Movement imagery refers to the ability to imagine a movement. The aim of this test is to determine the vividness of your movement imagery. The items of the test are designed to bring certain images to your mind. You are asked to rate the vividness of each item be reference to the five point scale. After each question, write the appropriate number in the box provided. The first box is for an image obtained watching somebody else and the second box is obtained for an image obtained doing it yourself. Try to do each item separately, independently of how you may have done other items. Complete all items obtained watching somebody else and then return to the beginning of the questionnaire and rate the image obtained doing it yourself. The ratings for any given question, may not be the same in all cases. For all items please have your eyes closed.

Think of each of the following acts, and classify the images according to the degree of clearness and vividness as shown on the RATING SCALE below.

Perfectly clear and as vivid as normal vision = 1
Clear and reasonably vivid = 2
Moderately clear and vivid = 3
Vague and dim = 4
No image at all, you only "know" that you are thinking of the skill = 5

23.	Balancing chair on two wheels (not castors).	Watching somebody else	Doing it yourself
24.	Pushing off a high step.		
1.	Sitting in Wheelchair.		
2.	Slow push.		
3.	Fast push.		
4.	Pushing upwards out of seat.		
5.	Reaching for something.		
6.	Drawing a circle on paper.		
7.	Throwing a stone.		
8.	Bending to pick up a coin.		
9.	Falling forwards.		
10.	Pushing uphill.		
11.	Side hop.		
12.	Falling backwards out of chair.		
13.	Catching a ball with two hands.		
14.	Throwing a stone into water.		
15.	Throwing a ball in the air.		
16.	Hitting a ball along the ground.		
17.	Rolling downhill.		
18.	Pulling yourself over a wall.		
19.	Sliding on ice in your chair.		
20.	Riding a hand bike.		
21.	Sliding into water.		
22.	Swinging on a rope.		

Appendix M: Imagery Diary

Great Britain Wheelchair Basketball Association
World Class Performance Squad

Collective Efficacy Inventory for Sport

Name: Date:

IMAGERY QUESTIONS

1. How many times did you complete a full imagery session this week?

   1 2 3 4 5 6 7 More

2. In general, score how vivid your imagery sessions were this week

   1 2 3 4 5 6 7 8 9 10

3. In general, how easy was it to control what you wanted to image?

   1 2 3 4 5 6 7 8 9 10

4. How many times have you used the DVD this week?

   1 2 3 4 5 6 7 More

5. Please type any other comments you feel important concerning your imagery session this week in the box to the right.

Appendix N: Introductory Imagery Workshop Handout and Checklist

Wheelchair Basketball Imagery Session

Why use imagery?

It is very difficult to describe with words something that has happened. Words are purely for communicating with other people and are not the best way of recalling our experiences. For example, it would be very difficult to describe to someone else the sights, sounds, personal feelings and sequence of event that happened during your best ever performance. You probably could take 15 minutes to describe your best performance to someone and still not do it justice. However, if you concentrate hard you can probably remember intricate detail in the forms of pictures.

Other examples:

Have you ever tried to explain a funny event in your life to someone who was not there? When you try to explain it to them, no matter how good an explanation, they will never find it as funny as you. This is because words alone cannot complete the picture or event. However, if you reminisce with others who were actually there, you will all soon be laughing again. This is because you will all be able to re-play in your mind what happened in the form of pictures or even video!!

Some basic exercises to try and practice:

- What does your doorbell sound like? Can you hear it in your head?
- Can you remember what a lemon tastes like? Can you taste it now?
- Can you remember what petrol smells like? Can you smell it now?
- Can you feel the movement of making a one single push in your chair? Can you imagine what the rims feel like on your hands? Can you feel how your arms move to turn the wheels? Can you feel the movement of the chair?

Imagery is more than just seeing pictures; it includes all of our senses. We use imagery, simply because it is more beneficial to experience something rather than simply explaining it. Imagery can be used to:

- Mentally practice a movement e.g. free throw
- Recreate feelings of confidence, relaxation or excitement
- Block out distractions and increase focus
- Practice offensive and defensive plays

Advanced Exercises

Take a couple of minutes to practice each of the scenarios below. If you struggle to form an image the first couple of times, keep trying!! Imagery takes practice!!!

- Pick an object in the room or look at someone's face. Focus on every detail of it, including the shape and colour. Now close your eyes and imagine you are still looking at the object or face.
- Imagine you are outside your house. Go through the front door and head towards the lounge. When you're in the lounge, try to imagine what it looks like. Where the furniture is, how the room is decorated. Imagine moving around the room and then out the door, closing it behind you.
- Try to imagine the route you take from Wenlock Hall to the dining area at Lilleshall. Try to imagine all features, sights, and sounds along the way and your journey past them. Imagine the final push across the gravel and up the paved slope to the dining hall. What noise do your tyres make on the gravel? Can you feel the difference in effort between pushing on the flat and pushing up the slope?

Sport Related Exercises

- Sit in front of the basketball ring with a ball in your hand. Take a real shot with the ball. If the ball goes in, take 20 seconds to imagine the shot in your head. How did the shot feel? What did the movement feel like? See the movement from the moments before you take the shot till after the ball has swished through the ring. Repeat the process again and again and try it from different places on the court.
- As in the exercise before, you are going to image taking the shot, however this time you will image before you take the shot. Start with a free-throw!! Complete you normal pre-shot routine, but just before you take the shot try to imagine taking it and it going in!! Imagine how the shot feels, looks, and see the ball arcing through the air and through the ring. Imagine feeling immensely confident and relaxed!!
- Can you remember the best ever performance by the GB team when you were playing? Try to imagine some of the more special moments now. Imagine where you were and what the venue looked like. Imagine the interaction and communication between you and your team-mates to create successful offence and defence. Was there a crowd and were they making a noise? What were the other people on court doing? Can you imagine how you felt? Did you feel confident and excited? Try to recreate those feelings as you imagine what you did during that game.

The ways in which you choose to use imagery are entirely up to you. However, most people make the mistake of trying it, finding it difficult, and then not bothering with it after that. If you had treated your shooting practice in this way then you would not be in the position you are in now. Just as with physical skills it is important to practice hard on mental skills; <u>you should allocate training time specifically for it</u>.

APPENDIX O: Example Informed Consent Form

DEPARTMENT OF PSYCHOLOGY
SUBJECT CONSENT FORM

Contact Details: [redacted]

Project Title: Imagery use and collective efficacy

Please initial box

1. I confirm that I have read and understood the information sheet dated ....../....../...... (version number ....) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that sections of any of data obtained may be looked at by responsible individuals from the University of Wales Swansea or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to these records. ☐

4. I agree to take part in the above study.

Name of Subject	Date	Signature
Name of Person taking consent	Date	Signature
Researcher	Date	Signature