Do increases in task difficulty lead to corresponding increases in group efficacy, cohesiveness and performance?

by

John Tredgett BA (Hons)

A thesis submitted in partial fulfilment for the requirements for the degree of MSc (by Research) at the University of Central Lancashire

April 2015

Student Declaration

Concurrent registration for two or more academic awards

I declare that while registered as a candidate for the research degree, I have not been a registered candidate or enrolled student for another award of the University or other academic or professional institution

Material submitted for another award

I declare that no material contained in the thesis has been used in any other submission for an academic award and is solely my own work

Signature of Candidate

John Tredgett

Type of Award MSc (By Research)

School Sports, Tourism and the Outdoors

Abstract

The three Royal Air Force Development Training Centres (RAFDTCs) have been established to provide personal and team development training for all ranks. Outdoor activities are used at the centres as a catalyst to promote learning and exploration. Anecdotal evidence suggests there is a training effect from the centre activities however, a link to a specific effect remains elusive. The study, conducted at RAFDTC Fairbourne, explored whether increases in task difficulty (easy, moderate & hard), correspond with increases in group efficacy, group cohesion and performance time to complete the task. Additionally, following literature surrounding mediating and moderating variables (Kim, Kay, & Wright, 2001), research explored whether a triadic reciprocal causation between efficacy, cohesion and performance could be established (Bandura, 2001). The study participants were teams of 6 adults, randomly assigned to training groups for centre activities [12 (pilot) & 68 (main)]. To explore relationships between task difficulty, group efficacy, cohesiveness and group performance, a Leonardo`s Bridge Building exercise (Metalogs, 2010) was set. A small pilot study compared efficacy collection methods and was adjusted accordingly. Both pilot and main studies confirmed that, as task difficulty increases, there is a corresponding increase in time to complete the task (pilot study, pearson's r (12) = .968*, p= .000 (1 tailed) & main study pearson's r (68) = .642*, p= .000 (1 tailed)). The pilot study results indicated time was a significant predictor of pre and post task efficacy $F(1.000,9.000)=5.880$, $p=.038$, $\eta p2=.395$ and that task level $F(2.000,9.000)=12.000$, $p=.003$, $\eta p2=.727$ interacted with time to predict task efficacy. However, the larger sample in the main study did not confirm either of these findings. Results do not support a triadic reciprocal relationship between group efficacy, cohesion and performance. Group efficacy and cohesion (i.e., Group Integration Task) only appeared as an effect of performance.

Key words

RAFDTC, Outdoor activities, Efficacy, Social cognitive theory, Cohesion, Task difficulty, Performance, Triadic reciprocal relationship.

Contents

Acknowledgements

This thesis would not have been possible without the help, support and patience of my principal supervisor, Dr Helen Hooper. Her sound advice on both an academic and a personal level has been invaluable. The good advice, support of my second supervisor, Dr Mark Hickman, has also been essential, for which I am extremely grateful.

1.0 Introduction

1.1 Training ethos at the Royal Air Force Development Training Centre Fairbourne (RAFDTC(F).

For over twenty years, RAFDTC(F) has, and continues to be, at the forefront of adopting personal and team development working practices. Influences for these approaches and direction can be attributed to forward thinking management, who seek to understand the implementation of leadership and social theories, gained from education and close partnership with civilian training teams and professional bodies, such as, Outward bound, Brathay, Exeter and Lancashire Universities. To maintain and further the experience of the centre, the staff, receive through training courses and workshops, significant continued professional development from military courses and outside agencies. Trainers from professional civilian training, include Mr Ken Way (NLP), Dr John Baber (professional approaches to training) and Dr Roger Greenaway (a prominent spokesman, who is considered as one of the academics at the cutting edge of active reflection). Workshops and training include University short courses and the Force Development Training Course (FDFC, 2009).

Throughout the 1990s the significant influence of RAFDTC(F) inspirational leaders resulted in a social belief paradigm shift (Handa, 1986). Applying paradigms to the social sciences, Handa (1986) proposes that paradigms, as a set of assumptions about reality, frame our thinking, which is consequently reflected through our behaviour. The social belief paradigm shift in the Royal Air Force (RAF) refers to the researcher's personal observation of the enormous modification in service ethos. His early career experienced a transactional approach from peers and management at all levels, this re-enforced the hierarchical nature of service and resisted change to processes and challenging ideas to leadership and management direction. Service personnel and institution training beliefs have changed over the past twenty years (Archer, Swinney, Taylor-Powell & Whinstanley, 2003) and transformational leadership (Burns, 1978) is now a common framework for managers at all levels. Mission statements, open inclusive workshops, force development strategies which explore lessons from the past and current leadership allied with development

approaches for the future, are some of many examples where personal and team development is now key to the “through service life” (GETR, 2011) training of all personnel.

1.2 Outlining the need and scope for research at Fairbourne

The personally observed influence from RAFDTC(F) approach continues to migrate into the Royal Navy and Army. Conceptual models such as, Maslow’s hierarchy of needs (Maslow, 1943) and Kolb cycle (Kolb, 1984) are used to explore and shape facilitators’ approaches to student-led exploration of experiences, and instructional expertise in framing the experience whilst coaching new skills to students at all levels (FDFC, 2009). These are all examples where the RAFDTC(F) approach is observed throughout the adventurous training wings, for all services as they now leave their isolated “single service” training, to share professional management and leadership experience between forces, due to the reduction in size of the British armed forces worldwide.

The development centre’s large, multi-cultural, mixed trade and gender student training turnover presented an excellent opportunity to pursue a line of enquiry that may link a specific training mechanism, with perceived student group effects and their engagement in outdoor activities.

However, a comprehensive literature review identifies a deficiency of studies relating to specific interdependent outdoor orientated activities and group performance. Studies have reviewed work group effectiveness (Walton, 1972) and team and workplace efficiency (Hackman & Morris 1983; Barrick, Bradley, Kristof-Brown, & Colbert, 2007). Whilst team performance in the outdoor environment has been studied, research appears to investigate the programmes (Wagner & Roland, 1992); a development strategy (Wagner, Baldwin, & Roland, 1991) and Outdoor Management Development (OMD) design and transfer (Irvine & Wilson, 1994). Literature surrounding sports teams presents a direction for study surrounding the effects of cohesion and team building activities. However, there is inconclusive evidence. Some research supports the inclusion of team building exercises in training programmes,

suggesting team building activities increased the development of cohesion and improved performance (Gould, Guinan, Greenleaf, Medbery, & Peterson, 1999; Greenleaf, Gould, & Dieffenbach, 2001; Voight & Callaghan, 2001). Although contrasting studies suggest there is little evidence to support the relationship (Prapavessis, Carron, & Spink, 1996; Bloom & Stevens, 2002).

1.3 Theoretical underpinnings of this study

Of interest to this study and RAFDTC(F) centre tasks, is the work of Wageman (1995) who views the efficiency by which a group or team is able to coordinate its social and task-related interactions across different task types as imperative to the ultimate effectiveness of the group. However, Whitney (1994) reported in her paper on team task effectiveness that overall, there were non-significant correlations between group cohesiveness and group task performance.

Further research and investigation into this enquiry, using quantitative analysis from student end of course questionnaires, consultation with instructors and students, appeared to indicate that a strong positive learning experience occurs during their week at the centre. However, despite the considerable financial and emotional investment, there appears to be a lack of clarity to link a specific mechanism to the training outcomes, with perceived student group effectiveness and their engagement in outdoor activities.

The lack of conclusive evidence is the rationale for conducting this study which will investigate the effect of involvement in typical centre activities on group efficacy and group cohesion, which are two related factors linked to group performance (Mullen & Copper,1994; Carron, Colman, Wheeler, & Stevens, 2002).

Personal observation over many years of outdoor development training, suggests group cohesion and performance may be negatively affected when tasks are too difficult. However, anecdotal evidence (from instructors at the centre) suggests a perception that difficult tasks should be used with RAF personnel. Given the lack of reliable scientific evidence, this study used 3 experimental conditions (easy, moderate & difficult) of a typical centre activity

called Leonardo's Bridge (Metalogs, 2012) to investigate the effects (if any) on group efficacy, group cohesion and performance.

Considering a review of the literature, five hypotheses were tested:

1. Task difficulty will be negatively correlated with performance.
2. Easy tasks will have no significant effect on group efficacy.
3. Moderate tasks will positively affect group efficacy.
4. Difficult tasks will negatively affect group efficacy.
5. Group cohesion will be highest following engagement with a moderate group task.

The possible benefits for this study include an increased understanding of the group development effects of the activities provided and future selection of task difficulty to enhance performance in relation to group dynamics. Preliminary consideration of end of course questionnaires, instructor reports, and current practice identified subject matter that may be of significant interest to the working ethos and training tasks, used by RAFDTCs and the RAF training teams worldwide.

2.0 Literature review

This study investigated various relationships found in RAFDTC(F) groups undertaking training activities. As such, the literature review will start by considering what it means to be part of a RAF training centre group. It will then progress to consider research on group performance, efficacy and cohesion and how these concepts may be related. Measurement issues that influenced the scope of this current study will be discussed at the end of each section.

2.1 Centre groups

Research identifies that a definition of a group differs widely within the literature (Bass, 1960; Fiedler, 1967; Rubin, Bukowski, & Parker 2006; Forsyth, 2006). Groups who are engaged in centre activities are under orders and syllabi, group activities form part of a specific training in personal and team development. It could be argued that both work groups and sports' teams are also under orders and it is with these two groups that much of the research reviewed in this chapter has been carried out.

2.1.1 Group selection process

Training teams from units that specialise in the many trades that make up the RAF collective, liaise with the centre and book weekly training blocks that form part of the student's trade training. Prior to centre arrival a list of course participants is sent to the administrative staff detailing trade specialisation, physical fitness, academic experience, age and gender. This information is passed to the training team who scrutinise the details before randomly allocating groups to a trainer, ensuring each consists of mixed trade and gender. Age, academic and physical fitness are considered less important for the overall aim, which is to encourage diversity, personal and team development, understanding of other trades and service experience. Centre groups consist of predominantly European ethnicity (for the RAF this is comprised of <2.1% Asian & Caribbean origin (Dasa, 2013)). Group ethnicity research has identified differing effects on team training (e.g., Cox, Lobel, & McLeod, 1991) however, the influence of RAF selection and early formative specific recruit selection may define centre groups as:

> *A collection of two or more individuals who possess a common identity, have common goals and objectives, share a common fate, exhibit structured patterns of interaction and modes of communication, hold common perceptions about group structure, are personally instrumentally interdependent, reciprocate interpersonal attraction, and consider themselves to be a group* (Carron, Hausenblas, & Eys, 2005, p.13).

Military service instils a common identity through shared training history and uniform. Early trade training brings to the fore common goals and objectives, which may influence individuals to easily accept group work as a critical component of military service (DG Leadership, 2012).

2.1.2 Military groups and the research questions

Personal observation, contact from personal training and shared experiences from many years of service life leads the researcher to ponder why service personnel appear to be highly motivated and essentially team orientated individuals. Civilian contractors and MOD colleagues are able to work in teams and groups that require complex interaction. Indeed, this requirement is now an essential and large part of the service environment. Military training, group work and courses, when integrated with civilian contractors, appear to highlight a different approach to the training. Service personnel easily adapt to the group work and discussions whereas their civilian colleagues appear to find the process more challenging. Perhaps the serviceman's shared cultural distinction mentioned by Terriff, (2006) serves as a contributory factor. Indeed the wearing of badges, uniform, shared history and common language may have a significant effect on activities that require shared resources (Sutton & Pierce, 2003). Team-work training appears to have support for an effect on team outcomes (Delise, *et al*. 2010), therefore service team-work training should have an observable effect on the population.

A clear understanding of why there is an effect is more problematical. Research indicates that the concept of self-efficacy could provide an avenue to investigate

probable effects on motivated, team orientated, service personnel and the following sections will provide a background to existing literature and possible effect to be explored in this study.

2.2 Self-Efficacy

Bandura (1986) suggests that, of all beliefs, "people's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances" (p. 391) are the most influential mediators in human interaction. Self-efficacy therefore plays a powerful role in determining the choices people make, the effort they will expend, how long they will persevere in the face of challenge, and the degree of anxiety or confidence they will bring to the task engaged in (Rahimi & Abedimi, 2009). Social Cognitive Theory is the overarching theoretical framework of the self-efficacy construct (Bandura, 1986). Within this perspective, an individuals behaviour is constantly under reciprocal influence from cognitive (& other personal factors such as motivation) and environmental influences.

2.2.1 Social cognitive theory

As discussed in the previous section the concept of self-efficacy is central to social cognitive theory Bandura (2001). This theory proposes we learn from an agentic perspective. People function as self-organising, proactive, self-reflecting and self-regulating individuals--not just as reactive organisms shaped by environmental forces or driven by inner impulses. The disparate groups that attend centre training will, according to the perspective advocated by Bandura (1982), have differing strategies and experience of group tasks. Their individual efficacy beliefs will have been influenced by four factors:

- mastery experiences (Bandura, 1982; Biran & Wilson, 1981; Feltz, Landers, & Raeder, 1979; Gist, 1987; Britner & Pajares, 2006).
- vicarious experiences (Bandura, 1986; Schunk, 1987, 2003).
- social persuasion (Litt, 1988; Schunk, 1987, 2003).
- physiological and emotional States (Ewart, 1992; Jones *et al*., 2002).

Performance success is considered to be the most influential source of efficacy information because these events are based on your own mastery experiences

(Bandura, 1997; Usher & Pajares, 2008). Personal mastery experiences affect self-efficacy beliefs through reflection on past events. For example if you repeatedly view these experiences as successes, self-efficacy beliefs will increase; however, if these experiences were viewed as failures, self-efficacy beliefs will decrease. The influence of past performance experiences on self-efficacy beliefs also depends on the perceived difficulty of the performance, the effort expended, the amount of guidance received, the sequential pattern of success and failure, and the individual's conception of a particular ability as a skill that can be acquired, versus a natural aptitude (Bandura, 1986; Lirgg; George, Chase, & Ferguson, 1996). Bandura (1997) suggested that performance accomplishments on difficult tasks, tasks attempted without external assistance, and tasks accomplished with only occasional failures carry greater efficacy value. This is in comparison to tasks that are easily accomplished, tasks accomplished with external help, or tasks in which repeated failures are experienced with little sign of progress (Feltz & Lirgg, 2001). This is of particular interest to this study because tasks at the centre follow a rationale that students should gain learning from the activity without external input. In addition, this research used a task of varying difficulty therefore, a group's perception of efficacy may vary when the task difficulty is manipulated.

The aforementioned group perception of efficacy was recognised by Bandura (1982,1986). According to Freeman & Adams (1999) Banduras seminal work, proposed the term collective efficacy to reflect a team or group shared belief about expectations of success for a specific event or task.

Based on the research and theory concerning origins of self-efficacy (Bandura, 1997). It has been hypothesised that the same four sources of self-efficacy i.e., mastery, vicarious experience, social persuasion and physiological/ emotional states should be increased to seven. The three additional sources of self-efficacy are group size, group cohesion (Feltz & Lirgg, 2001) and imaginal experiences (Maddux, 1995) and may serve as origins or sources of the group construct, collective efficacy.

Efficacy is suggested as an influential mediator in human interaction (Bandura, 1986). If these additions are origins or sources of collective efficacy they may have a significant impact on RAFDTC(F) group training effects and the following sections discuss each, in turn.

2.2.2 Group size and possible collective efficacy effects

Group size and the effects on performance are significant considerations in RAFDTC training, fortunately budgetary pressure for larger groups is controlled by the professional concern of supervision in accordance with national adventurous training governing bodies (JSP, 419). This supervisory control of group size further migrates to classroom activities and may play a crucial role in creating a positive environment.

According to Heuzé, Raimbault, & Fontayne (2006a) group size contributes to perceptions of collective efficacy through its effects on co-ordination and co-operation. Studies suggest increased group size may negatively influence collective efficacy, because coordination difficulties and the potential for cliques to form increases with size of group, and team cohesiveness may be more difficult to maintain (Zaccaro, Blair, Peterson, & Zazanis, 1995; Watson, Chemers, & Preiser, 2001; Feltz & Lirgg, 2001). Kerr (1989) suggested that, as group size increases and co-operation between individual members decrease, there is a general perception in the group that collective efficacy is less.

According to Messick & Mackie (1989) precise determinants for this effect are psychologically complex. Many factors such as, modelling, conformity pressures, or enhanced prospects for group success are, potentially conflicting, motives that may play a significant part in the experience of group collective efficacy. My own personal observation from training groups prior to this study appears to support these researched effects. Larger groups appear to lose a shared goal for success. One explanation for this may be the distancing of the dynamic between facilitator and student. Agreement for large group performance loss has been observed in many fields. For example, research in social psychology, such as the work of Steiner (1972) on process losses, implies that as groups increase in size, the potential for group process

losses increases. Steiner suggested that a group's actual performance is a function of potential performance and process losses, due to factors such as social loafing (a reduction in motivation & effort when individuals work collectively, compared to when they work individually (Latané, 1986)) and poor decision making and conformity (Pronin, Molouki, & Berger, 2007; Latané, Williams, & Harkins, 1979; Everett, Smith, & Williams, 1992).

More recently, Curral, Forrester, Dawson, & West (2001) lend further support for smaller groups by suggesting that as group size increases, the difficulties of agreeing objectives, ensuring appropriate participation in decision making, achieving consensus on what constitutes high quality, and eliciting unanimous support for innovation, all increase. In addition to considerable academic evidence to support the use of smaller groups anecdotal evidence, gained through discussion with colleagues, suggests that, in the military, individuals from trade specialities and from each gender can begin to form cliques, due to the increased likelihood of previous acquaintances and social stereotypes appearing in the larger group, Essens *et al*. (2005) mention that large military organisations with multi disciplined groups, may observe process loss, unless the leadership team recognises the need to ensure that all team members communicate efficiently between themselves and senior command.

As the group size and composition was to remain the same throughout the study (see section 2.1.1), research was not carried out to test whether group size should be added as an antecedent/moderator or mediator in the cohesion, collective efficacy relationship. Further research is suggested, as the main study groups were different to those used in the pilot study and design stages due to unforeseen circumstances, (see section 6.5).

2.2.3 Group cohesion and collective efficacy relationship

Group cohesion is defined by Ramzaninezhad & Keshtan (2009, p. 37) as "the dynamic process that is found in a group's tendency to stick together and its resistance to disruptive forces". Consequently, as the bond and unity among team members increases, so likely would their shared belief in the team's ability to work together. This relationship between group cohesion and collective

efficacy is viewed as reciprocal (Paskevich, Brawley, Dorsch, & Widmeyer, 1999). Yet, group cohesion is also seen as a consequence of collective efficacy (Zaccaro *et al.,* 1995). Therefore, if a group has a shared belief about its competence, then its attraction to the group (cohesion) should also increase.

Based on previous conceptual ideas, some social psychologists describe cohesion as an origin of collective efficacy (Bandura, 1997), although others consider it both an origin and a consequence of collective efficacy (Zaccaro *et al.,* 1995). As an origin certain positive changes are associated with cohesion (i.e., greater acceptance of group norms, assigned roles, performance standards, and stronger resistance to disruption) should enhance the performance capabilities of the group and promote a higher level of collective efficacy (Bandura, 1997; Zaccaro *et al*., 1995). As a consequence, stronger perceptions of collective efficacy should increase the desirability of group membership and therefore group cohesion (Zaccaro *et al.,* 1995).

Studies in the domain of sport psychology acknowledge the importance of collective efficacy and cohesion in ensuring successful collective outcomes (e.g., Carron *et al.,* 2002; Myers, Feltz, & Short, 2004a; Heuzé, Sarrazin, Masiero, Raimbault, & Thomas, 2006b). Bandura (1986) proposed collective efficacy as an extension of self-efficacy and suggested that collective efficacy is more than just the sum of individual efficacy levels within the group. Collective efficacy involves the individuals' perceptions regarding the group's performance capabilities. Collective efficacy beliefs have substantial implications for group effort and performance, especially for tasks requiring interaction among group members for success (Bandura, 1989). This can be seen to have specific relevance to RAFDTC(F) activities, as group members are required to work interdependently whilst engaged in activities. In addition, Paskevich *et al.* (1999) propose strong correlations between task-related aspects of cohesiveness and members' shared beliefs about collective efficacy. Volleyball players from university and club teams who perceived high task cohesion also tended to perceive high overall collective efficacy in their team. The authors also noted that relationships between cohesion and collective efficacy were reciprocal. Taken together, previous research provides support for a group cohesion – collective efficacy relationship.

Both collective efficacy and cohesion have also been found to be associated (independently) with performance. For example, a positive relationship has been reported between collective efficacy and performance in both laboratory (Hodges & Carron, 1992; Greenlees, Graydon, & Maynard, 1999) and field settings (Feltz & Lirgg, 1998; Watson *et al*., 2001; Myers *et al*., 2004a; Myers, Payment, & Feltz, 2004b).

Other studies have extended previous findings by examining the reciprocal nature of the collective efficacy – performance relationship. Watson *et al*. (2001) focused on the experiences and consequences of collective efficacy in 28 college basketball teams tested at both the beginning and end of a season. The authors reported that collective efficacy beliefs at the beginning of the season predicted later collective efficacy and overall team performance at the end of the season. They concluded that sport teams develop persistent efficacy beliefs relatively early, and these have a positive influence on subsequent performance.

In particular Watson *et al*. (2001) suggested past performance was a positive predictor of collective efficacy at the group level, these findings seem to support the significant contribution that mastery of experiences play in performance proposed by Bandura (1997). Also the work of Feltz & Lirgg (1998); Myers *et al*. (2004a,b) support these findings in their studies surveying ice hockey or American football teams within 24hrs of competitions over consecutive weekends. Their results appear to indicate that collective efficacy was a positive predictor of team performance within teams (Feltz & Lirgg, 1998; Myers *et al.,* 2004b), as well as within weeks and across teams (Myers *et al.,* 2004a).

Additionally, previous performance appeared to be a positive predictor of subsequent collective efficacy within teams (Myers *et al.,* 2004b), as well as across games and teams (Feltz & Lirgg, 1998; Myers *et al.,* 2004a). When considered together these results appear to support a reciprocal relationship between collective efficacy and team performance. It is the intention of this current study to explore any such relationship in the military cohort under investigation.

2.2.4 Imaginal experiences as an antecedent of collective efficacy

Maddux (1995) introduced imaginal experiences as a separate source of efficacy information. People can generate efficacy beliefs by imagining themselves or others behaving successfully or unsuccessfully in anticipated performance situations. Bandura (1997) refers to this as cognitive self-modeling (or cognitive enactment) and describes it as a form of modeling influence. Imagining your-self winning against an opponent has been shown to raise efficacy judgments and endurance performance (Feltz & Riessinger, 1990). Other cognitive simulations, such as mental rehearsal strategies have also been shown to enhance competition efficacy beliefs and competitive performance (Garza & Feltz, 1998).

The use of mental rehearsal, or prior reflection for the task may have been useful to investigate the aforementioned authors findings with military personal and team development training. Future studies should investigate whether imaginal experiences have the potential to increase collective efficacy perceptions for military groups participating in centre tasks.

2.3 Group performance

Extant research surrounding a definition of group performance appears to be elusive. Literature suggests a generalisation of group performance as, some form of task effectiveness or group productivity (e.g., Mullen & Copper, 1994; Gully, Devine, & Whitney, 1995). Also many studies have reviewed team and workplace efficiency (Hackman & Morris, 1983; Barrick, Stewart, Neubert, & Mount, 1998). Whilst research into team performance in the outdoor environment has investigated the programmes (Wagner & Roland, 1992), a development strategy (Wagner *et al*., 1991) and outdoor management development design and transfer (Irvine & Wilson, 1994), there appears to be a lack of literature relating to specific interdependent outdoor orientated activities and group performance. A reason for this gap of study in the outdoor environment may be due to a lack of clarity in an effect that could be measured in an outdoor activity to reflect group performance.

Bandura (1997; 2000) offers a likely influence that could be measured, mentioning that the influence of collective efficacy on performance operates both directly and indirectly. For example the goal difficulty level that teams select for themselves is considered to be a factor that mediates the link between collective efficacy and performance (Spink, 1990). Although the students in this study will not be choosing the activity goal level, the efficacy belief may still predict a likely performance outcome. Specifically related to this study design is the proposal by Bandura (1999) that self-efficacy beliefs are formulated before and after a specific task. This study used group collective efficacy questionnaires to measure and compare pre-and post-task activity scores. If the aforementioned hypothesis is predictive, scores would be expected to change when the task difficulty was manipulated.

Significant research mentions that a person's perceived capability is a valid indicator of self-efficacy when influenced by outcome expectancies, (Rhodes & Blanchard, 2007; Shoenberger, Kirsch & Rosenguard, 1991) and is highly predictive of behavior (Moritz *et al*., 2000; Sadri & Robertson, 1993: Stajkovic & Luthans, 1998). Williams (2010) calls for researchers to recognise that outcome expectancy will have a significant influence on self-efficacy beliefs, especially if a group is asked to gauge their future performance based on past experiences. In the current study, the students were asked to hypothesise if they were to do a similar task in the future how would they rate their success.

This consultation with the group would appear to satisfy the theoretical standpoint mentioned by Williams (2010), thus this research measured outcome expectancy as an influential contributor to the self-efficacy of the group members when comparing pre and post-task efficacy measurements.

Therefore it is hypothesised that, in this study of a typical centre activity, the collective efficacy measure will change positively when task levels are increased from easy to moderate levels, and decrease as task levels overreach the expectations of group success.

2.4 Efficacy collection methods

While the expectations for success appear to be a strong predictor of performance, researchers who investigate these expectations do not agree on a collection method which best reflects the group opinion. Furthermore the terms group (Gibson, 1999; Whiteoak, Chalip, & Hort, 2004; Stajkovic, Lee, & Nyberg, 2009) and collective efficacy, (Guzzo, Yost, Campbell, & Shea, 1993; Bray, Gyurcsik, Martin-Ginis, Nicole-Culos-Reed, 2004; Borgoni, Dello-Russo, Petitta, & Latham, 2009; Katz-Navon & Erez, 2009) appear to be used by the listed researchers' definitions to describe their shared understanding of efficacious by a group.

Additionally, research has highlighted four possible operational definitions of collective efficacy,

1. Assessment of each team member's belief in their personal ability to perform within the group (i.e., self- efficacy) and then aggregating these individual self-efficacy measures (Bandura, 1997).

2. Assessment of each team member' s belief in their team' s capabilities as a whole and then aggregating these individual measures. From literature reviewed this method is consensually termed aggregated collective efficacy (Bandura, 1997; Myers, Feltz & Short, 2004).

3. Aggregation of each individual's opinion of the team's belief of collective efficacy (Zaccaro, Blair, Peterson & Zazanis, 1995: Paskevich, Brawley, Dorsch, & Widmeyer, 1999).

4. Team members debating a single value to obtain a group response to a single question (Gibson, Randel, & Earley, 2000).

Aggregation and a group single assessment value are established as methods to accurately collect group performance beliefs (Gibson, Randel, & Earley, 2000). Each has supporters and critics and the merits for each are discussed.

2.4.1 Aggregation method

Group efficacy is defined by the aggregation of individual group member perceptions of the efficacy of the group. In this method, each group member considers his/her perception of the efficacy of the group. The assessment is made individually and privately, data are collected from each member, and these assessments are then aggregated into one assessment at a group level of analysis. The variability in beliefs among group members may be masked in this method (Whiteoak, Chalip, & Hort, 2004). Bandura (1997) and Stajkovic *et al.* (2009) suggest the aggregated score is the preferred way of assessing group efficacy because it avoids the social influence biases associated with the group discussion. Although, as previously suggested there is no evidence on which to base this effect (Stajkovic *et al.,* 2009), and social influences may be of less an effect at this time of the students training. Criticism also surrounds the question of how an individually based method can capture shared group beliefs (Guzzo, Yost, Campbell, & Shea, 1993). Bandura (1986, 2000) has noted this question may be largely due to the meaning and definition of the term “shared”. That is, social cognitive theory emphasises that there is no physical entity such as a group mind, and it cannot be considered/measured (for it is metaphysical) for its level of shared belief (Bandura, 2000). Therefore, even though group efficacy is a group level property, minds of the individual members who make up the group are the source of this assessment.
This distinction suggests, that groups should discuss their perceptions and explore the group’s view of their efficacy measurement, as aggregating the measurement may hinder the freedom of individual members to reach a mutual conclusion. Lindsley, Brass, & Thomas (1995) appear to support this effect suggesting that averaging individual perceptions of their own capabilities to do their part in the group, fails to account for dynamic social and organisational processes that occur within groups. They propose the measurement of group efficacy must allow room for emergent group properties.

The second method (group single assessment) is defined by a group’s shared belief in their capabilities through group discussion. Facilitated discussion is a central part of current centre training practice thus, providing further justification for the use of this method in the current study.

2.4.2 Group single assessment value

In this method, members discuss their group's perceived collective efficacy. After the group discussion, they settle on a single assessment. This measure is readily correlated (no need for aggregation) with the group level of performance. If potential social/power influences are dealt with effectively, group discussion may reveal group strengths/weaknesses previously unknown to each group member. While Baker (2001) supports the need for facilitated discussion when seeking to gain a consensual realistic view of the group, the work of Bar-Tal (1990) mentions that people commonly refrain from communicating their true beliefs to others whom they do not fully trust, out of fear of negative sanctions. Therefore, only under certain circumstances is communication likely to lead to 'common beliefs'. Although recognising its strengths, Bandura (1997) suggests, group discussion, placed in the daily reality of work, is prone to potential weaknesses. The concern is that group discussion can turn into a social influence event where individuals may feel the need to conform to group influences (Pronin *et al*., 2007) rather than an unbiased, shared assessment procedure. If the former occurs, the method of assessment may change the phenomena being assessed (Bandura, 1997). Regarding group discussion Rydgren (2009) proposes that the principal means of negating view diversity that stand in opposition to a single approach or method of interpretation is communication.

Consideration has been made to the assessment concerns of Bandura (1997) in relation to the current study. It was essential that all group discussions were centred on the training activity as opposed to the daily reality of military life and, with limited evidence to allow a conclusion to be drawn about social influence effects (Stajkovic *et al.,* 2009), it was planned that all groups were engaged in the study at an early stage when forming. According to the model proposed by Tuckman (1965), at this early stage, group members cautiously begin to explore the group and attempt to establish some social structure. Therefore it was assumed that all groups may need to conform to similar social influences (Pronin *et al.*, 2007) when using the group single assessment value method.

Both efficacy collection methods have collected conflicting opinions in regards to their accuracy in reflecting the efficacy measurement of groups. Group facilitators at the centre were aware of the need for communication in debating the efficacy measure. Also, the conflicting literature mentioned by Stajkovic *et al.* (2009) surrounding whether the social influence concerns of Bandura (1997), actually affect the group efficacy scores collected, became a strong consideration in deciding which method to use. The early formation of the group and facilitated discussion (an essential aspect of centre training), would guide discussion to the topic of the task and encourage whole group interaction thus reducing social influences on numerical choice. Additionally a pilot study gathered data and opinion (see section 3.1), which informed the eventual decision to use the group single assessment value method for this study.

2.5 Group cohesion and team performance relationship.

As aforementioned there appears to be significant conflicting literature that suggests group cohesion has a positive relationship with performance in groups. One explanation for this confusion in the literature was the disagreement in the definitions and measurements of cohesion (Cota, Evans, Dion, Kilik, & Longman, 1995; Mudrack, 1989a,b). These researchers have called for practical research to be based on a consistent definition and measurement of group cohesion (Cota *et al*., 1995; Mudrack, 1989a,b). Both Cota *et al*. (1995) and Mudrack (1989a,b) recommend using Carron, Widmeyer, & Brawley's (1985) multidimensional model as a good starting point for studies using a common definition and measurement. The development of the GEQ appears to have enabled a concerted approach to research on cohesion in sport psychology (e.g., Gardner, Shields, Bredemeier, & Bostrom, 1996; Boone, Beitel, & Kuhlman, 1997; Li & Harmer, 1996; Prapavessis & Carron, 1997; Shields, Gardner, Bredemeier, & Bostro, 1997).

Carron *et al*. (1985) noted the various definitions of cohesion could be arranged into two major groups Group integration (GI: “a member’s perceptions of the group as a totality” p. 248), and Individual attraction to group (ATG: “a member’s personal attraction to the group” p. 248). They argued that both

perceptions helped to bind members to their group. Furthermore, Carron *et al*. (1985) asserted that both GI and ATG could be focused on either the task or the social aspect of the group. Therefore, cohesion was conceptualised as consisting of four unique constructs, group integration task (GI-T), group integration-social (GI-S), individual attraction to group-task (ATGT) and individual attraction to group-social (ATG-S). From this conceptual model, Carron *et al*. (1985) devised the group environment questionnaire to capture data for analysis.

2.6 The Group Environment Questionnaire (GEQ)

2.6.1 Subscales and measurement

The Group Environment Questionnaire is an 18-item instrument measuring athletes' perceptions of team cohesion. Four subscales are contained within the questionnaire as mentioned above. Each scale item is rated on a 9-point Likert-type scale ranging from 1 (strongly disagree) to 9 (strongly agree). The group integration construct represents the closeness, similarity, and bonding within the group as a whole. Conversely, individual attractions to group (ATG) represents the interaction of the motives working on the individual to remain in the group. The task construct refers to a general orientation toward achieving the group's goals and objectives, whereas the social orientation is focused on developing and maintaining social relationships within the group.

Cota *et al.* (1995) proposed that the work of Carron *et al*. (1985) offered a promising future to cohesion research because (a) "the task-social and individual-group dimensions are important to understanding cohesion in many types of groups and have been identified independently by other researchers"(p. 576); and (b) "the implications of the two dimensional model have been tested with the GEQ in a growing number of empirical reports" (Cota *et al*., 1995, p. 576).

2.6.1.1 Subscale correlations

Researchers have shown that GEQ subscale scores had separate and meaningful patterns of correlations with variables that were important to group functioning and effectiveness. Prapavessis & Carron (1997) reported that

athletes who scored high on the ATG-T scale worked harder than athletes who scored low on the ATG-T. Boone *et al*. (1997) found that members of losing baseball teams exhibited significant decreases on the ATG-T, GI-T, and GI-S subscales, but no such change was found in members of the winning teams.

2.6.2 Adapting the GEQ

The model of cohesion proposed by Carron *et al*. (1985) was specifically developed for sport teams, and has few uses outside the sport setting. Recent discussion on the structure and measurement of this model (Carless, 2000; Carless & De Paola, 2000; Carron & Brawley, 2000) highlighted the challenges of adapting the GEQ for measuring cohesion in work teams. For example Carless & De Paola (2000) did not find support for the four-factor structure. They concluded that results of their study together with other findings (Hogg & Hains, 1998) questioned the usefulness of defining group cohesion at the individual level (Carless, 2000). In their reply to Carless & De Paola, Carron & Brawley (2000) argued the dynamic nature of work groups should be taken into consideration when researchers adapt the multidimensional model and GEQ for their research projects. In particular, Carron, Brawley & Widmeyer, (2002a, p. 22) noted it is important for researchers to define a clear theoretical model that is appropriate for their research project, and to select and pilot appropriate measures for the theoretical model of cohesion. In light of this recommendation it was considered the aforementioned note to be essential for the study, the use of the GI-T subscale alone to gather cohesion measures was specifically inspected throughout the pilot study. In support of the researchers use of the task related subscale, Blanchard *et al*. (2009) report using the GIT in a similarly modified questionnaire, a smaller questionnaire being considered easier to administer. Of direct relevance to the measure used in this study was their rationale that the study would be focussing on the sports task, as opposed to developing the social cohesion. Adding further support to this sole use of the GI-T for centre groups in the current study, Mullen & Copper (1994) & Barrick *et al*. (2007) reported that task cohesion was modestly related to work-group performance, whereas social cohesion was unrelated to work-group performance (Mullen & Copper, 1994; Carless & De Paola, 2000).

2.6.2.1 GEQ task and social cohesion measurement

A distinction between task and social cohesion has also been made about leadership of work teams (e.g., Fleishman & Peters, 1962; Hersey & Blanchard, 1969) and group processes (Gladstein, 1984). Cota *et al.* (1995) draw on a notion of consensual validity by suggesting that the worth of separating task and social cohesion when using the measure for group performance is becoming generally accepted, thus providing support for the current study's choice of method. Findings of Carless & De Paola (2000) also support the use of task cohesion subscales, as task cohesion was found to show a stronger relationship, than social cohesion and individual attraction to the group, with all of the team characteristics examined.

The four-factor structure of the GEQ was unable to be replicated by Dyce and Cornell (1996) and Carless & De Paola (2000) leading to the development of a three-factor model with a reduced set of items (Carless & De Paola, 2000). The three constructs were task cohesion (the degree of commitment to the task), social cohesion (the extent to which members interacted socially), and individual attraction to the group (the extent to which individual team members saw the group as an attractive social group). Of the four items that formed task cohesion, two items were originally from the ATG-T subscale and two from the GI-T subscale. All of the items that formed social cohesion were from the GI-S subscale and similarly, the two items that formed individual attraction to the group were from the ATG-S subscale. Of the three cohesion constructs, task cohesion was the only one significantly related to supervisor ratings of team performance. These findings are consistent with previous research (Mullen & Copper, 1994; Zaccaro, 1991) that have also shown that commitment to the task is related to work-group performance, whereas the social aspects of cohesion are unrelated to work-group performance. Guzzo & Shea (1992) appear to agree, suggesting that group tasks are important in determining the effectiveness of groups in at least three ways: as sources of individual member motivation, as a moderator of the relationship between member interaction and effectiveness, or as determinants of the instrumental interactions (i.e., task-related interactions) among group members.

However, contrary to the findings of Mullen & Copper (1994) and Carless & De Paola (2000) recent studies have suggested that group level task and social cohesion constructs are more appropriate for research that investigates the relationship between group cohesion and group performance (Chang, Duck & Prashant, 2006). This is because the limited number of studies with non-sporting teams generally found good support for the task-social distinction, but not for the group-individual distinction (Dyce & Cornell, 1996; Carless & De Paola, 2000). Carron et al. (2002a) concluded that a significant, positive, moderate to large relationship exists between cohesion and performance. This relationship was observed independently of type of cohesion (i.e., task vs. social), gender, sport type (i.e., co-active vs. interactive) or skill/experience of the competitors (i.e., high school, intercollegiate, club, professional). Additionally, both task and social cohesion were related to performance in a reciprocal fashion. Carless & De Paola (2000) support the use of the group individual attraction to the task subscale by suggesting that conclusions from their study raise questions about the usefulness of assessing social cohesion and individual attraction to the group in work groups.

Considering the literature, the choice to use the task cohesion subscale in assessing a reliable cohesion measure appears to have some support. Groups in the study were brought together at an early stage and were asked specific questions in relation to the task using the GI-T subscale. Aforementioned literature supports this measure for assessing cohesion in groups, and highlights the suggestion that task cohesion may have a more significant relationship with performance for sports and non-sports teams. There appears to be academic support for the task subscale being useful, when assessing cohesion and performance relationships within the teams that attend training at the centre. The choice for using the task cohesion measures as opposed to the social measures centres around the aforementioned findings by Blanchard *et al*. (2009) & Kozub & McDonnell (2000) the measurement in this study is when groups are engaged in the task. The group focus therefore was believed to be more accurate when directed to the responses by the group when answering the GEQ task integration subscale questions. Also, Kozub & McDonnell (2000) reported that despite positive significant correlations between

the two social cohesion scales and collective efficacy, they did not add significantly to the prediction of collective efficacy.

The focus of the current study was the relationship between collective efficacy and cohesion in groups. It is therefore hypothesised, from reviewed literature, that using the social cohesion scales, may have a reduced effect when collecting data for collective efficacy and cohesion when using task difficulty as a foundation for scientific measurement. Therefore, the lone use of the GI-T subscale is considered an acceptable collection method to accurately reflect the cohesion belief of the team. Increased cohesion belief through increased task difficulty may affect group performance, if this link could be established, the interacting relationship between each could be useful to underpin training strategy and explain group success or failure whilst engaged in centre development training.

2.7 Investigating the group cohesion-group performance relationship

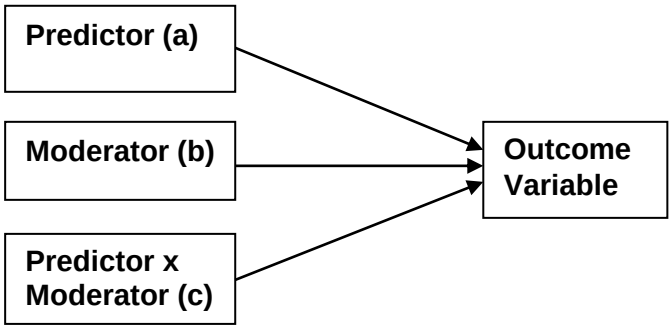
There are a significant number of studies surrounding the group cohesion-group performance relationship (Evans & Dion, 1991; Mullen & Copper, 1994; Oliver, 1994; Stoner, Freeman, & Gilbert, 1995: Carron, Colman, Wheeler, & Stevens, 2002b). Earlier literature identifies a concern for finding a methodical relationship between performance and cohesion (Stogdill, 1972; Steiner, 1972; Mitchell, 1982; Forsyth, 1990). Two meta-analytic studies concluded that a small but positive relationship between group cohesion and group performance existed (Evans & Dion, 1991; Mullen & Copper, 1994). However, subsequent studies disagreed with these meta-analyses on whether or not the cohesion performance relationship was moderated by other variables, such as level of analysis, task interdependency, goal acceptance, and group norm (Gully *et al.*, 1995; Podsakoff, MacKenzie, & Ahearne, 1997; Langfred, 1998). Carron *et al*. (2002b) highlighted that their meta-analysis offered insight of a descriptive nature but it did not provide an explanation – answers associated with the ‘‘why’’ or ‘‘when’’ of the cohesion – performance relationship. The search for why cohesion is related to performance belongs to the search for possible mediators; the search for when cohesion is related to performance applies to the search for possible moderators. The authors concluded that future research

should examine how the different manifestations of group dynamics influence this relationship.

2.7.1 Explaining the cohesion-performance relationship

According to Kim, Kaye, & Wright (2001), moderators and mediators serve different functions in causal models, and accurate interpretation of these functions is important. Baron & Kenny (1986) offer clarity mentioning, in general terms, a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Specifically within a correlational analysis framework, a moderator is a third variable that affects the zero-order correlation between two other variables.

Fig 1. Moderator Model (adapted from Baron & Kenny, 1986)



Using the study variables, the essential properties of a moderator variable are summarised in Figure 1. The model in Figure 1 has three causal paths that feed into the outcome variable of task performance, the impact of efficacy as a predictor (Path a), the impact of difficulty as a moderator (Path b), and the interaction or product (time) of these two (Path c). The moderator hypothesis is supported if the interaction (Path c) is significant. There may also be significant main effects for the predictor and the moderator (Paths a & b), but these are not directly relevant conceptually to testing the moderator hypothesis. In addition to these basic considerations, it is desirable that the moderator variable be uncorrelated with both the predictor and the criterion (the dependent variable) to provide a clearly interpretable interaction term. That is, moderator variables always function as independent variables, whereas mediating events shift roles

from effects to causes, depending on the focus of the analysis. Moderators are always at the same level as predictor variables, whereas mediator variables lie between a predictor and a dependent variable (Baron & Kenny, 1986).

2.8 Collective efficacy as a mediator variable

Carron *et al.* (2002b) suggested concentrating on group variables that have been shown to be correlated with both cohesion and team success. The research reviewed provides strong support for the proposition that one important mediator of the cohesion – performance (& performance – cohesion) relationship may be collective efficacy. Positive reciprocal relationships have been found to exist between cohesion and performance (e.g., Carron *et al*., 2002b), collective efficacy and performance (e.g., Myers *et al*., 2004b), and cohesion and collective efficacy (e.g., Paskevich *et al.,* 1999). Players in more cohesive teams may hold stronger shared beliefs in their team's competence, which in turn may lead to greater team success, and group performance success may increase players' perceptions of collective efficacy, which in turn may contribute to the development of cohesion. But research also indicates that the three variables operate within an interdependent connecting structure involving triadic reciprocal causation (Heuzé *et al*., 2006a). Cohesion, collective efficacy and performance operate as interacting determinants that influence one another bi-directionally. Therefore, perceptions of cohesion should also mediate the collective efficacy – performance (& performance – collective efficacy) relationship.

2.9 Reciprocal mediating structure

If this reciprocal mediating structure can be established, the variable effect may have direct implications for training, as the need to explore training task impact on each of the variables would appear to be of importance if they have a reciprocal effect. Students at the centre perceiving higher collective efficacy within their team may develop stronger perceptions of cohesion, which in turn may lead to greater team success, and group performance success may increase student's perceptions of cohesion, which in turn may increase perceived collective efficacy. There is strong evidence to suggest that collective efficacy beliefs partly determine teams' performance—the higher these beliefs

are the better is the performance. This conclusion has been reported in different domains of research such as education (Lent, Schmidt, & Schmidt, 2006; Wang & Lin, 2007) sports (Feltz & Lirgg, 1998; Myers *et al*., 2004a; Myers *et al.,* 2004b; Heuzé *et al*., 2006) and organisational psychology (Prussia & Kinicki, 1996; Little & Madigan, 1997; Jung & Sosik, 2003; Walumbwa, Wang, Lawler, & Shi, 2004).

2.9.1 Reciprocal triadic relationship and centre tasks

From the literature reviewed it would seem important to explore whether a reciprocal triadic relationship could be observed with students when engaged in interdependent centre tasks. Gully *et al.* (2002) suggest the degree of group interdependence serves as a moderator in the collective efficacy- performance relationship. Tasks that require higher levels of co-operation, co-ordination and have shared goals among group members appear to have stronger effects than group tasks being carried out independently. This literature appears to correlate with the study task conditions (the easy, moderate & hard tasks all requiring differing levels of interaction between the students), and the observed group goal setting (see section 6.2.1).

Therefore it is suggested the level of task difficulty and the time taken (performance time) in this study would be a moderator that could be used to investigate the triadic relationship between collective efficacy, cohesion (GI-T) and performance. Heuzé *et al*. (2006a) suggest there should be a triadic relationship between the aforementioned variables, this relationship was explored (see section 5.0 & discussion section 6.4) using the causal model for moderating and mediating effects of variables (Kim *et al*., 2001).

2.10 Task Interdependence

Research indicates that, when working in teams, it is essential that structured tasks are given to each specialised role in order to better coordinate work among several people. In order to effectively complete a task within a group, team members must be aware of the level of task interdependence (Kozlowski & Bell, 2003). Task interdependence is defined as “the degree to which group members must rely on one another to perform their tasks effectively, given the

designs of their jobs" (Saavedra, Early, & Van Dyne, 1993, p. 62). It would appear that "team level of interdependence" (Van de Ven, Delbecq, & Koening 1976, p. 323), best classifies centre activity group interaction as students have the autonomy to define their own roles, jobs, and the nature of their interaction. The requirement for mutual interaction among group members to diagnose, problem solve, and implement a process to complete the task, accurately reflects the syllabus training objectives. Research highlights the nature of the task may have implications for the appropriateness of certain performance strategies (Shea & Guzzo; 1987; Gully *et al.,* 1995; Wageman, 1995). Wageman (1995) postulates greater clarity in the task to group effectiveness relationship, suggesting, the efficiency by which a group or team is able to coordinate its social and task-related interactions across different task types is imperative to the ultimate effectiveness of the group.

2.11 Methodological perspective

There appears to be considerable debate about the appropriateness of methodologies amongst social researchers to capture information about human nature from human participants (Bryman, 1984). Significant discussion surrounds ontological and epistemological differences between the use of qualitative, quantitative, or a mixed methods approach to gain information from social research (Neuman, 2003).

Advocates of quantitative and qualitative research paradigms have engaged in ardent dispute (Burke-Johnson & Onwuegbuzie, 2004). From these debates, purists have emerged on both sides: Qualitative purists include Campbell & Stanley, 1963; Lincoln & Guba, 1985. Advocates for purely quantitative methods include, Ayer, 1959; Popper, 1959; Schrag, 1992; Maxwell & Delaney, 2004. Both sets of purists view their paradigms as the ideal for research and advocate the "incompatibility thesis" which suggests methods based on contradictory theoretical assumptions cannot be coherently mixed in a single study or set of studies (Howe, 1988 p.10).

Research that applies the positivist or post-positivist paradigm tends to predominantly use quantitative methods to data collection and analysis. Whilst the interpretivist/constructivist paradigm, operates using predominantly qualitative methods (Mertens, 1998; Silverman, 2000; Wiersma, 2000). Positivists aim to test a theory or describe an experience "through observation and measurement in order to predict and control forces that surround us" (O'Leary, 2004, p.5).

This study will not adopt a purist paradigm. Although, at first glance, methods are mainly quantitative in nature, author observations and discussions with instructors on data collection and group process will influence interpretations made. This mix of methods has been, more recently advocated by Creswell (2009) and has significant criticism from both within (e.g., Greene, 2008; Morse, 2005; Creswell, Plano Clark, & Garrett, 2008) and outside (Denzin & Lincoln, 2005; Howe, 2004) the mixed methods community. Despite this conflicting literature, Creswell (2010) champions mixed methods research, seemingly against the established qualitative/quantitative purist communities, who dispute the legitimacy of the philosophical underpinnings and pragmatics of conducting mixed method research.

2.12 Emerging research design

After careful consideration of the literature surrounding methodologies, an approach was selected that could be easily implemented without impacting on the training schedule at the centre—this was a central consideration and deciding factor in the adoption of a generally positivist/post-positivist approach.

Large numbers of personnel in randomly allocated groupings come through the centre and were an ideal opportunity to collect quantitative data. Literature highlights established links between task difficulty, group efficacy, cohesiveness and performance from areas outside the outdoor environment that provided a clear direction for designing an approach for measurement and analysis of the research parameters using questionnaires. The researcher accepts there may be a loss of contextual detail from using a purely quantitative data capture. However, the time consuming nature of gathering qualitative interview data from groups and individuals would have a significant impact on the tight training schedule.

At the centre, the bias of the researcher being immersed in the data capture when using interviews is a consideration (DeWalt & DeWalt, 2002). Whereas it is argued that, using a questionnaire approach, the researcher tends to remain physically separated from the subject matter and may have less influence on the group's interaction (Miles & Huberman, 1994). Thus, given the author's central role in the training process, a decision was made adopt a collection method in which this was potentially of less influence.

The next sections will discuss pilot studies and the resulting changes to eventual methods employed within the main study.

3.0 Pilot Study and Contributions to methods used

The term *pilot study* is used in two different ways in social science research. It can refer to so-called feasibility studies which are often scaled down versions to try out aspects of the major study (Polit, Beck, & Hungler, 2001). However, a pilot study can also be the pre-testing or 'trying out' of a particular research instrument (Baker, 1994). One of the advantages of conducting a pilot study is that it might give advance warning about where the main research project could fail, where research protocols may not be followed, or whether proposed methods or instruments are inappropriate or too complicated (Van Teijlingen & Hundley, 2001). Babbie (1998) suggests further reasons for conducting a pilot study including: assessing whether the research protocol is realistic and workable, identifying logistical problems which might occur using proposed methods and training a researcher in as many elements of the research process as possible.

As this would be the first time the efficacy questionnaire devised by Gibson *et al*. (2000) in conjunction with an adapted questionnaire devised by Carron *et al.* (2002a) would be used to collect data from military groups undertaking team development tasks, a pilot study was necessary for three reasons. Firstly to investigate the reliability of the data collection method, secondly to try out the activity condition timings that would frame the performance indicator, and thirdly to define the briefing protocol used by the trainer. The initial phase of pilot study (labelled group/collective efficacy methods) set out to consider some of the method-based issues highlighted in section 2.4 regarding measurement of efficacy in groups.

3.1 Group/Collective efficacy methods

As aforementioned there are two principle methods that best reflect a group's collective efficacy. Bandura (1997) & Stajkovic *et al*. (2009) suggest the aggregated score is the preferred way of assessing collective efficacy, this method is defined by the aggregation of individual group member perceptions of the efficacy of the group. In contrast is the group single value assessment method, where each group member considers his/her perception of the collective efficacy of the group and gives a single score. Gibson *et al*. (2000)

found the group single value method to best predict time taken to reach agreement when performing negotiation tasks. Prior to commencing the main study it was thought prudent to test these two collection methods at the development centre as all previous studies have used samples from the civilian populations in various disciplines e.g., sports, teambuilding and industry. Would results obtained using each method differ and would one method better suit the ethos of the existing training programme?

3.1.1 Method

Twenty groups, each consisting of six people with a mix of gender and ages (age range 18 to 45 years), were engaged in a desktop activity, which debated two conditions (easy & hard). The task required the group to work interdependently, manipulating four pens in the easy condition and five pens in the hard condition to produce required shapes within a set time period of 15 minutes. Groups were given a single questionnaire for the group single assessment value, and one each for the aggregated measurement. The questionnaire asked for their belief (efficacy) in completing the set exercise successfully.

3.1.2 Results and discussion

Results from this small pilot study identified differences shown in table 1. The aggregated mean in the hard condition appears to be significantly lower than the group single value measurement. Conversely, in the sample there was no difference to report in the easy measurement.

Table 1. **Results of single value and aggregated group efficacy methods in two conditions.**

Results of single value and aggregated group efficacy methods in two conditions		
	Single value	**Aggregated**
Easy	*100 (1)	*100
Hard	*40	*27.6
*Score of 20 groups with six students		

(1). 100 indicates the maximum score likert scale 5 = very probable x 20 groups.

The minimum score would be 20, likert scale 1 = not probable x 20 groups

The group single value efficacy measurement method was overseen by one of 12 centre trained facilitators who were rotated to alleviate personality bias. In addition the trainers were specifically briefed to encourage group discussion about the task only. The free flow of past experience and opinion about the task allowed an open and honest environment free from apparent training observational pressures. However, this facilitation may have unintended effects on the group decision making process. The facilitated discussion explored individuals' reasons for choice and allowed a re-calculation if wished. This interaction between facilitator and group is considered a potent delivery mechanism (Wheeler & Valacich, 1996) and should be factored as a possible bias on group agreement, further study would be useful to either confirm or deny this effect.

The aggregation efficacy method comprised the same social environment, which allowed discussion prior to score choice. Using this method, all the group scores were less in the aggregation efficacy collection as opposed to single value efficacy. Quantitative results (shown in table 1) and personal observation of discussions, led to a hypothesis that if opinions are congruent, the scores will be the same in both conditions. However, if opinions are undecided, a lower collective score will be observed when using the aggregated efficacy measurement.

The twenty groups of students who conducted the military centre pilot study of the two methods, mentioned in their discussions (post-study) that they all believed the group discussion single score, which for reasons of clarity I will term (group efficacy) measurement, was the most accurate group value. It is a limitation to this study that the researcher is unable to validate whether all students were fully engaged in the group discussion, however, all the facilitators mentioned centre groups were active in all discussions. The principal reasons for the final collection method were:

- More discussion and richer views were considered.
- A single score made the group reach a consensus and therefore more accurately communicated the group opinion.

- Unexpected personal views and insights were shared when the task solution was uncertain; the stronger desires of the group to reach a conclusion, allowed the facilitator to better explore individual reasons for numerical choice.

For the reasons outlined above and the apparent consensual validity (Gibson, 2000) regarding the single score technique's purposeful fit (see section 2.4 for discussion of limitations of this choice), a decision was made to use the group single assessment method as discussed in section 2.4.2.

3.2 Task and data collection methods

3.2.1 Method notes

In the task and data collection methods pilot study, 12 groups of 4 to 7 people participated in a version of the main study data collection that only differed in recommendations from the lessons learned (see section 3.2.3). The groups completed tasks in 3 set conditions (see section 4.1 for full discussion of methods employed), over a 12-week period.

3.2.2 Results

Hypothesis 1. Task difficulty was negatively correlated with performance

The Spearman's rank correlation was used calculating alpha level at .01 (1 tailed), to confirm a relationship between task difficulty and task time. The hypothesis that task difficulty was negatively correlated with performance could be confirmed.

Research identified there may be an unintended error using the Spearman's correlation as the performance time is ratio data. To test whether ranked or ordinal data would have a significant effect on the non-parametric correlation (spearman's) it was decided to use the parametric pearson's correlation coefficient to explore a linear relationship between strength of association between two variables and investigate whether there would be an effect on the data when run in both conditions. Table 2 shows pearson's r (12) = .968**, p= .000(1 tailed).

The data does show an ascending monotonic effect (as one value increases the other also increases) and therefore is suitable for a spearman's correlation. However, the spearman's correlation is non-parametric and may lose granularity in the data particularly when converted from ratio to ranked time. Of interest is the variance from pearson's ratio variable *r* (12) = .968**, *p*= .000(1 tailed) and pearson's ranked variable *r* (12) = .956**, *p*= .000(1 tailed) (see appendix 1, SPSS calculation output 1.1 & 1.2) which closely aligns with the spearman's result and shows a linear relationship with few outliers. It is therefore suggested the Pearson`s correlation, is a suitable choice to interpret the data for the first hypothesis that task difficulty was negatively correlated with performance.

Hypothesis 2. Easy tasks have no significant effect on group efficacy.
Hypothesis 3. Moderate tasks positively affect group efficacy &
Hypothesis 4. Difficult tasks negatively affect group efficacy.
The researcher wanted to compare and determine if there was any significant difference between the 3 groups; easy, moderate and hard. To test for the potential statistical significance of a true difference between sample means, a sampling distribution needed to be established of the difference between pre- and post-efficacy sample means. Using an alpha level of .05 (2 tailed), a 3 x 2 (task by time) ANOVA with repeated measures on time was conducted (see appendix 1.5) to evaluate whether there was a significant difference between pre and post-efficacy means between the task conditions.

The results indicated time was a significant predictor of Pre- and post- task efficacy F(1.000,9.000)=5.880,p=.038, ηp2=.395. Task level also interacted with time to predict task efficacy F(2.000,9.000)=12.000,p=.003, ηp2=.727. There were no significant differences between task levels F(2,9)=2.204,p=.166, ηp2=.329.

Follow up tests show no significant difference between task level and Pre- and post-task efficacy scores in the easy to medium task level M(.750,SD=.412)p=.307, also the medium Pre- and post-task efficacy scores are not significant to hard M(1.006E-013,sd,.412)p=1.000. The hypothesis that

moderate tasks positively affect group efficacy is rejected. Also the hypothesis that difficult tasks negatively affect group efficacy is rejected. The group sample of n=4 in each condition is considered too small to derive significance, the main study has a larger sample and may confirm or deny these results.

Hypothesis 5. Group cohesion was highest following engagement with a moderate group task.

Independent samples *t* tests were used to investigate whether the hypothesis could be confirmed. Using an alpha level of .05 (2 tailed), an independent-samples *t* test was conducted (table 2) to evaluate whether there was a significant difference. The results of the comparison of values between easy / moderate and moderate / hard are as follows; There was not a significant difference in the scores for easy task M=17.16, SD=1.73 and moderate task M=17.20, SD= 1.54 conditions; *t* (6)= -030, *p*= .977. Also, comparison between the values of moderate tasks M= 17.20, SD 1.540 and hard tasks M= 17.57, SD 1.64; *t* (5.98)= -.331, *p* =.752, does not show a significance in the difference in the scores between moderate and hard tasks (see also appendix 1, tables 1.8 & 1.9). Therefore the hypothesis for the pilot study is rejected. The group sample of n=4 in each condition is considered too small to derive significance, the main study has a larger sample and may confirm or deny these results.

Relationship between Efficacy and Cohesion

The relationship between the scores for efficacy and cohesion in each of the 3 conditions was examined through the use of a spearman's rank test calculating with an alpha level set at .01 (2 tailed) to explore the relationship between the two measures. In terms of the Hypothesis, there is not a significant relationship between group efficacy and cohesion. However, Spearman's *r* (12) = .319, *p*= .311(2 tailed) suggests a weak association between post-efficacy and cohesion. As task difficulty increases, post-efficacy and cohesion scores weakly correspond with each other. However the sample of n=12 is small, a larger sample may derive greater significance.

Table 2. Summary statistics for task and data collection methods

*(1 Tailed)

** (2 tailed)

Test type		N	Sig	P	Mean comparison		
1. Spearman's rank test for association between task difficulty and performance time.		12	.000	.956*			
2. Spearman's rank test for association between post efficacy and cohesion.		12	.319	.311**			
3. Pearson`s correlation test for association between task difficulty and performance time		12	.000	.968*			
			SD		Pre	Post	Diff
3. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post efficacy value in the easy condition.	Pre Post	4			4.50	4.25	-0.25
4. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post efficacy value in the moderate condition.	Pre Post	4			3.75	3.50	-.025
5. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post efficacy value in the hard condition.	Pre Post	4			2.50	4.75	2.25
					Easy	Mod	Diff
6. Independent sample test comparison of cohesion value between easy and moderate condition.	Easy Mod	4	1.73 1.54	.977	17.16	17.20	0.4
					Mod	Hard	Diff
7. Independent sample test comparison of cohesion value between moderate and hard condition.	Mod Hard	4	1.54 1.64	.752	17.20	17.57	0.37

3.2.3 Lessons learned

3.2.3.1 Briefing protocol

The briefing protocol underwent many procedural changes over the 12 week pilot study, trainers observed facilitator and student effects which changed the original brief. The limitations for the exercise require the trainer to place an exclusion zone for the task condition using a rope across a room. During two early studies trainers observed unintentional rope movement by the students which may have affected the limitation set for the activity. From this observation exclusion zones were designated using an adhesive tape that resists manipulation, a specific note was made on the briefing sheet to monitor this effect and stop to re-set if required. Trainers began to adapt the content from the sheet as their familiarity with the process developed. Two of the specific conditions of when to present the questionnaires and the role of the facilitator when the groups debated the efficacy measurement varied from trainer to trainer. To reduce this effect the researcher appointed an overall control trainer (the centre senior instructor), who observed all training and maintained standards.

During this time the trainers were encouraged to debate the briefing sheet and confirm their understanding of the study protocol. Trainers who were anxious of a possible stereotype effect also acknowledged a further concern. Trainers used the terms “my”, “group 1” and “best”, the use of which may have contributed to a performance outcome and was specifically outlined as an effect the research wished to avoid. All the trainers were consulted and relevant adaptions to the paperwork were made to avoid using this language when briefing the groups.

3.2.3.2 Questionnaires

The two questionnaires used were adapted from efficacy measurement studies Gibson *et al.* (2000) and the Group Environment Questionnaire (GEQ) devised by Carron, Brawley, & Widmeyer (1998). The efficacy questionnaires were found to be effective and easy to use after a small adaption. The question (Our team is certain that we are able to achieve the task considering the set limitations) for the 5 point likert scale was well defined however, the title efficacy

questionnaire led to confusing explanation from the students when consulted, who thought the meaning was “efficiency”. After this observation all further questionnaires dropped the title efficacy questionnaire in favour of the question (Our team is certain that we are able to achieve the task considering the set limitations), which appeared to be understood by all.

Early in the pilot study there appeared to be some confusion experienced by instructors and students when trying to interpret what was meant by the questions 3 and 5 (which were reverse scored). This effect was due to a researcher oversight whereby the wording for scoring purposes was unintentionally included on the questionnaire.

To investigate the internal reliability of the cohesion questionnaire, Cronbach’s alpha was calculated for each task condition:

- Easy, N=22, 5 items (α=.61)
- Medium, N=19, 5 items (α=-.51)
- Hard, N=23, 5 items, (α=.31)

The negative correlation in the medium reliability value suggest, the mean of all the inter-item correlations are negative. Thus, the reverse scored items (questions 3 & 5) were altered to score positively to see whether this alteration would improve the alpha value. Re-calculated output statistics for the medium task condition are:

- Medium, N=19, 5 items (α=.57)

The alpha value for each of the questionnaire task conditions are below the critical level of .70 as suggested by Nunnally (1978). Section 4.1.4 has further discussion on the adaption of the GEQ and factors that may have affected the internal reliability, also there appeared to be confusion in both students’ and instructors’ understanding of the reverse scoring for the GI-T subscale questionnaire. This questionnaire had two negatively worded questions and these were altered to read positively.

The researcher considered the format change, from the one suggested by Carron *et al*. (1998), to be useful to alleviate respondent's confusion. However, the researcher is mindful of this change and the effects of positive / negative bias in question wording (Alexandrov, 2010). Student's cognitive response to the differently worded questions could affect results. However, it is suggested the small questionnaire asking a total of 5 questions should limit the affect and the questionnaire will continue to be relevant for the data capture.

The Pilot study task and data collection methods confirmed a low internal reliability for the adapted questionnaires. A sample test on the main study questionnaire data was conducted to assess whether the positively worded items could increase internal reliability as suggested by Eys, Carron, Bray & Brawley (2007).

To investigate the questionnaire internal reliability, Cronbach's alpha was calculated for each task condition:

- Easy, N=24, 5 items (α=.71)
- Medium, N=23, 5 items (α=-.68)
- Hard, N=23, 5 items, (α=.61)

The values are an improvement from the pilot study. However, only the easy results are within the acceptable alpha value as proposed by Nunnelly (1978). The questionnaire is therefore a limitation to this study. More investigation should have been made to improve internal reliability. The distancing of the researcher, and time allocated to capture data due to unforeseen circumstances, are significant factors that resulted in the use of the questionnaire in its current form.

4.0 Main study

4.1 Method

4.1.1 Study participants and study context

The RAF study participants were teams of 4-7 adults, of predominantly European ethnicity (in military cohorts this is viewed as <2.1% Asian & Caribbean origin (Dasa, 2013)) and were randomly assigned to training groups for centre activities. Ethnicity is specifically mentioned to ensure the reader understands the cultural sample, this being predominantly white and in line with British military demographics.

Initial centre booking from external training teams was made by trade sponsors (e.g., Catering, Supply & Administrative). Prior to centre arrival a list of course participants was sent to the administrative staff detailing trade specialisation, physical fitness, academic experience, age and gender. This information was passed to the training team who scrutinise the details before randomly allocating groups, ensuring each consists of mixed trade and gender. However, due to unforeseen circumstances, see 4.1.4, this randomising strategy altered significantly. The student's age, academic and physical fitness is considered less important for the overall aim, which is to encourage diversity, personal and team development, understanding of other trades and service experience.

4.1.2 Ethical approach

To ensure an ethical approach was maintained throughout the study all group members were asked to complete a consent form before commencing research activities. Anonymity of the individual was deemed an important component of the study. The effects of stereotype (Steel & Aronson, 1995; Steel, 1997) on instructor perceptions of a student's trade, ethnicity, sex and the students inclusion in a study (Landsberger, 1958) are well documented and may effect intellectual performance by those being studied and those capturing the data.

There may also be an unintentional pressure for the trainee and instructor when participating in the study as the military hierarchical system at the centre is intentionally avoided to encourage a questioning environment. However, the transactional nature (Burns, 1978) of early military training may have a significant effect on the student. Therefore the use of an informed consent form allowed the participants sufficient personal space to consider their wish to be included in the study. This procedure was followed through both studies and was thought to be effective, there were no instances of any students wish to be excluded.

During the study questionnaires were annotated with the group name. Number and colour identification was avoided, as there may have been a perceived group effect in their belief of ability when being considered as belonging to group number or a colour such as red or blue. The identification of groups enabled the researcher to evaluate whether the randomising was effective and if group composition had an influence on the relationships between task difficulty, efficacy, cohesion and performance. To ensure individuals remain anonymous, each form was placed into a blank envelope and given to the unit administrative staff, which were located within a separate building to the instructional team carrying out the research. Should any person within the group decide not to take part in the study, the whole group would still complete the training as part of the wider syllabus training. To adhere to informed consent procedures and to avoid any influence on data collected, the whole group's performance was excluded from the research data.

4.1.3 Study design

a. Task difficulty

To explore the relationship with task difficulty, group efficacy, cohesiveness and group performance an activity was set. The activity for study was a Leonardo`s Bridge Building exercise (Metalogs, 2010). Two groups of between four and Seven members were briefed separately in accordance with the activity guidance notes (see appendix 4). After the initial brief, practice and ten minute brainstorming session, both groups continued to work independently in separate rooms, building a bridge construction from two metre length wooden sticks.

After a set maximum time limit of forty five minutes the facilitator removed a partition wall separating the two groups, they attempted to join the individual structures together across a set distance determined by the facilitator at the initial task brief.

One of three levels of task difficulty was randomly presented to the groups. To aid random selection, the researcher presented the facilitator with one of three opaque laminated cards, marked Easy, Moderate and Hard. The facilitator/instructor and researcher knew these cards however, no member of the student group had any idea of the selection. The researcher felt it prudent to mention a possible stereotype effect or threat (Steele, 1997) on a group. Groups who believe they are engaged in a set task condition labelled hard or easy may make assumptions on their task efficacy based upon that label before they commit to the task. As a consequence the possible effect and the researchers wish to avoid it, was an important component in a pre-brief (see appendix 4) to all facilitator/instructors before any commitment to the study was made. The three task conditions are outlined below

1 = Easy. To construct the partial bridge and join with the second group's partial bridge over a gap of 1m with no time limit and the solution exemplar picture. All group members were allowed to stand on the marked hedge area either side of the gap.

2 = Moderate. To construct the partial bridge and join with the second group's partial bridge over a gap of 1.5m within forty five minutes. No additional clues were presented at any time. One group member from each team was allowed to stand on the marked hedge area either side of the gap.

3 = Hard. To construct the partial bridge and join with the second group's partial bridge over a 2m gap within forty five minutes. No additional clues were presented at any time. No team members were allowed to stand within the marked hedge area.

b. Group efficacy

To study whether task difficulty has an effect on group efficacy a modified survey was used incorporating the recommendations of Gibson *et al*. (2000) who reviewed significant research and proposed a reliable single item measure for group efficacy using a five point Likert scale. Each group received one copy of the survey and each point represented a different level of overall efficacy from 1 = Not possible to 5 = Very possible. The students were encouraged to discuss and complete the questionnaire indicating how certain they would be to complete the task condition before (pre-task efficacy) commencing the activity. Immediately following success or failure the group discussed and completed a further questionnaire (post-task efficacy), indicating the group belief of success in completing the same or a similar future task within the set time period.

c. Group cohesion

Post- activity, group cohesiveness was assessed using the Group Integration-Task subscale of the Group Environment Questionnaire (GEQ, Carron *et al.*, 2002a). This task cohesion subscale contains five items to assess participants' perceptions of the degree to which their group was cohesive in relation to the task of building a bridge. For example, one item will read: "Our team is united in its commitment to achieve its timed task." Each item on the scale was rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The response to each item was averaged to provide a composite score for the scale—larger scores reflected stronger perceptions of task cohesiveness.

The original GEQ 9-point scale has been adapted for this study after consideration of the recommendation by Burke, Estabrooks, Hill, Loughead, & Patterson (2005). They made this revision in order to provide respondents with a consistent response format across constructs (i.e., cohesion, self-efficacy). Another adaption for this study was the decision to use only one from among the four cohesion measures contained in the GEQ (these being a, Group Integration Task (GI-T), b, Group Integration-Social (GI-S), c, Individual Attraction to Group-Task (ATGT), and d, Individual Attraction to Group-Social (ATG-S)). Given the task-oriented nature of the group's activity, the social

cohesion scales are considered least relevant and, therefore, were not considered. Additionally the groups were required to focus on collective outcomes (i.e., collective time taken). The Group Integration-Task (which queries "we, "our," & "us" perceptions) was chosen rather than Individual Attractions to the Group-Task (which queries “I, " "my, “& "me" perceptions). Data also allowed an exploration of the links between group efficacy and group cohesion and thus, the potential use of a single item measure in place of the full GEQ.

d. Group performance

The dependent variable of group performance was assessed for each group by recording the completion time for the assigned task.

4.1.4 Factors that may have affected the study

Recommendations from the pilot study were applied to the questionnaires and instructors briefing sheet. Critically, at the start of the main study, the researcher that conducted all initial briefs and ensured a standardised approach, was re-assigned to another centre, which made future regular contact problematical. Therefore it was considered prudent to amend the Instructor briefing sheet to ensure greater clarity for the group’s facilitator throughout the activity. Additionally Government cutbacks to the military decimated the training numbers attending the centre. The original randomised trade, gender and ethnic structure of the groups were altered to trade specific such as, stewards, motorised transport or police. This may have had a significant effect on the group results, which will be explored, in the discussion sections at 6.3 & 6.5.

4.1.5 Data analysis

The use of a control group in this particular adventure training context would not be acceptable to either clients or employer. The data contained in the class participant lists were exposed to comparative means tests. Section 4.1.4 discussed unforeseen circumstances that affected the original randomising strategy; the randomising strategy may have addressed some of the potential influencing factors external to the task itself. Therefore the data collection methods employed in this study are compromised partly by group formation.

Considering the literature review, five hypotheses were tested:

1. Task difficulty would be negatively correlated with performance.
2. Easy tasks have no significant effect on group efficacy.
3. Moderate tasks positively affect group efficacy.
4. Difficult tasks negatively affect group efficacy.
5. Group cohesion was highest following engagement with a moderate group task.

Hypothesis 1: a Pearsons's rank correlation test was used to compare task time with task difficulty.

Hypotheses 2, 3 and 4: a 3 x 2 (task by time) ANOVA with repeated measures on time was conducted to compare pre- and post-task values for group efficacy in each of the three conditions.

Hypotheses 5: an independent sample t test was used to compare values of cohesion scores post-activity for each of the 3 levels of task difficulty.

The relationship between the scores for efficacy and cohesion in each of the 3 conditions was examined through the use of a spearman's rank test in order to explore the relationship between the two measures.

To investigate a triadic reciprocal relationship between the variables a multiple linear regression analyses for each of the 3 task levels was undertaken in four conditions (Baron and Kenny, 1986), (see results 5.1).

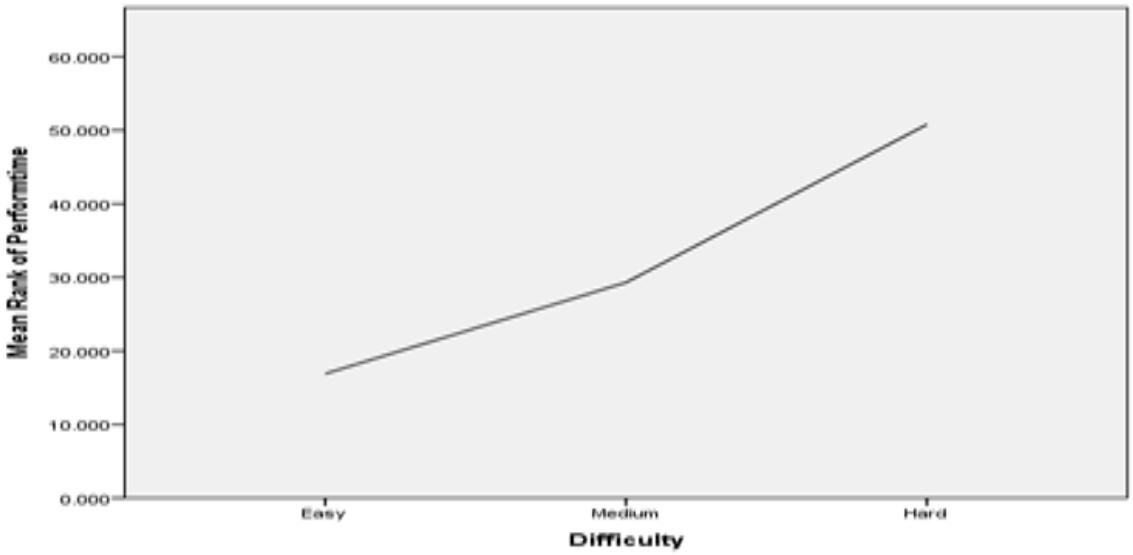
5.0 Results

The data from sixty eight studies was analysed in line with recommendations from the pilot study (see section 3.2.1), with the following results.

Hypothesis 1. Task difficulty was negatively correlated with performance

The Pearson's correlation was used calculating alpha level at .01 (1 tailed), to confirm a relationship between task difficulty and task time. The hypothesis that task difficulty will be negatively correlated with performance could be confirmed, (see table 3). Pearson's *r* (68) = .642*, *p*= .000 (1 tailed) suggests a strong correlation with difficulty and performance time. Fig 1 shows a simple line graph indicating the link of task difficulty and ascending time required to complete the activity. Therefore as task difficulty increases there was a corresponding increase in time taken to complete the task.

Fig 1. Simple Line graph from Pearson's correlation SPSS output showing ascending performance time to ascending task difficulty



Hypothesis 2. Easy tasks have no significant effect on group efficacy.
Hypothesis 3. Moderate tasks positively affect group efficacy &
Hypothesis 4. Difficult tasks negatively affect group efficacy.

Using an alpha level of .05 (2 tailed), a 3 x 2 (task by time) ANOVA with repeated measures on time was conducted (table 3). Time was not a significant predictor of pre and post task efficacy F(1,65)=.819,p=.164, ηp2=.030. Also neither task level F(2,65)=.556,p=.267, ηp2=.040 interacted with time to predict task efficacy. However there is significant differences between task levels F(2,65)=13.809,p=.000, ηp2=.298. Follow up tests show easy pre and post task efficacy scores are different to medium M(.425,sd=.154)p=.023 & medium pre and post task efficacy scores are different to easy m(-.425,SD.154)p=.023 but are not significantly different to the efficacy scores arising from hard tasks M(.325,SD.143)p=.078. The hypothesis that easy tasks did not have a significant effect on group efficacy can be confirmed. The hypothesis that moderate tasks positively affect group efficacy was rejected. Also hard tasks did not significantly affect group efficacy, therefore the hypothesis was rejected.

Hypothesis 5. Group cohesion was highest following engagement with a moderate group task.

Independent sample mean t tests were used to investigate whether the hypothesis could be accepted. Using an alpha level of .05 (2 tailed), an independent-samples *t* test was conducted (see table 3) to evaluate whether there was a significant difference.

Results of the comparison of means between easy / moderate and moderate / hard are as follows:

- There was not a significant difference in the scores for easy tasks M=18.79, SD=2.78 and moderate tasks M=18.74, SD= 2.31 conditions; *t* (38)= -062, *p*= .951.
- Comparison between the values of moderate tasks M=18.74, SD= 2.31 and hard tasks M= 17.79, SD 2.17 conditions; *t* (46)= 1.45, *p*=.154, does not show a significance in the difference in the scores between moderate and hard tasks.

Therefore the results are unable to support the hypothesis.

Relationship between Efficacy and Cohesion

The relationship between the scores for efficacy and cohesion in each of the 3 conditions were examined through the use of a spearman's rank test calculating an alpha level of 0.01 (2 tailed) to explore the relationship between the two measures. Posing the hypothesis, there is a significant relationship between group efficacy and cohesion, Spearman's r (68) = .098, p= .427(2 tailed) suggests a moderate to low association between post-efficacy and cohesion. As task difficulty increases, post-efficacy and cohesion scores moderately correspond with each other. The aforementioned hypothesis is therefore rejected in this study.

5.1 Main study multiple linear regression results

The moderator variable was held constant in each of the conditions and mediating effects were examined using; (a) performance as the independent variable, post efficacy as the mediating variable, and cohesion (GIT) as the dependent variable; or (b) performance as the independent variable, cohesion (GIT) as the mediating variable, and post efficacy as the dependent variable.

Appendix 2 SPSS calculation outputs 2.9 to 2.26 show multiple linear regression analyses for each of the 3 task levels and undertaken in four conditions.

1. The predictor (i.e. performance) must affect the mediator (i.e. post efficacy or cohesion (GIT)).

2. The predictor must be significantly related to the dependent variable (i.e. Group integration-task or post efficacy). The correlations indicated previously revealed that the two conditions were satisfied.

3. Requires the mediator must affect the dependent variable when regressed with the predictor (see section 5.1.1).

In the easy condition cohesion (GIT) was not significantly predicted by post efficacy (β = -.016, $t(2,17) = .062$, $p>.05$), (R^2=.010, f (2, 17) = .082, $p>.05$) when post efficacy was regressed with performance. Also, post efficacy was not significantly predicted by (GIT) (β = -.014, $t(2,17) = 0.62$, $p>.05$), (R^2=.097, f (2, 17) = .912, $p>.05$) when (GIT) was regressed with performance.

In the moderate condition cohesion (GIT) was not significantly predicted by post efficacy (β = -.024, $t(2,17) =.064$, $p>.05$), (R^2=.016, f (2, 17) = .135, $p>.05$) when post efficacy was regressed with performance. However, post efficacy was significantly predicted by (GIT) (β = -.783,$t(2,17) = -4.840$, $p<.05$), (R^2=.584, f (2, 17) = 11.937, $p<.05$) when (GIT) was regressed with performance.

In the hard condition cohesion (GIT) was not significantly predicted by post efficacy (β = .185, $t(2,25) =.940$, p>.05), (R^2=.066, f (2, 25) = .881, $p>.05$) when post efficacy was regressed with performance. Also, post efficacy was not significantly predicted by (GIT) (β = -.221, $t(2,25) = - 1.127$, p>.05) (R^2=.068, f (2, 25) = .914, $p>.05$) when (GIT) was regressed with performance.

4. The last condition implies that the effect of the predictor on the dependent variable must be less when regressed with the mediator than when regressed without it.

In the easy condition the effect of performance on cohesion (GIT) was not significant when regressed with post efficacy (β = .307, $t(2,17) = 1.337$, p>.05), (R^2=.104, f (2, 17) = .982, $p>.05$) also not significant when regressed without it (β = -.097, $t(1,18) = -.412$, p>.05), (R^2=.009, f (1, 18) = .169, $p>.05$). In addition, the effect of performance on post efficacy was not significant when

regressed with cohesion (GIT) (β = .307, t(2,17) = 1.337, p>.05), (R^2=.104, f (2, 17) = .982, p>.05) and was also not significant when regressed without it (β = .311, t(1,18) = 1.388, p>.05), (R^2=.097, f (1, 18) = 1.926, p>.05).

In the moderate condition the effect of performance on cohesion (GIT) was significant when regressed with post efficacy (β = -.760, t(2,17) = -4.840, p<.05), (R^2=.586, f (2, 17) = 12.030, p>.001) but not significant when regressed without it (β = .124, t(1,18) = .531, p>.05), (R^2=.015, f (1, 18) = .282, p>.05). In addition, the effect of performance on post efficacy was significant when regressed with cohesion (GIT) (β = -.760, t(2,17) = -4.840, p<.05), (R^2=.586, f (2, 17) = 12.030, p< .05) and was also significant when regressed without it (β = -.764, t(1,18) = -5.027, p<.05), (R^2=.584, f (1, 18) = 25.27, p<.05).

In the hard condition the effect of performance on cohesion (GIT) was not significant when regressed with post efficacy (β = -.218, t(2,25) = 1.127, p>.05), (R^2=.080, f (2, 25) = .1.080, p>.05) also not significant when regressed without it (β = .181, t(1,25) = .939, p>.05), (R^2=..033, f (1, 26) = .882, p>.05). In addition, the effect of performance on post efficacy was not significant when regressed with cohesion (GIT) (β = -.218, t(2,25) = -1.127, p>.05), (R^2=.080, f (2, 25) = 1.080, p>.05) and was also not significant when regressed without it (β = -.188, t(1,26) = -.975, p>.05), (R^2=.035, f (1, 26) = .950, p>.05).

The results of this study provide evidence of a mediating effect of post-efficacy in the performance – GI-T relationship in the moderate task condition only. The results also supported a mediating effect of GI-T in performance time – group efficacy relationship. Moreover, results indicated perfect mediations in the moderate task condition: performance had no effect (a) on GI-T when post-efficacy was controlled or (b) on post-efficacy when GI-T was controlled (Baron & Kenny, 1986). The results found no support of a triadic relationship in the

easy and hard task conditions. Also the moderate task condition questions the direction of the mediating relationships. These results do not support a triadic reciprocal relationship between group efficacy, cohesion and performance. Group efficacy and cohesion (i.e., GI-T) only appeared as an effect of performance.

Table 3. Summary statistics for main study

*(1 Tailed)

** (2 tailed)

Test type		N	Sig	P	Mean comparison		
1. Pearson's correlation test for association between task difficulty and performance time.		68	.000	.642*			
2. Spearman's rank test for association between post- efficacy and cohesion.		68	.098	.427			
			SD		Pre	Post	Diff
3. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post-efficacy value in the easy condition.	Pre Post	19			4.75	4.50	-0.25
4. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post-efficacy value in the moderate condition.	Pre Post	19			4.15	4.25	0.10
5. 3 x 2 (task by time) ANOVA with repeated measures on time comparison of pre and post-efficacy value in the hard condition.	Pre Post	27			4.03	3.71	-0.32
					Easy	Mod	Diff
6. Independent sample test comparison of cohesion value between easy and moderate condition	Easy Mod	38	2.78 2.31	.951	18.79	18.74	0.05
					Mod	Hard	Diff
7. Independent sample test comparison of cohesion value between moderate and hard condition.	Mod Hard	46	2.31 2.17	.154	18.74	17.79	-0.95

6.0 Discussion

6.1 Task difficulty, efficacy perceptions and performance time

Previous literature has established relationships between task difficulty and efficacy perceptions (Bandura, 1997; Feltz & Lirgg, 2001). Therefore the relationship of task complexity and the student's time to complete the activity may be highly significant to efficacy perceptions. There appears to be sufficient evidence (Pearson's r (68) = .642*, p= .000) to suggest that more complex tasks take longer, although there is not overwhelming proof for this effect. One interpretation could be that perceptions of efficacy differ for groups at different stages of training and/or in more normative stages of their development (Tuckman, 1965). The trade specific group structure may have had an effect on the dynamics of the group. Groups at this stage of training have been together for approximately twenty to twenty five weeks dependent on trade before attending the centre development week. These unforeseen group social changes may have affected the method collection rationale and subsequently the relationship between task difficulty and efficacy perceptions. Crucially, the decision to use a single group efficacy measure hinged on the centre activity being conducted by randomised groups. More socialised groups may have exhibited longer approaches to difficult tasks as they may have been more disposed to group discussion of role selection (a process that takes time) or social event (Bandura, 1997).

6.1.1 Task difficulty and pre- and post- efficacy relationship

6.1.1.1 Easy task condition

The easy condition is significantly less complex in the early stages of planning and problem solving than the moderate and hard conditions. The low interdependence and problem solving required during this early stage could negatively affect task-related interactions, because a solution is given to the team for them to implement once the activity commences. Perhaps the social loafing effect on groups (Steiner, 1972) has an effect on the students post - efficacy perception, when answering the question of the group belief of success in completing the same or a similar future task within the set time period.

The social loafing effect is considered less of a factor within this study, students at the centre may have a perception they should engage themselves in the task, regardless of complexity, due to the nature of the training and military service environment (see 4.1.2). Although the lack of complexity and resulting social loafing effect should be mentioned as a potential contributory factor in the easy condition. Observation of some students showed that they resisted full engagement in the pre-activity discussion period, which sets the scene for the team to coordinate its task-related interactions once the activity commences. This lack of full engagement in the pre-activity discussion period may be due to the social hierarchy established roles of group members in the study. Also, students who require more reflection or theoretical time to consider a response, may be more reluctant to offer opinion in the time allocated than their more activist (Kolb, 1971) colleagues, however this should be the same for all groups irrespective of trade and does not adequately explain the lower post task efficacy measure.

After the briefing stage, the easy task condition necessitates a higher degree of commitment and interdependence for all team members to achieve the task time within the allotted maximum time of 45 minutes. If the aforementioned low task interdependence is influencing the group, the considerable task engagement when teams decide leaders, role allocation and engage in the high levels of communication necessary once the activity commences, should hypothetically reduce this effect. Kozlowski & Bell (2003) discuss the importance of role allocation to team members when tasks have high levels of interdependence. Personal observation of the students' engagement in the easy task, and post-task discussion with students and facilitators, revealed that, without exception, all groups ensured team members had clear roles and divided the task into:

a. Individuals requiring support standing on the task hedge,
b. Individuals supporting the construction of the free standing structure, or,
c. A conceptual design crew, which continued to design a better construction if the one being used, failed.

All students were highly engaged at all times and the free flow of discussion throughout the activity was high. It is these observations that lead the researcher to believe the social loafing effect may not be a significant factor for the reduced pre-task and post-task efficacy score in this study.

6.1.1.2 Moderate task condition

The moderate task condition gave an increase in efficacy of + 0.10. This result confirms the literature which suggests that, as task difficulty rises there is a corresponding rise in the task interdependence required to complete the activity. This greater interaction is reciprocal and creates greater motivation for the team to integrate more and thus apply more effort to complete the activity (Kozlowski & Bell, 2003). However, the marginal increase is unexpected as both literature review and experience led to the hypothesis, that greater integration between team members would show a significant response in the post-efficacy value.

6.1.1.3 Difficult task condition

The interview and process of RAF selection training may be a predictor for highly efficacious individuals. Airmen and, specifically, aspirant officers are regularly exposed to command task and team development activities which do not always have solutions. There is also a possibility that the cultural moulding and stereotypic effect of service trades e.g., physical education, engineering and administrative, focus individuals to process tasks differently. The results in the study indicate that the students appear to share high efficacy beliefs. Pre- and post-efficacy group scores range between 3.50 and 4.75 (max score 5.00 = very possible) and raises the question as to whether this high efficacy score could be due to formative stages in training.

A further body of evidence suggests that strong beliefs of personal efficacy may have an influence in occupational development and the pursuits people choose to engage in. The high scores may be an indicator of a strong population cultural moulding and stereotypic effect mentioned earlier. Research indicates a possible reason for why the efficacy scores of the air force population were high. Preparation, interest in career choice and staying power in challenging

pursuits has been established as a predictor of increased perceived efficacy (Betz & Hacket,1983; Lent, Brown, & Hacket 1994; Hacket, 1995 & Bandura,1997). Considering this research the strong population cultural identity is likely to be enhanced through a nationwide interview and selection policy. This common process funnels individuals to a career choice that requires significant prior preparation and challenging training before considering an application. The commonality of selection and preparation suggests that trainees may have strong efficacious beliefs, and indicates a direction for why the Pre- and post-task efficacy beliefs are high in this population.

Another important consideration for the data collection method, used on the more socialised group (main study), is the proposed effect of group discussion (cf. section 2.4) when placed in the daily reality of work. The centre setting and discussion period may have turned into a social influence event where individuals felt the need to conform to group influences (Pronin *et al.*, 2007) rather than an unbiased, shared assessment procedure (Bandura, 1997) which may have altered the phenomenon being assessed. There may have been influences from the above areas in the population, service training and data collection however, the study hard task condition findings were aligned with expected norms i.e., a significant decrease in efficacy following task failure (Pre- task efficacy 4.03 & post-efficacy 3.71).

Table 4. Study Pre- and post-efficacy value difference for all 3 task Conditions

Task Condition	Value difference between Pre and Post efficacy belief
Easy	- 0.25
Moderate	.10
Hard	- 0.32

6.2 Sources of efficacy as contributory factors in this study

As discussed earlier (see section 2.2), theory concerning origins of self-efficacy (Bandura, 1997) suggests there are four sources of self-efficacy i.e., mastery, vicarious experience, social persuasion and physiological and emotional states. Maddux (1995) & Feltz & Lirgg (2001) propose these four sources should be increased to seven, adding (group size, group cohesion & imaginary experiences). As discussed in section 4.1.1 the study design initially observed randomised groups at an early stage of training, thus the researcher believed students would be unlikely to have experienced this task or one similar before undertaking centre task training and did not test for this effect. However the main study observed students at a later stage in training (see section 6.1).

Future study should investigate whether students have undertaken similar activities, if this could be substantiated, groups could participate in imaginary interventions, which may increase collective efficacy perceptions for military groups at the centre.

Efficacy is suggested as an influential mediator in human interaction (Bandura, 1986). If these additions are origins or sources of collective efficacy they may have a significant impact on RAFDTC(F) group training effects and the following sections discuss each in turn.

6.2.1 Group size

The group size was constant throughout the study and should not have made significant differences in each of the sample conditions. Research indicates the pressures on groups as team size increases (Zaccaro *et al*., 1995; Watson *et al.,* 2001; Feltz & Lirgg, 1998). The centre's standard group size of six was unaltered for the study. The centre proposes this as an optimal size, to allow students time to give opinion on the group's co-ordination and co-operation, and allow perceptions of collective efficacy to develop through discussion and exploration of past performance effects (Heuzé *et al*., 2006a). Section 2.2.2 highlighted anecdotal evidence, which suggested that, in the military, individuals from trade specialities and from each gender could begin to form cliques (Paris *et al*., 2005). On reflection, this effect could have been studied and further research should seek to find data to corroborate this assumption.

6.2.2 Group efficacy

Of interest is the limited effect of Bandura's (1997) four sources of efficacy, from which it was hypothesised that moderate tasks will have a significant effect on post-efficacy,

1. *The significant effect of mastery*. The groups were highly engaged in the task and succeeded in completing the task within the set performance parameter.

2. *Vicarious experience*. None of the students would have seen others engaged in this task—though perhaps the effect of undertaking similar problem solving tasks would have been an influence.

3. *Verbal persuasion*. No external persuasion was given by the directional staff, so any social persuasion was therefore present within the group. This may have been a mediating effect in the moderate condition, and certainly personal observation has observed large increases in a student's efficacy if verbal internal/external persuasion is present when engaged in tasks that are unfamiliar.

4. *Psychological and emotional states* will always have unexpected influences. Some students evidence fragile confidence when operating in a competitive training environment and this has regularly surprised the facilitators at the centre. However, although it is recognised as an effect, the researcher suggests for the short duration the students had to interact to complete the task, it may not be a significant contributor to pre- and post-efficacy in this study. Therefore the proposed significant mastery effect in the moderate task condition appears to have a marginal influence on the students at this centre whilst engaged in this bridge building task.

6.2.3 Efficacy measurement

Whereas the value difference is marginal (4.15 pre-task & 4.25) post-task, the score value of over 4 is high, with respondents suggesting that, if they were given the same task again in the future, they were highly likely to complete the task within the set conditions. The high efficacy scores may also be considered as a possible reason for a marginal significance between the two measures.

The high efficacy scores may be due to the chosen group discussion method. Research suggests people may refrain from communicating their true beliefs fearing negative sanctions and, as a result, the group environment surrounding discussions of success or failure are likely to be important for people to communicate their true beliefs (Bar-Tal, 1990). Also, according to Bandura (2000) measuring individual perceptions of collective efficacy is much more meaningful than group consensus because it allows us to understand the variances that occur within the group in terms of perceptions of efficacy.
In this way it may have allowed facilitators to identify those members who are lower in their efficacy perceptions and intervene to improve those perceptions.

The pilot study exploration of the measures noted that, if the decision between the students was in dispute, the aggregation method score would be significantly lower (see table 1, section 3.1). However, it would appear that student discussion highlighted little dispute in their deliberation of a consensual score. This effect was noted within the pilot study collection method and suggests that, when there is little dispute between respondents, the collective and aggregated methods will show similar results. Therefore it is suggested the adopted collection method is not a likely contributor to the high efficacy measure and that, the high measure should be accepted as the likely group belief of their consensual efficacy when asked to answer the pre- and post-question (Our team is certain that we are able to achieve the task considering the set limitations) in each of the task conditions.

6.3 Pre- and post-efficacy and task performance

There appears to be considerable academic support for the efficacy performance relationship in both laboratory (Hodges & Carron, 1992; Greenlees *et al.,* 1999) and field settings (Feltz & Lirgg, 1998; Watson *et al*., 2001; Paskevich *et al.,* 1999, Myers *et al.,* 2004a; Myers *et al.,* 2004b) and within the sports environment (Feltz & Lirgg, 1998; Watson *et al.,* 2001; Myers *et al*., 2004a,b). As previously mentioned, when considered together these results appear to support a reciprocal relationship between group efficacy and team performance. Therefore it must be considered whether the performance time is a predictor for the high efficacy scores in each of the conditions. Team-efficacy perceptions predicted performance of hockey teams better than the aggregated self-efficacies of the players (Feltz & Lirgg, 1998). Collective efficacy was also positively correlated with group performance in a field study of nurses in hospitals (Gibson, 1999). Reviewed literature suggests that the collection method used in this study should show a similar correlation.

The current study should highlight an effect of the efficacy-performance relationships which Lindsley *et al.* (1995) propose have a spiral nature; that is, initial efficacy perceptions affect performance, which in turn influence subsequent efficacy perceptions. Therefore when the students are engaged in tasks of this nature past performance will affect the efficacy level they take to the next. Bandura (1997) emphasised that self-efficacy is a reliable predictor of performance when the task is new and challenging and should be a considerable factor for this study. The students will be faced with a challenge that has similarities with others they have experienced before, yet is dissimilar in the specifics of the task. Perhaps the fact that students have faced similar tasks will contribute to the proposition that after people gain experience in performing their tasks, past performance should become the major explanatory factor of future self-efficacy (Bandura, 1997). This again would suggest a strong relationship between performance on the task and the subsequent efficacy figures.

The effect of the forming stage Tuckman (1965) on perceived self-efficacy in groups may affect social interaction and role allocation in response to increased task interdependence. It is proposed that groups who participated in the main

study were more aligned to a performing stage in their development. The model suggests that teams in the performing stage are more strategically aware; the team displays harmony, productivity, effective problem-solving and full development of the potential of the group. There will also be a high degree of autonomy i.e., if disagreements occur they are resolved within the team positively, and necessary changes to processes and structure are made by the team (Tuckman, 1965). Team performance in the set task requires mutual interactions and coordination among team members. As a consequence, the level of task interdependence will then influence social and psychological factors that shape team members' perceptions of efficacy. Group-efficacy perceptions should develop as the team members gain knowledge about how well they function together. The self-knowledge that each team member may have from his or her own personal history is not enough for evaluating how well the team will function as a unit. Therefore the shared perceptions of collective efficacy influence team performance and reciprocally, team performance influences the shared perceptions of collective efficacy that follow performance (Wageman, 1995; Feltz & Lirgg, 1998; Gibson, 1999). There is an established link between task difficulty and performance (which is measured in this study as completion of the task time in minutes). As the student's task becomes increasingly more complex, the time to complete the activity increases. Consequently, if there is a link between task performance and efficacy there should have been be a corresponding decrease in efficacy as the tasks become more complex and the performance time rises.

Table 5. Study Pre- & post-task efficacy comparison to performance time in minutes.

Task Condition	Pre-task efficacy	Post-task efficacy	Performance time in minutes
Easy	4.75	4.50	36.26
Moderate	4.15	4.25	41.82
Hard	4.09	3.71	64.74

In the study, as task difficulty rises there is a corresponding increase in performance time and Table 5 shows descending efficacy scores in the post activity efficacy condition. Therefore, the performance effect of success in completing the task within the set condition appears to correspond to post-task efficacy. As aforementioned, there appears to be a directional effect in line with current literature/hypothesis. However, the study results (see section 5.0) are statistically unable to support this effect.

6.4 Post-task efficacy and cohesion

Feltz & Lirgg (2001) suggest that cohesion is a construct of efficacy. Therefore there should be a corresponding link when the two are compared.
The cohesion scores, when compared with post-task efficacy, show marginal variances (see table 6). There appears to be a corresponding cohesion to post-task efficacy decrease, and would appear to suggest there might be a marginal relationship between the two measures.

Table 6. Study post-task efficacy and cohesion measures

Task Condition	Post-task efficacy	Cohesion
Easy	4.50	18.79
Moderate	4.25	18.74
Hard	3.71	17.79

As previously mentioned, cohesion, collective efficacy and performance may operate as interacting determinants that influence one another bi-directionally (Carron *et al*., 2002a). Therefore cohesion and collective efficacy should indicate similar responses when manipulated with higher task interdependence. Paskevich *et al.* (1999) suggest players in more cohesive teams may hold stronger shared beliefs in their team's competence, which in turn may lead to greater team success. Section 6.3 has established for this study a corresponding relationship between a decreasing post-task efficacy belief as task complexity increases and section 6.4 discusses a similar correspondence for post-task efficacy and cohesion. As task interdependence increases, post-efficacy reduces which suggests the group believe they are less likely to

achieve completing a task within the set conditions. The cohesion also decreases suggesting the group believes they are less cohesive as the restrictions applied to each task condition increase. The effect is non-significant, however, there appears to be an effect, which goes some way to support the triadic link between efficacy-cohesion and performance.

6.5 Limitations of the cohesion collection method

The effect of more socialised groups (Forsyth, 2006) may have a serious effect on the cohesion measurement rationale, as the researcher only used the GIT subscale which hinged on the effect of individuals at a very early stage of formation coming together to perform a task. In the pilot study, group members were introduced to each other in the morning before the activity in the afternoon of the same day. However, due to government cutbacks and unforeseen trade training requirements, the pilot and main study groups attended training at the centre in different stages of their phase 2 trade training (for the pilot study this was between weeks 4 to 7 and main study from weeks twenty to twenty five).

For cohesion (GI-T) the pilot study response was >17.16 and the main study score >18.74. Although not statistically different, it shows a trend for the response to be higher in the main study, which perhaps could be attributed to the increased social integration in the main study. Cota *et al.* (1995) suggested the task-social and individual-group dimensions are important to understanding cohesion in many types of groups and have been identified independently by other researchers. These two dimensions have been tested with the GEQ in many reports (Cota *et al*., 1995). The literature appears to support the use of the two measures to accurately reflect the group cohesion belief. In this study, the researcher dismissed this social effect as the students were to be randomised as discussed (see section 4.1.4). In support of the design decision to use task subscales only, Kozub and McDonnell (2000) dispute the use of the social cohesion subscales by mentioning they did not add significantly to the prediction of collective efficacy. Carless & De Paola (2000) also support the single use of the GIT subscale as conclusions from their study raised questions about the usefulness of assessing social cohesion and individual attraction to the group in work groups. The centre groups would appear to closely resemble

the definition of work teams (Koslowski & Bell, 2001). As a result, literature suggests that social integration would not act significantly to the prediction of cohesion in this study. However, social integration may have a marginal causal relationship if pilot and main study total scores are compared.

Future research may find it useful to include one or both social subscales when assessing group cohesion during engagement in team orientated tasks.

6.6 Cohesion and performance relationship

If cohesion and performance have a relationship, the association between increasing time to complete the task and cohesion scores should be a negative one in this study. Table 7 shows the scores of cohesion and the performance time for groups to complete the task in each of the 3 conditions. Study results show a reducing cohesive score as task difficulty and performance time increase. Which suggests, as group tasks get more difficult and teams fail to meet their goal within set limitations, they are more likely to believe they are less cohesive.

To explain the effect on the team cohesion score reducing as task difficulty rises, it is proposed that teams with clearly defined goals, and obvious high expectations of success within the set deadline, may observe or gain different opinions on the team interactions. These opinions may negatively affect their personal perceptions of the group cohesion, as the task's high levels of interdependency places external pressure on the team to complete the activity in the set time (Wageman, 1995). Teams who easily complete the task within the limitations may observe a different interaction i.e., the interdependent pressure of easy to moderate tasks in this study should be enough to stimulate discussion and problem solving. The requirement to maintain a free flow of ideas and group integration to solve the task within the set limitations should increase the group cohesion belief (Mullen & Copper, 1994: Stoner *et al.,* 1995).

Study results appear to support this cohesion-performance relationship. As task difficulty increases cohesion scores decrease (see table 7). This would suggest the task performance time and interdependent nature of the task has a causal relationship on cohesion.

Table 7. Study comparison of cohesion score and performance time in minutes

Task Condition	Cohesion	Performance time in minutes
Easy	18.79	36.26
Moderate	18.74	41.82
Hard	17.79	64.74

6.7 Investigating the triadic relationship between collective efficacy, cohesion and performance.

The results from this study showed no mediating relationships between the variables in the easy and hard task conditions (see results 5.1). However, in the moderate condition the results revealed two mediating relationships: post-efficacy significantly mediated in the performance – GI-T relationship, and GI-T was a significant mediator in the performance – post-efficacy relationship (see section 5.1). Previous studies (Gully *et al.,* 2002; Heuzé *et al*., 2006a) suggest mediating effects within the GI-T – group efficacy – performance relationship. Multiple linear regression tests were carried out in each of the 3 task conditions to explore this finding (see sections 5.1.1 to 5.1.3). The results of this study provide evidence of a mediating effect of post-efficacy in the performance – GI-T relationship in the moderate task condition only. Consequently it is proposed that students' individual performances contribute to their perceptions of efficacy, which in turn contribute to their perceptions of GI-T.

The results also supported a mediating effect of GI-T in performance time – group efficacy relationship. Students' individual performances influence their perceptions of GI-T, which in turn influence perceived group efficacy. Moreover, results indicated perfect mediations in the moderate task condition: performance had no effect (a) on GI-T when post-efficacy was controlled or (b) on post-efficacy when GI-T was controlled. The results found no support of a triadic relationship in the easy and hard task conditions.

Also the moderate task condition questions the direction of the mediating relationships. These results do not support a triadic reciprocal relationship between group efficacy, cohesion and performance. Group efficacy and

cohesion (i.e., GI-T) only appeared as an effect of performance. This result is aligned with some previous studies that supported a relationship between performance and cohesion (e.g., Zaccaro, 1991; Mullen & Copper, 1994), or described prior performance as a source of collective efficacy (e.g., Hodges & Carron, 1992; Bandura, 1997; Greenlees *et al.,* 1999; Zaccaro *et al.,* 1995). It is also partially consistent with research that supported reciprocal relationships between cohesion or collective efficacy and performance (e.g., Feltz & Lirgg, 1998; Carron *et al.,* 2002; Myers, *et al.,* 2004a).

Considering this existing research evidence, a surprising finding is the lack of any significant relationship in the easy task condition. The level of task interdependence in the activity is thought to be consistent with providing sufficient stimulus for the team to make significant interactions, which would have an impact on their perceived efficacy and cohesion scores. Perhaps a reason for the present findings could be related to the characteristics of Royal Air Force personnel. The student's prior experience through similar training may create highly efficacious team orientated individuals who understand the need to integrate previously learned experiences to enhance greater team efficiency. This prior experience may explain the group belief that the easy task condition was set at a level that did not engage them enough to observe an increased belief in efficacy and cohesion.

6.8 Implications for centre tasks and training

Bandura (1997) suggests all human beings are subject to social influences that shape their formative stages through life that will affect their choice of direction and strength to their agentic perspective. We are self-organising, proactive, self-reflecting and self-regulating individuals, and not just reactive organisms shaped by environmental forces or driven by inner impulses. Our educational background may be an effect of this earlier socialisation and the path we choose reflects the many influences on personal choice shaped by interests, historical family perspectives and economic factors. Members of the Commonwealth and wider continents will share these influences and bring many differing views from backgrounds that will all bring a rich exchange of political and social opinion for personal and group interaction.

Military service instils a common identity through shared training history and uniform. Early trade training brings to the fore common goals and objectives which may influence individuals to easily accept group work as a critical component of military service (DG Leadership, 2012).

Many professional work placements (e.g., NHS), large corporations (e.g., Tesco & Asda), financial institutions (e.g., Barclays & Lloyds banks) and service orientated organisations (e.g., Fire, Police & Prison service) have strong value systems. However, although all RAF service population will share similar early socialisation which will inform and influence all staff, there are significant differences in the nature of military service that when compared to any civilian organisation, especially if you consider the requirement to fight for your queen and country. The serviceman is subject to an interview and selection process, which streams the applicants, and a training policy that influences all servicemen irrespective of rank or trade which, at first glance, is similar to other large corporations. However, extreme training in preparation for adversity and social influences instil a strong sense of belonging through shared uniform, trade badges, historical reference, arduous field & adventure training, extreme exposure to climates and regular duty gatherings. Additionally, the rigid hierarchical structure places a framework for interaction between junior and senior management that will always imbue a strong sense duty to comply with leadership and ethical policy that underpin service life.

Students regularly undertake development training as part of the Generic & Education Training Requirement (GETR), which inculcates the Chief of the Air Staff (CAS)' direction for through life training of all personnel. FDTC training is initiated in late phase one syllabus for airmen and later training phases for all trades. Personal and team development including service specific training, undoubtedly has an effect on the personnel who supports mission directives. However, the less tangible effect of personal and team interaction is not so well understood. Also the larger investment of engagement and training for managers at all levels imposes a further training burden on an already highly tasked work force.

Team task integration through shared experiences of challenges all form part of the toolbox for facilitators when used as part of a larger syllabus or direction of training. The nature of these tasks is wide ranging from climbing to mountain biking and canoeing to desk top type activities. As already established, all personnel will inevitably have a mix of experiences that will affect their engagement in the task set by the centre staff. Experience suggests, the use of table top exercises in the early stages of the programme may help develop a stronger bond between the team, to create an open and honest environment that shares an agreed commonality, to allow opinion and greater understanding of the organisations aims and the expectations of each team member for the training week. The nature of the task is important as task difficulty will affect the performance time and facilitators must ensure the task difficulty is set within the ability of the group. This task condition will be a difficult consideration and inevitably place large pressure on the training staff that may not have prior experience of the group. The Leonardo's bridge task chosen for this study is thought to be ideal, as the conditions can be easily manipulated to suit the group if the initial level exceeds their abilities as the team progresses through the task.

This study suggests that the moderate task condition is suitable for groups to achieve a consistent rate of success, which increases efficacious belief in the group's ability to be successful in future similar tasks. The easy condition appears to have less of an effect and the hard condition shows a negative response. As a result, centre initial tasks should be set at a moderate task difficulty that has sufficient task interdependence to engage the group and create a consistent environment to promote team success. This higher efficacious belief for groups may have large implications for the future tasks the team chooses, as their mastery of this experience will form opinions of their likely ability to perform well in the next.

Study results suggest that easy tasks enhance the group belief of greater cohesion as measured in the group integration task subscale. The structure of the randomised groups that participated in the pilot study was different from the more socialised groups currently under training at the centres. This greater

socialisation may have had an effect on the cohesion values recorded in this study. However, irrespective of prior socialisation, all groups were at an early stage of experience in centre tasks and located from their training/work areas that formulated much of their social interaction. Considering this important factor the cohesion measure should be considered as a reasonable reflection of the group cohesion belief. Cohesion has been established as a construct of efficacy and the performance dependent variable appears to have a causal role in creating greater cohesion belief. To maximise the performance and efficacy effect, centre tasks should take into account the specific aspects of cohesion measured in this study (see section 4.1.3).

Discussion with facilitators suggests that many tasks are set at a very high level of task interdependence, or presented to the group in a hierarchical manner in order to create a peer pressure environment which will restrict team interaction and free discussion of individuals` concerns about the challenges set. Subsequent investigation into the use of this strategy revealed some interesting facilitator rationale,

- Very difficult tasks ensure the group fails, causes friction and are viewed as an aid to discussion for cross-examination by the team.
- We all come against tasks that are beyond our ability and it is good to expose the team to this.
- It will closely resemble the future tasks they will be exposed to out of training and into war settings, and the RAF is a military organization, the students have to be aware of this, the centre is a training establishment that needs rules and regulations.

The researcher is aware of the apparent validity of some of these suggestions, and has some sympathies to the military ethos and obvious need for regulations that underpin military service.
The main objection to these approaches is the huge weight of literature and overall message from senior management, calling for use of a more informed approach. If inexperienced trainers use difficult tasks, aspirant leaders in all ranks may make decisions that become vindicated by the turn of events. Future

qualification and rank which serves to confirm this highly efficacious belief could lead to managers and leaders to become intolerant of opposing points of view and resentful of criticism. Thus the capacity for frank discussion and organisational learning may be lost as successes mount and collective efficacy correspondingly rises (Miller, 1990).

This study and specifically the GI-T cohesion measure suggest that respondents will be less likely to feel the team is more cohesive after integrating the aggressive strategies outlined above. Performance has been established as a major factor for enhanced cohesion belief, the suggestion from this study would be to use activities that increase confidence, ensure all students are aware of their role within the task, and create an environment that allows a free flow of discussion which will increase the knowledge of past experiences known to the team which will then increase the teams confidence in completing future tasks which may require greater interdependence within the group.

Students are engaged with many activities outdoors where measurement of group development through a lengthy measure (e.g., GEQ, Carron *et al.,* 2002a) would not be appropriate. Instead, typical debriefing occurs in discussion with groups post activity. Given the similar effects on task condition observed in the two measures group post-task efficacy and group cohesion, the use of a validated single item, discursive measure of group efficacy was found to be a likely descriptor of a group's perceived efficacy. The high post-task efficacy belief score suggests the group may perform well and believe they are more cohesive. Therefore a single item measure post activity to measure group development could be used by the facilitator to provide an indicator for training effect. Further exploration of this data collection could be beneficial to military training teams to investigate the meaning of group work in outdoor activity**.** This study highlighted probable differences in the military population that may have observable influences on their perception of group efficacy and cohesion.

7.0 Conclusion

RAFDTCs are outdoor training centres. The management and staff use activity as a catalyst for discussion regarding team and personal development, which provide learning outcomes from group activities. Using these interactions individual moral and ethical beliefs are discussed. These beliefs and observations of military experience are compared with those of the organisation. Students are encouraged to investigate social interaction using psychological models and psychometric testing guided by centre instructional staff. Outdoor activities (including MTB, climbing, canoeing & hill walking), and various indoor tasks are used in the early formation of the groups to promote a feeling of esprit d corps and common language before more active and environmentally demanding team tasks are given to the group to complete.

This study investigated a typical team building activity used by facilitators at FDTC Fairbourne as part of the current syllabus of training. The data collection ran for 9 months resulting in 12 pilot and 68 main studies. Three task conditions (easy, moderate & hard) were presented to randomised groups (pilot study) and trade specific groups (main study). The task specific details were outlined by the facilitator before group deliberation of how successful they would be (pre-task efficacy). After this discussion they were then asked to give a consensual score by completing a pre-task efficacy questionnaire. Directly following their activity the group was asked to provide a score that reflected how successful they believed the group would be, if asked to do this task again, or one similar, in the future (post-task efficacy). Following this group discussion and completion of the post-task efficacy questionnaire, the group members were asked to individually complete a modified GEQ using the GI-T subscale only, to interpret the group's cohesion belief.

Five hypotheses were tested to explore whether relationships could be established between task difficulty, efficacy, cohesion and performance

1. Task difficulty will be negatively correlated with performance. Study results confirmed that when task difficulty rises, there is a corresponding rise in time taken to complete the task within the set conditions.

2. Easy tasks will have no significant effect on group efficacy could be confirmed. However, results observed a drop of 0.25 in post-task efficacy belief. Social loafing effects may be influencing the group choosing to participate in future tasks of this nature. Further research should aim to investigate whether this task was a true indicator for this effect.

3. Moderate tasks will positively affect group efficacy was rejected. A small positive effect of 0.10 was observed in the post-task efficacy score, however this effect was not significant and the hypothesis for the study is rejected. Further study should aim to investigate whether the efficacy measurement affected this finding.

4. Difficult tasks will negatively affect group efficacy. A trend was observed in the hard task condition (where pre-task efficacy score = 4.09 &, post-task = 3.71). However the result is not significant and the hypothesis cannot be verified, therefore for the study, hard tasks do not significantly effect group efficacy.

5. Group cohesion will be highest following engagement with a moderate group task was not substantiated. Cohesion scores were slightly higher in the easy task condition (see section 6.5 table 6). The different task level results for all of the cohesion scores are minimal, and only show trends indicating effects on group cohesion by task difficulty. Further research using a larger sample may confirm or deny this effect.

Relationship between Efficacy and Cohesion

Posing the hypothesis, there is a significant relationship between group efficacy and cohesion, Spearman's r (68) = .098, p= .427(2 tailed) suggests a moderate to low association between post-efficacy and cohesion. As task difficulty increases, post-efficacy and cohesion scores moderately correspond with each other. The aforementioned hypothesis is therefore rejected in this study.

Triadic Reciprocal Relationship

Multiple linear regressions were undertaken to investigate this effect. There was no evidence to support any reciprocal relationships in the easy and hard task conditions. The results of this study provide evidence of a mediating effect of post-efficacy in the performance – GI-T relationship in the moderate task condition only. It is proposed that centre students individual performances contribute to their perceptions of group efficacy, which in turn contribute to their perceptions of GI-T. The results also supported a mediating effect of GI-T in performance time – group efficacy relationship. Therefore centre students' individual performances influence their perceptions of GI-T, which in turn influence perceived group efficacy.

8.0 References

Alexandrov, A. (2010). Characteristics of Single-Item Measures in Likert Scale Format. *Business Research Methods,* 8(1),1-12.

Archer, D., Swinney, R., Taylor-Powell, C., & Whinstanley, D. (2003). Officer Cadet Training Review-Leadership in Royal Air Force Officer Training. In D. Williamson, M. Wood, P. Case, R. Bolden, A. Marturano & J. Gosling (eds), *Leadership Refrains: Encounters, Conversations & Enchantments*. Studying Leadership: 3rd International Workshop, 15-16 December 2004. Centre for Leadership Studies, University of Exeter.

Ayer, A. J. (1959). *Logical positivism*. New York: The Free Press.

Babbie, E. (1998). *Survey Research Methods* (2nd ed.). Belmont: Wadsworth.

Baker, T. L. (1994). *Doing Social research* (2nd edn.), New York: McGraw-Hill.

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

Bandura, A. (1982). The self and mechanisms of agency. In J. Suls (Ed.), *Psychological perspectives on the self* (vol. 1). Hillsdale, NJ: Erlbaum.

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

Bandura, A. (1989). Perceived self-efficacy in the exercise of personal agency. *The Psychologist: Bulletin of the British Psychological Society*, 2, 411-424.

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

Bandura, A. (1999). Exercise of agency in personal and social change. In E. Sanavio (Ed.), *Behaviour and cognitive therapy today*: Essays in honour of Hans J. Eysenck (pp. 1-29). Oxford: Anonima Romana.

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science*, 9, 75-78.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology,* 52, 1-26. Palo Alto, CA: Annual Reviews.

Barrick, M. R., Stewart, G. L., Neubert, M. & Mount, M. K. (1998). Relating member ability and personality to work team processes and team effectiveness. *Journal of Applied Psychology,* 83, 377-391.

Barrick, M. R., Bradley, B. H., Kristof-Brown, A. L & Colbert, A. E. (2007). The moderating role of top management team interdependence: Implications for real teams and working groups. *Academy of Management Journal*, 50(3), 544-557.

Baron, R. M. & Kenny, D. A. (1986). Moderator-mediator variables distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-82.

Bar-Tal, D. (1990). *Group beliefs: A Conception for analyzing group structure, processes, and behaviour*. New York: Springer.

Bass, B. M. (1960). *Leadership, psychology, and organizational behaviour*. New York: Harper.

Betz, N. E. & Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behaviour*, 28, 329-345.

Biran, M. & Wilson, G. T. (1981). Cognitive versus behavioural methods in the treatment of phobic disorders: A self-efficacy analysis. *Journal of Consulting and Clinical Psychology*, 49, (6), 886-899.

Blanchard, C.M., Amiot, C.E., Perreault, S., Vallerand, R.J. & Provencher, P. (2009). Cohesiveness, Coaches interpersonal style and Psychological needs: their effects on self-determination and athletic subjective well-being. *Psychology of Sport and Exercise,* 10, 545-551.

Bloom, G.A. & Stevens, D. E. (2002). *A team building mental skills training programme with intercollegiate equestrian teams, Athletic Insight 4*. Retrieved February 12, 2012 from www.athletic insight.com,vol 4, issue1.EquestrianTeambuilding.htm.

Boone, K. S., Beitel, P. & Kuhlman, J. S. (1997). The effects of the win/loss record on cohesion. *Journal of Sport Behaviour*, 20, 125-134.

Borgogni, L., Dello Russo, S., Petitta, L. & Latham, G. P. (2009). Collective efficacy and organizational commitment in an Italian city hall. European Psychologist, 14, 363–371.

Bray, S.R., Gyurcsik, N.C., Martin Ginis, K.A. & Nicole Culos Reed, S. (2004). The proxy efficacy exercise questionnaire: Development of an instrument to assess female exercisers proxy efficacy beliefs in structured group exercise classes. *Journal of Sports & Exercise Psychology*, 26, 442-456.

Britner, S.L. & Pajares, F. (2006). Sources of Science Self-Efficacy Beliefs of Middle School Students. *Journal of Research in Science Teaching*, 43(5), 485-489.

Bryman, A. (1984). The debate about quantitative and qualitative research: A Question of method or epistemology? *The British Journal of Sociology*, 35(1), 75-92.

Burke-Johnson, R. & Onwuegbuzie, J. A. (2004). Mixed methods research: A Research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26

Burns, J. M. (1978). *Leadership*. New York: Harper and Row.

Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research on teaching. In N. L. Gage (Ed.), *Handbook of research on teaching* (pp. 171-246). Chicago: Rand McNally.

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

Carron, A., & Brawley, L. R. (2000). Cohesion: Conceptual and measurement issues. *Small Group Research*, 31(1), 89-106.

Carron, A. V., Brawley, L. R., & Widmeyer, W. N. (2002a). *Group environment questionnaire: Test manual*. Morgantown, WV: Fitness Information Technology.

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

Carron, A.V., Hausenblas, H., & Eys, M.A. (2005). *Group dynamics in sport* (3rd ed.). Champaign, IL: Human Kinetics.

Carless, S. A. (2000). Reply to Carron and Brawley. *Small Group Research*, 31(1), 107-118.

Carless, S. A., & De Paola, D. (2000). The Measurement of Cohesion in Work Teams. *Small Group Research*, 31(1), 71-88.

Chang, A., Duck, J. & Prashant, B. (2006). Understanding the Multidimensionality of Group Development. *Small Group Research*, 37(4), 327-350.

Cota, A. A., Evans, C. R., Dion, K. L., Kilik, L., & Longman, R.S. (1995). The structure of group cohesion. *Personality and Social Psychology Bulletin*, 21, 572-580.

Cox, T. H., Lobel, S. A., & McLeod, P. L. (1991). Effects of ethnic group cultural differences on cooperative and competitive behaviour on a group task. *Academy of Management Journal,* 24(4), 827 -847.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* (3rd ed.). Thousand Oaks: Sage.

Creswell, J. W. (2010). *Mapping the developing landscape of mixed methods research*. In A. Tashakkori & C. Teddlie (Eds.), SAGE handbook of mixed methods in social & behavioral research (2nd ed., pp. 45–68). Thousand Oaks, CA: Sage.

Creswell, J. W., Plano Clark, V. L., & Garrett, A. L. (2008). *Methodological issues in conducting mixed methods research designs*. In M. M. Bergman (Ed.), Advances in mixed methods research (pp. 66–83). London: Sage.

Curral, L. A., Forrester, R. H., Dawson, J. F., & West, M. A. (2001). It's what you do and the way that you do it: Team task, team size, and innovation-related group processes. *European Journal of Work and Organizational Psychology*, 10, 187-204.

DASA, (2013). Defence Analytical Services and Advice dasa.mod.uk. Retrieved June 1, 2013 from http://www.dasa.mod.uk/publications/people/military/monthly_personnel_report/2013-06-01/1_june_2013.pdf?PublishTime=08:30:00.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2005). *The SAGE handbook of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage.

DeWalt, K. M. & DeWalt, B. R. (2002). *Participant observation: a guide for fieldworker*s. Walnut Creek, CA: AltaMira Press.

DG Leadership, (2012). Developing Leaders – A Sandhurst Guide. Retrieved August 17, 2014 from https://www.army.mod.uk/documents/general/rmas_developing_leaders.pdf

Dyce, J. A., & Cornell, J. (1996). Factorial validity of the group environment questionnaire. *Journal of Social Psychology*, 136, 263-264.

Essens, P., Voglelaar, A., Mylle, P., Blendel, G., Paris, C., Halpin, S. & Baranski, J. (2005). Military Command, Team Effectiveness: Model and Instrument for Assessment and Improvement. RTO Technical Report, North Atlantic Treaty Organisation. Retrieved August 22, 2014 from http://www.sti.nasa.gov/pubs/star.html

Evans, C. R., & Dion, K. L. (1991). Group cohesion and performance: A meta analysis. *Small Group Research*, 22, 175- 186.

Everett, J. J., Smith, R. E., & Williams, K. D. (1992). Effects of team cohesion and identifiability on social loafing in relay swimming performance. *International Journal of Sport Psychology*, 23, 311-324.

Ewart, C. K. (1992). Role of physical self-efficacy in recovery from heart attack. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 287-304). Washington, D.C.: Hemisphere.

Eys, M.A., Carron, A.V., Bray, S.R. & Brawley, L.R. (2007). Item Wording and Internal Consistency of a Measure of Cohesion: The Group Environment Questionnaire. *Journal of Sport and Exercise Psychology*, 29, 393-402.

FDFC, (2009). Force Development Facilitators Course. FDTC Fairbourne, GETC, UK: High Wycombe.

Feltz, D. L., Landers, D. M., & Raeder, U. (1979). Enhancing self-efficacy in high-avoidance motor tasks: A comparison of modeling techniques. *Journal of Sport Psychology*, 1, 112-122.

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

Feltz, D., & Lirgg, C. D. (1998). Percieved team and player efficacy in Hockey. *Journal of Applied Psychology*, 78(3), 352-360.

Feltz, D. L., & Lirgg, C. D. (2001). Self-efficacy beliefs of athletes, teams, and coaches. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology*, (2nd ed., pp. 340-361). New York: John Wiley & Sons.

Fiedler, F. E. (1967). *A theory of leadership effectiveness*. New York: McGraw-Hill.

Fleishman, E. A., & Peters, D. R. (1962). Interpersonal values, leadership attitude, and managerial "success." *Personnel Psychology*, 15, 127-143.

Fodor, E. M., & Smith, T. (1982). The power motive as an influence on group decision making. *Journal of Personality and Social Psychology*, 42, 178-185.

Forsyth, D. R. (1990). *Group dynamics*. Needham Heights, MA: Allyn & Bacon.

Forsyth, D. R. (2006). *Group dynamics* (4th ed). Brooks/Cole, CA: Pacific Grove.

Freeman, L.H. & Adams, P.H. (1999). Comparative effectiveness of two training programmes on assertive behaviour. *Nursing Standard*, 13(8), 32-35.

Gardner, D. E., Shields, D. L. L., Bredemeier, B. J. L., & Bostrom, A. (1996). The relationship between perceived coaching behaviours and team cohesion among baseball and softball players. *Sport Psychologist*, 10, 367-381.

Garza, D. L. & Feltz, D. L. (1998). Effects of selected mental practice on performance, self-efficacy, and competition confidence of figure skaters. *The Sport Psychologist, 12*, 1-15.

GETR, (2011). Generic Education and Training Requirement. Retrieved Nov 15, 2013 from http://www.raf.mod.uk/pmdair/rafcms/mediafiles/ADDA62E8_5056_A318_A829CEDE2F0974B5.pdf

Gibson, C.B. (1999). Do they do what they believe they can? Group efficacy and group effectiveness across tasks and cultures. *Academy of Management Journal*, 42(2), 138-152.

Gibson, C. B., & Randel, A. E., & Earley, P. C. (2000). Understanding group-efficacy: An empirical test of multiple assessment methods. *Group & Organization Management*, 25, 67–97.

Gist, M. E. (1987). Self-Efficacy: Implications for organisational behaviour and human resource management. *Academy of Management Review*, 12(3), 472-485.

Gladstein, D. (1984). Groups in context: a model of task group effectiveness. *Administrative Science Quarterly*, 29, 499–517.

Gould, D., Guinan, D., Greenleaf, C., Medbery, R., & Peterson, K. (1999). Factors affecting Olympic performance: Perceptions of athletes and coaches from more and less successful teams. *The Sport Psychologist*, 13, 371–394.

Greene, J. C. (2008). Is mixed methods social inquiry a distinctive methodology? *Journal of Mixed Methods Research*, 2(1), 7–22

Greenleaf, C., Gould, D., & Dieffenbach, K. (2001). Factors influencing Olympic performance: Interviews with Atlanta and Nagano U.S. Olympians. *Journal of Applied Sport Psychology*, 13, 154–184.

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.

Gully, S. M., Devine, D. J., & Whitney, D. J. (1995). A meta analysis of cohesion and performance: Effects of level of analysis and task interdependence. *Small Group Research*, 26(4), 497-520.

Guzzo, R. A., & Shea, G. P. (1992). Group performance and intergroup relations in organizations. In M. D. Dunnette, & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (Vol. 3, pp. 269–313). Palo Alto, CA: Consulting Psychologists Press

Guzzo, R. A., Yost, P. R., Campbell, R. J., & Shea, G. P. (1993). Potency in groups: Articulating a construct. *British Journal of Social Psychology*, 32, 87-106.

Gully, S. M., Incalcaterra, K. A., Joshi, A., & 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.

Hackett, G. (1995). Self-efficacy in career choice and development. In A. Bandura (Ed.), *Self-efficacy in changing societies*. New York: Cambridge University Press.

Hackman, J. R., & Morris C. G. (1975). Group tasks, group interaction process, and group performance effectiveness: A review and proposed integration. In L. Berkowitz (Ed.), *Advances in experimental psychology* (Vol 8). New York: Academic press.

Hackman, J. R., & Morris C. G. (1983). Group tasks group interaction and group performance effectiveness. In H.H. Blumberg, A.P. Hare, V. Kent, & M. Davies (Eds.), *Small groups and social interaction* (Vol 1). Chichester, UK: Wiley and sons.

Handa, M. L. (1986). "Peace paradigm: Transcending liberal and marxian paradigms" Paper presented in "International symposium on science, technology and development, New Delhi, India, March 20–25, 1987, Mimeographed at O.I.S.E., University of Toronto, Canada (1986).

Heron, J. (1999). *The facilitators Handbook*. New York: Kogan Page.

Hersey, P., & Blanchard, K. H. (1977). The management of organizational behaviour, (3rd ed). Upper Saddle River, NJ: Prentice Hall.

Heuz´e, J. P., Raimbault, N., & Fontayne, P. (2006a). Relationships between cohesion, collective efficacy, and performance in professional basketball teams: An examination of mediating effects. *Journal of Sports Sciences*, 24, 59–68.

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

Hilgermann, R.H. (1998). Communication satisfaction, goal setting, job satisfaction, concerted control, and effectiveness in self-managing teams. (Doctoral dissertation, University of Maine, 1998). Dissertation Abstracts International Section A: *Humanities and Social Sciences*, 59(5-A), 16-61.

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

Hogg, M. A., & Hains, S. C. (1998). Friendship and group identification: A new look at the role of cohesiveness in group think. *European Journal of Social Psychology*, 28, 323-341.

Howe, K. R. (1988). Against the quantitative-qualitative incompatability thesis, or, Dogmas die hard. *Educational Researcher*, 17, 10-16.

Howe, K. R. (2004). A critique of experimentalism. *Qualitative Inquiry*, 10, 42–61.

Irvine, D., & Wilson, J. P. (1994). Outdoor Management Development – Reality or Illusion?. *Journal of Management Development*, 13(5), 25 – 37.

Jones, M.V., Bray, S.R., Mace, R.D., MacRae, A.W. & Stockridge, C. (2002). The impact of motivational imagery on the emotional state on Self-Efficacy levels of novice climbers. *Journal of Sport Behaviour*, 25(1).

JSP 419, (2013). Joint service publication 419: The joint services adventurous training scheme. Retrieved November 5, 2013 from www.raf.mod.uk/.../89858C36_5056_A318_A8584A95745BE1B4.doc.

Jung, D., & Sosik, J. (2003). Group potency and collective efficacy: Examining their predictive validity, level of analysis, and effects of performance feedback on future group performance. *Group and Organization Management*, 28, 366-391.

Katz Navon, T.Y., & Erez, M. (2009). When Collective- and Self-Efficacy Affect Team Performance: The Role of Task Interdependence. *Collective Efficacy and Task Interdependence*, Israel: The Arison School of Business Administration, The Interdisciplinary Center.

Kerr, N. L. (1989). Illusions of efficacy: The effects of group size on perceived efficacy in social dilemmas. *Journal of Experimental Social Psychology*, 25, 287-313.

Kim, J. S., Kaye, J., & Wright, L. K. (2001). Moderating and mediating effects in causal models. *Issues in Mental Health Nursing*, 22, 63 – 75.

Kolb, D.A. (1971). Individual learning styles and the learning process. Working Paper #535-71, Sloan School of Management, Massachusetts Institute of Technology.

Kolb, D. A. (1984). *Experiential Learning experience as a source of learning and development*. New Jersey: Prentice Hall.

Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. Borman, R. Liden, and R. Klimoski (Eds.), *Handbook of psychology: Industrial and organizational psychology*, (pp, 333–375). New York: Wiley.

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

Landsberger, H. A. (1958). *Hawthorne revisited*. Ithaca. N.Y: Cornell University.

Langfred, C. W. (1998). Is group cohesiveness a double-edged sword? An investigation of the effects of cohesiveness on performance. *Small Group Research*, 29(1), 124-143.

Latané, B. (1986). Responsibility and effort in organizations. In P. Goodman (Ed.), *Groups and organizations* (pp. 277-303). San Francisco: Jossey-Bass.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behaviour*, 45, 79-122.

Lent, R. W., Schmidt, J., & Schmidt, L. (2006). Collective efficacy beliefs in student work teams: Relation to self-efficacy, cohesion, and performance. *Journal of Vocational Behaviour,* 68*,* 73-84.

Li, F., & Harmer, P. (1996). Confirmatory factor analysis of the group environment questionnaire with an intercollegiate sample. *Journal of Sport and Exercise Psychology*, 18, 49-63.

Liden, R.C., Wayne, S.J., Jaworski, R.A. & Bennett, N. (2004). Social Loafing: A Field Investigation. *Journal of Management*, 30(2), 285-304.

Lincoln, Y. S., & Guba, E. (1985). *Naturalistic enquiry*. Beverly Hills, CA: Sage.

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

Lirgg, C. D., George, T. R., Chase, M. A., & Ferguson, R. H. (1996). Impact of conception of ability and sex-type of task on male and female self-efficacy. *Journal of Sport and Exercise Psychology*, 18, 426-343.

Litt, M.D. (1988). Self-efficacy and perceived control: cognitive mediators of pain tolerance. *Journal of Personality and Social Psychology*, 54, 149-160.

Little, B. L., & Madigan, R. M. (1994). Motivation in work teams: A test of the construct of collective efficacy. Paper presented at the annual meeting of the Academy of Management, Houston, Texas.

Maddux, J.E. (1995). Self-efficacy theory: An introduction. In J.E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment: Theory, research, and application* (pp. 3-33). New York: Plenum.

Maslow, A. H. (1943). A Theory of human motivation. *Psychological Review*, 50(4), 370-96.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data*. Mahwah, NJ: Lawrence Erlbaum.

Mertens, D. M. (1998). *Research methods in education and psychology*. Thousand Oaks, CA: Sage.

Messick, D. M., & Mackie, D. M. (1989). Intergroup relations. *Annual Review of Psychology,* 40, 45–51.

Metalogs, (2012). *Leonardo's bridge team task*, METALOG® OHG, Wellington House, East Road, Cambridge CB1 1BH, UK. www.metalogtools.co.uk.

Miller, D. (1990). *The Icarus paradox: How exceptional companies bring about their own downfall.* New York, NY: Harper Business.

Miles, MB. & Huberman, AM. (1994). *Qualitative Data Analysis* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Mitchell, T. R. (1982). *People in organizations: An introduction to organizational behaviour* (2nd ed.). New York: McGraw-Hill.

Mudrack, P. (1989a). Defining group cohesiveness: A legacy of confusion. *Small Group Research*, 20(1), 37-49.

Mudrack, P. E. (1989b). Group cohesiveness and productivity: A closer look. *Human Relations*, 42, 771-785

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

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.

Morse, J. M. (2005). Evolving trends in qualitative research: Advances in mixed methods designs. *Qualitative Health Research*, 15, 583–585.

Myers, N., Feltz, D. L., & Short, S. E. (2004a). Collective efficacy and team performance: A longitudinal study of collegiate football teams. *Group Dynamics: Theory, Research and Practice*, 8(2), 126-138.

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

Neuman, W. L. (2003). *Social research methods: Qualitative and quantitative approaches* (5th ed.). Boston: Allyn and Bacon.

Nunnally, J.C. (1978). *Psychometric theory*. New York: McGraw-Hill.

Oliver, L. W. (1990). The relationship of cohesion and performance: A meta analysis and critique of the literature. (Unpublished manuscript). Army Research Institute, U.S.

O'Leary, Z. (2004). *The essential guide to doing research*. London: Sage.

Paris, C.R., Salas, E., & Cannon-Bowers, J.A. (1999). *Human performance in multi-operator systems.* In E.C. Carterette & M.P. Friedman (Series Eds.) & P.A. Hancock (Vol. Ed.), Handbook of Perception and Cognition: Vol. 17. Human performance and ergonomics (2nd ed.). San Diego, CA: Academic Press, 329-386.

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

Prapavessis, H., Carron, A. V., & Spink, K. S. (1996). Team building in sport. *International Journal of Sport Psychology*, 27, 269–285.

Prapavessis, H., & Carron, A. V. (1997). Cohesion and work output. *Small Group Research*, 28, 294-301.

Prussia, G. E., & Kinicki, A. J. (1996). A motivational investigation of group effectiveness using social-cognitive theory. *Journal of Applied Psychology*, 81, 187–198.

Pronin, E., Molouki, S., & Berger, J. (2007). Alone in a crowd of sheep: Asymmetric perceptions of conformity and their roots in an introspection illusion. *Journal of Personality and Social Psychology*, 92, 585-595.

Podsakoff, P. M., MacKenzie, S. B., & Ahearne, M. (1997). Moderating effects of goal acceptance on the relationship between group cohesiveness and productivity. *Journal of Applied Psychology*, 82, 974-983.

Polit, D. F., Beck, C. T., Hungler, B. P. (2001). Essentials of nursing research: Methods, appraisal, and utilisation (5th ed.). Philadelphia: Lippincott.

Popper, K. R. (1959). *The logic of scientific discovery*. New York: Routledge.

Rahimi, A. & Abedini, A. (2009). The interface between EFL learners Self-Efficacy concerning listening comprehension and listening proficiency. *Novitas-ROYAL* 3(1), 14-28.

Ramzaninezhad, R., & Keshtan, M. H. (2009). The relationship between coach's leadership styles and team cohesion in Iran football clubs professional league. *Brazilian Journal of Biomotricity* , 3(2), 111–20

Rhodes, R. E., & Blanchard, C. M. (2007). What do confidence items measure in the physical activity domain? *Journal of Applied Social Psychology, 37*, 759-774.

Rydgren, J. (2009). *The Oxford handbook of analytical sociology*. P. Hedström, & P. S. Bearman (Eds.), Oxford: Oxford University Press.

Saavedra, R., Early, P., & Van Dyne, L. (1993). Complex interdependence in task performing groups. *Journal of Applied Psychology*, 78(1), 61-72.

Sadri, G., & Robertson, I. T. (1993). Self-efficacy and work related behavior: A review and meta-analysis. *Applied Psychology: An International Review, 42*, 139-152.

Schrag, F. (1992). In defence of positivist research paradigms. *Educational Researcher*, 21(5), 5-8.

Schunk, D. H. (1987). *Self-efficacy and motivated learning*. In N. Hastings & J. Schwieso, (Eds.), New directions in educational psychology: 2. Behaviour and motivation in the classroom (pp. 233-251). London: Falmer Press.

Schunk, D. H. (2003). Self-efficacy for reading and writing: Influence of modeling, goal setting, and self-evaluation. *Reading and Writing Quarterly*, 19, 159-172.

Shea, G. P., & Guzzo, R. A. (1987). Groups as human resources. *Research in Personnel and Human Resources Management*, 5, 323-356.

Shields, D. L. L., Gardner, D. E., Bredemeier, B. J. L., & Bostro, A. (1997). The relationship between leadership behaviours and group cohesion in team sports. *Journal of Psychology*, 131,196-210.

Schoenberger, N. E., Kirsch, I., & Rosengard, C. (1991). Cognitive theories of human fear: An empirically derived integration. *Anxiety Research, 4*, 1-13.

Silverman, D. (2000). *Doing qualitative research: A practical handbook*. London: Thousand Oaks, New Delhi: Sage Publications.

Spink, K. S. (1990). Group cohesion and collective efficacy of volleyball teams. *Journal of Sport and Exercise Psychology*, 12, 301-311.

Stajkovic, A. D., Lee, D., & Nyberg, A. J. (2009). Collective efficacy, group potency, and group performance: Meta-analyses of their relationships, and test of a mediation model. *Journal of Applied Psychology*, 94(3), 814-828.

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work- related performance: A meta-analysis. *Psychological Bulletin*, *124*, 240-261.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, 52, 613–629.

Steele, C. M., & Aronson, J. (1995). Stereotype Threat and the intellectual test-performance of African-Americans. *Journal of Personality and Social Psychology*, 69(5), 797-811.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.

Stevenson, P. & Fuller, T. (2005). *Leadership.* UK: Royal Air Force Leadership Centre.

Stogdill, R. M. (1972). Group productivity, drive, and cohesiveness. *Organizational Behaviour and Human Performance*, 8, 26-43.

Stoner, J. A., Freeman, A. E., Gilbert, D. R. Jr. (1995). Management, (6th ed). New Jersey: Prentice Hall.

Sutton, J.L & Pierce, L.G. (2003). A framework for understanding cultural diversity in cognition and learning. *Human resource and engineering directorate*, Army research laboratory, 1-16.

Terriff, T. (2006). Warriors and innovators: Military change and organisational culture in the US Marine corps, *Defence studies,* 6, 215-247.

Tuckman, B. W. (1965). Developmental sequence in small groups, *Psychological Bulletin*, 63, 384-399.

Usher, E.L. & Pajares, F. (2008). Sources of Self-Efficacy in Schools: Critical Review of the Literature and Future Directions. *Review of Educational Research*, 78(4), 751-796.

Van Teijlingen, E. R., & Hundley, V. (2001). The importance of pilot studies. *Social Research Update*, Department of Sociology, University of Surrey, 35, 1- 4.

Van de Ven, A., Delbecq, A., & Koening, R. (1976). Determinants of coordination modes within organizations. *American Sociological Review*, 41, 322-338.

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

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly*, 40, 145-180.

Wagner, R. J., & Roland, C. C. (1992). How effective is outdoor training? Outdoor-based experiential training. *Training & Development*, 46(7), pp. 61-66.

Wagner, R. J., Baldwin. T. T., & Roland, C. C. (1991). Outdoor training: Revolution or fad?. *Training and Development Journal*, 45(3), 50 –56.

Walton, R. E. (1972). How to counter alienation in the plant. *Harvard Business Review*, 50(6), 70-81.

Walumbwa, F. O., Wang, P., Lawler, J. J., & Shi, K. (2004). The role of collective efficacy in the relations between transformational leadership and work outcomes. *Journal of Occupational and Organizational Psychology*, 77, 515-530.

Wang, S., & Lin, S. S. J. (2007). The effects of group composition of self-efficacy and collective efficacy on computer-supported collaborative learning. *Computers in Human Behaviour,* 23, 2256-2268.

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

Wheeler, B.C. & Valacich, P. (1996). Facilitation, GSS, and Training as Sources of Process Restrictions and Guidance for Structural Group Decision Making: An Empirical Assessment. *Information Systems Research*, 7(4), 429-451.

Whiteoak, J., Chalip, L., & Hort, L. (2004). Assessing group efficacy: Comparing three methods of measurement. *Small group research*, 35,158-173.

Whitney, K. (1994). Improving group task performance: The role of group goals and group efficacy. *Human Performance*, 7(1), 55-78.

Wiersma, W. (2000). *Research methods in education: An introduction* (7th ed.). Boston: Allyn and Bacon.

Williams, D.M. (2010). Outcome Expectancy and Self-Efficacy, Theoretical Implications of a Universal Contradiction. *Personality and Social Psychology Review*, 14(4), 417-425.

Zaccaro, S. J. (1991). Non-equivalent associations between forms of cohesiveness and group-related outcomes: Evidence for multidimensionality. *Journal of Social Psychology*, 131, 387-399.

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* (pp. 305–328). New York: Plenum Press.

Appendix 1

Pilot study results

1.1 SPSS calculation output Pearson's correlation test for task condition to performance time in ratio variable.

Correlations

		Difficulty	Performance
Difficulty	Pearson Correlation	1	.968**
	Sig. (1-tailed)		.000
	N	12	12
Performance	Pearson Correlation	.968**	1
	Sig. (1-tailed)	.000	
	N	12	12

**. Correlation is significant at the 0.01 level (1-tailed).

1.2 SPSS calculation output. Pearson's correlation test for task condition to performance time in ranked variable.

Correlations

		Difficulty	Rank of Performtime
Difficulty	Pearson Correlation	1	.956**
	Sig. (2-tailed)		.000
	N	12	12
Rank of Performtime	Pearson Correlation	.956**	1
	Sig. (2-tailed)	.000	
	N	12	12

**. Correlation is significant at the 0.01 level (2-tailed).

1.3 SPSS Calculation output. Spearman's correlation test for task condition to performance time in ratio variable.

Correlations

			Difficulty	Performance
Spearman's rho	Difficulty	Correlation Coefficient	1.000	.956**
		Sig. (1-tailed)	.	.000
		N	12	12
	Performance	Correlation Coefficient	.956**	1.000
		Sig. (1-tailed)	.000	.
		N	12	12

**. Correlation is significant at the 0.01 level (1-tailed).

1.4 SPSS Calculation output. Spearman's correlation test for task condition to performance time in ranked variable

Correlations

			Difficulty	Rank of Performtime
Spearman's rho	Difficulty	Correlation Coefficient	1.000	.956**
		Sig. (1-tailed)	.	.000
		N	12	12
	Rank of Performtime	Correlation Coefficient	.956**	1.000
		Sig. (1-tailed)	.000	.
		N	12	12

**. Correlation is significant at the 0.01 level (1-tailed).

1.5 SPSS Calculation output. 3 x 2 (task by time) ANOVA with repeated measures on time, showing means results for pre and post efficacy.

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	Grpefficacy1
2	Grpefficacy2

Between-Subjects Factors

		Value Label	N
Difficulty	1.00	Easy	4
	2.00	Medium	4
	3.00	Hard	4

Descriptive Statistics

	Difficulty	Mean	Std. Deviation	N
Pre	Easy	4.5000	.57735	4
	Medium	3.7500	.50000	4
	Hard	2.5000	1.00000	4
	Total	3.5833	1.08362	12
Post	Easy	4.2500	.50000	4
	Medium	3.5000	1.00000	4
	Hard	4.7500	.50000	4
	Total	4.1667	.83485	12

Box's Test of Equality of Covariance Matrices[a]

Box's M	2.433
F	.518
df1	3
df2	6480.000
Sig.	.670

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.[a]

a. Design: Intercept + Tasklevel
Within Subjects Design: time

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.395	5.880[b]	1.000	9.000	.038
	Wilks' Lambda	.605	5.880[b]	1.000	9.000	.038
	Hotelling's Trace	.653	5.880[b]	1.000	9.000	.038
	Roy's Largest Root	.653	5.880[b]	1.000	9.000	.038
time * Tasklevel	Pillai's Trace	.727	12.000[b]	2.000	9.000	.003
	Wilks' Lambda	.273	12.000[b]	2.000	9.000	.003
	Hotelling's Trace	2.667	12.000[b]	2.000	9.000	.003
	Roy's Largest Root	2.667	12.000[b]	2.000	9.000	.003

Multivariate Tests[a]

Effect		Partial Eta Squared
time	Pillai's Trace	.395
	Wilks' Lambda	.395
	Hotelling's Trace	.395
	Roy's Largest Root	.395
time * Tasklevel	Pillai's Trace	.727
	Wilks' Lambda	.727
	Hotelling's Trace	.727
	Roy's Largest Root	.727

a. Design: Intercept + Tasklevel
Within Subjects Design: time

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
time	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
time	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Tasklevel

Within Subjects Design: time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
time	Sphericity Assumed	2.042	1	2.042	5.880
	Greenhouse-Geisser	2.042	1.000	2.042	5.880
	Huynh-Feldt	2.042	1.000	2.042	5.880
	Lower-bound	2.042	1.000	2.042	5.880
time * Tasklevel	Sphericity Assumed	8.333	2	4.167	12.000
	Greenhouse-Geisser	8.333	2.000	4.167	12.000
	Huynh-Feldt	8.333	2.000	4.167	12.000
	Lower-bound	8.333	2.000	4.167	12.000
Error(time)	Sphericity Assumed	3.125	9	.347	
	Greenhouse-Geisser	3.125	9.000	.347	
	Huynh-Feldt	3.125	9.000	.347	
	Lower-bound	3.125	9.000	.347	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
time	Sphericity Assumed	.038	.395
	Greenhouse-Geisser	.038	.395
	Huynh-Feldt	.038	.395
	Lower-bound	.038	.395
time * Tasklevel	Sphericity Assumed	.003	.727
	Greenhouse-Geisser	.003	.727
	Huynh-Feldt	.003	.727
	Lower-bound	.003	.727
Error(time)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	2.042	1	2.042	5.880	.038
time * Tasklevel	Linear	8.333	2	4.167	12.000	.003
Error(time)	Linear	3.125	9	.347		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Partial Eta Squared
time	Linear	.395
time * Tasklevel	Linear	.727
Error(time)	Linear	

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Pre	1.400	2	9	.296
Post	1.500	2	9	.274

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Tasklevel

Within Subjects Design: time

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	360.375	1	360.375	529.531	.000	.983
Tasklevel	3.000	2	1.500	2.204	.166	.329
Error	6.125	9	.681			

Estimated Marginal Means

1. Difficulty

Estimates

Measure: MEASURE_1

Difficulty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	4.375	.292	3.715	5.035
Medium	3.625	.292	2.965	4.285
Hard	3.625	.292	2.965	4.285

Pairwise Comparisons

Measure: MEASURE_1

(I) Difficulty	(J) Difficulty	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Easy	Medium	.750	.412	.307	-.460	1.960
	Hard	.750	.412	.307	-.460	1.960
Medium	Easy	-.750	.412	.307	-1.960	.460
	Hard	1.006E-013	.412	1.000	-1.210	1.210
Hard	Easy	-.750	.412	.307	-1.960	.460
	Medium	-1.006E-013	.412	1.000	-1.210	1.210

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.500	2	.750	2.204	.166	.329
Error	3.063	9	.340			

The F tests the effect of Difficulty. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. time

Estimates

Measure: MEASURE_1

time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.583	.210	3.109	4.058
2	4.167	.204	3.705	4.628

Pairwise Comparisons

Measure: MEASURE_1

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-.583*	.241	.038	-1.128	-.039
2	1	.583*	.241	.038	.039	1.128

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.395	5.880[a]	1.000	9.000	.038	.395
Wilks' lambda	.605	5.880[a]	1.000	9.000	.038	.395
Hotelling's trace	.653	5.880[a]	1.000	9.000	.038	.395
Roy's largest root	.653	5.880[a]	1.000	9.000	.038	.395

Each F tests the multivariate effect of time. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

3. Difficulty * time

Measure: MEASURE_1

Difficulty	time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Easy	1	4.500	.363	3.678	5.322
	2	4.250	.354	3.450	5.050
Medium	1	3.750	.363	2.928	4.572
	2	3.500	.354	2.700	4.300
Hard	1	2.500	.363	1.678	3.322
	2	4.750	.354	3.950	5.550

Post Hoc Tests

Difficulty

Multiple Comparisons

Measure: MEASURE_1

Tukey HSD

(I) Difficulty	(J) Difficulty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Easy	Medium	.7500	.41248	.218	-.4016	1.9016
	Hard	.7500	.41248	.218	-.4016	1.9016
Medium	Easy	-.7500	.41248	.218	-1.9016	.4016
	Hard	.0000	.41248	1.000	-1.1516	1.1516
Hard	Easy	-.7500	.41248	.218	-1.9016	.4016
	Medium	.0000	.41248	1.000	-1.1516	1.1516

Based on observed means. The error term is Mean Square(Error) = .340.

Homogeneous Subsets

MEASURE_1

Tukey HSD[a,b,c]

Difficulty	N	Subset
		1
Medium	4	3.6250
Hard	4	3.6250
Easy	4	4.3750
Sig.		.218

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square(Error) = .340.

a. Uses Harmonic Mean Sample Size = 4.000.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

1.6 SPSS calculation output. Independent samples t test comparing easy and medium tasks to cohesion score

Group Statistics

	Difficulty	N	Mean	Std. Deviation	Std. Error Mean
Cohesion	Easy	4	17.1650	1.73270	.86635
	Medium	4	17.2000	1.54056	.77028

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cohesion	Equal variances assumed	.159	.704	-.030	6	.977	-.03500	1.15926	-2.87162	2.80162
	Equal variances not assumed			-.030	5.919	.977	-.03500	1.15926	-2.88105	2.81105

1.7 SPSS calculation output. Independent samples t test comparing medium and hard tasks to cohesion score

Group Statistics

	Difficulty	N	Mean	Std. Deviation	Std. Error Mean
Cohesion	Medium	4	17.2000	1.54056	.77028
	Hard	4	17.5725	1.63742	.81871

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cohesion	Equal variances assumed	.190	.678	-.331	6	.752	-.37250	1.12411	-3.12310	2.37810
	Equal variances not assumed			-.331	5.978	.752	-.37250	1.12411	-3.12557	2.38057

1.8 SPSS calculation output. Spearman's correlation for post efficacy and cohesion scores in ranked variable.

Correlations

			Rank of Grpefficacy2	Rank of Cohesion
Spearman's rho	Rank of Grpefficacy2	Correlation Coefficient	1.000	.319
		Sig. (2-tailed)	.	.311
		N	12	12
	Rank of Cohesion	Correlation Coefficient	.319	1.000
		Sig. (2-tailed)	.311	.
		N	12	12

Correlation is significant at 0.05 value (2 tailed)

1.9 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire easy condition

Case Processing Summary

		N	%
Cases	Valid	22	100.0
	Excluded[a]	0	.0
	Total	22	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.605	.625	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.2273	1.02036	22
Qu2	3.4545	.73855	22
Qu3	3.0000	1.34519	22
Qu4	3.5909	1.00755	22
Qu5	3.0455	1.43019	22

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.425	.139	-.183	.515
Qu2	.425	1.000	.192	.326	.430
Qu3	.139	.192	1.000	.246	.297
Qu4	-.183	.326	.246	1.000	.113
Qu5	.515	.430	.297	.113	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	13.0909	9.325	.345	.425	.559
Qu2	13.8636	9.552	.529	.372	.508
Qu3	14.3182	8.132	.335	.136	.571
Qu4	13.7273	10.398	.169	.283	.636
Qu5	14.2727	6.589	.528	.363	.441

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.3182	12.513	3.53737	5

1.10 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Medium condition

Case Processing Summary

		N	%
Cases	Valid	19	100.0
	Excluded[a]	0	.0
	Total	19	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha[a]	Cronbach's Alpha Based on Standardized Items[a]	N of Items
-.512	-.642	5

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.4737	.51299	19
Qu2	3.7368	.73349	19
Qu3	1.8421	.83421	19
Qu4	3.9474	.91127	19
Qu5	2.2632	1.04574	19

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.202	-.465	-.063	-.142
Qu2	.202	1.000	-.616	.643	-.412
Qu3	-.465	-.616	1.000	-.158	.496
Qu4	-.063	.643	-.158	1.000	-.334
Qu5	-.142	-.412	.496	-.334	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	11.7895	2.620	-.275	.239	-.274[a]
Qu2	12.5263	2.263	-.170	.688	-.365[a]
Qu3	14.4211	2.257	-.210	.628	-.276[a]
Qu4	12.3158	1.673	-.032	.544	-.732[a]
Qu5	14.0000	1.889	-.193	.322	-.310[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.2632	2.427	1.55785	5

1.11 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Hard condition

Case Processing Summary

		N	%
Cases	Valid	23	100.0
	Excluded[a]	0	.0
	Total	23	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.313	.387	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	3.9130	.79275	23
Qu2	3.9130	.59643	23
Qu3	2.6957	1.22232	23
Qu4	3.6087	.78272	23
Qu5	3.3478	1.02730	23

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.176	.018	.602	.206
Qu2	.176	1.000	-.287	.021	.200
Qu3	.018	-.287	1.000	-.083	-.020
Qu4	.602	.021	-.083	1.000	.290
Qu5	.206	.200	-.020	.290	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	13.5652	3.621	.426	.403	.038
Qu2	13.5652	5.166	.004	.173	.355
Qu3	14.7826	4.632	-.113	.114	.570
Qu4	13.8696	3.846	.350	.421	.108
Qu5	14.1304	3.482	.260	.126	.150

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.4783	5.534	2.35236	5

1.12 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Medium condition- Reverse scored

Case Processing Summary

		N	%
Cases	Valid	19	100.0
	Excluded[a]	0	.0
	Total	19	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.604	.636	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.4211	.50726	19
Qu2	4.0526	.62126	19
Qu3	4.1579	.68825	19
Qu4	4.2632	.56195	19
Qu5	3.8421	1.01451	19

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	-.074	.436	.174	.028
Qu2	-.074	1.000	.369	.595	.102
Qu3	.436	.369	1.000	.461	.515
Qu4	.174	.595	.461	1.000	-.021
Qu5	.028	.102	.515	-.021	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	16.3158	4.117	.188	.321	.619
Qu2	16.6842	3.561	.347	.425	.556
Qu3	16.5789	2.591	.765	.622	.310
Qu4	16.4737	3.596	.398	.486	.538
Qu5	16.8947	2.877	.248	.402	.669

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
20.7368	4.760	2.18180	5

Appendix 2

Main study results

2.1 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Easy condition- Positive worded

Case Processing Summary

		N	%
Cases	Valid	24	100.0
	Excluded[a]	0	.0
	Total	24	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.712	.731	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.3750	.64690	24
Qu2	4.1250	.79741	24
Qu3	3.2500	1.11316	24
Qu4	4.1667	.81650	24
Qu5	3.0833	1.17646	24

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.579	.408	.453	.129
Qu2	.579	1.000	.257	.434	-.058
Qu3	.408	.257	1.000	.383	.681
Qu4	.453	.434	.383	1.000	.256
Qu5	.129	-.058	.681	.256	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	14.6250	7.810	.514	.433	.663
Qu2	14.8750	7.940	.336	.423	.711
Qu3	15.7500	5.326	.685	.587	.556
Qu4	14.8333	7.188	.510	.310	.651
Qu5	15.9167	6.341	.399	.533	.711

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.0000	10.087	3.17600	5

2.2 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Medium condition- Positive worded

Case Processing Summary

		N	%
Cases	Valid	23	100.0
	Excluded[a]	0	.0
	Total	23	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.676	.726	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.3478	.64728	23
Qu2	4.0870	.79275	23
Qu3	3.7826	.73587	23
Qu4	4.1304	.81488	23
Qu5	3.2609	1.09617	23

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.558	.452	.427	.187
Qu2	.558	1.000	.657	.404	-.184
Qu3	.452	.657	1.000	.504	.299
Qu4	.427	.404	.504	1.000	.164
Qu5	.187	-.184	.299	.164	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	15.2609	5.383	.572	.431	.581
Qu2	15.5217	5.352	.420	.692	.629
Qu3	15.8261	4.696	.716	.645	.506
Qu4	15.4783	4.988	.514	.304	.587
Qu5	16.3478	5.601	.139	.420	.797

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.6087	7.522	2.74258	5

2.3 SPSS calculation output. Pilot Study - Cronbachs alphas for Cohesion questionnaire Hard condition- Positive worded

Case Processing Summary

		N	%
Cases	Valid	23	100.0
	Excluded[a]	0	.0
	Total	23	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.605	.608	5

Item Statistics

	Mean	Std. Deviation	N
Qu1	4.1304	.69442	23
Qu2	4.0435	.87792	23
Qu3	4.2174	.73587	23
Qu4	4.0435	.82453	23
Qu5	3.7391	.91539	23

Inter-Item Correlation Matrix

	Qu1	Qu2	Qu3	Qu4	Qu5
Qu1	1.000	.363	.120	.307	.342
Qu2	.363	1.000	.125	.186	.298
Qu3	.120	.125	1.000	.059	.493
Qu4	.307	.186	.059	1.000	.076
Qu5	.342	.298	.493	.076	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	16.0435	4.589	.454	.252	.511
Qu2	16.1304	4.300	.371	.173	.545
Qu3	15.9565	4.862	.314	.247	.573
Qu4	16.1304	4.937	.220	.105	.622
Qu5	16.4348	3.893	.468	.348	.486

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
20.1739	6.423	2.53435	5

2.4 SPSS Calculation output. Pearson's correlation test for task condition to performance time in ratio variable.

Correlations

		Difficulty	Performance
Difficulty	Pearson Correlation	1	.642**
	Sig. (2-tailed)		.000
	N	68	68
Performance	Pearson Correlation	.642**	1
	Sig. (2-tailed)	.000	
	N	68	68

**. Correlation is significant at the 0.01 level (2-tailed).

2.5 SPSS Calculation output. 3 x 2 (task by time) ANOVA with repeated measures on time, showing means results for pre and post efficacy.

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	Grpefficacy1
2	Grpefficacy2

Between-Subjects Factors

		Value Label	N
Difficulty	1.00	Easy	20
	2.00	Medium	20
	3.00	Hard	28

Descriptive Statistics

	Difficulty	Mean	Std. Deviation	N
Pre	Easy	4.7500	.44426	20
	Medium	4.1500	.87509	20
	Hard	4.0357	.69293	28
	Total	4.2794	.75004	68
Post	Easy	4.5000	.51299	20
	Medium	4.2500	.44426	20
	Hard	3.7143	.80999	28
	Total	4.1029	.71529	68

Box's Test of Equality of Covariance Matrices[a]

Box's M	23.568
F	3.748
df1	6
df2	64191.187
Sig.	.001

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.030	1.984[b]	1.000	65.000	.164
	Wilks' Lambda	.970	1.984[b]	1.000	65.000	.164
	Hotelling's Trace	.031	1.984[b]	1.000	65.000	.164
	Roy's Largest Root	.031	1.984[b]	1.000	65.000	.164
time * Tasklevel	Pillai's Trace	.040	1.348[b]	2.000	65.000	.267
	Wilks' Lambda	.960	1.348[b]	2.000	65.000	.267
	Hotelling's Trace	.041	1.348[b]	2.000	65.000	.267
	Roy's Largest Root	.041	1.348[b]	2.000	65.000	.267

Multivariate Tests[a]

Effect		Partial Eta Squared
time	Pillai's Trace	.030
	Wilks' Lambda	.030
	Hotelling's Trace	.030
	Roy's Largest Root	.030
time * Tasklevel	Pillai's Trace	.040
	Wilks' Lambda	.040
	Hotelling's Trace	.040
	Roy's Largest Root	.040

a. Design: Intercept + Tasklevel

Within Subjects Design: time

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.	Epsilon[b]
					Greenhouse-Geisser
time	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
time	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Tasklevel

Within Subjects Design: time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	Df	Mean Square	F
time	Sphericity Assumed	.819	1	.819	1.984
	Greenhouse-Geisser	.819	1.000	.819	1.984
	Huynh-Feldt	.819	1.000	.819	1.984
	Lower-bound	.819	1.000	.819	1.984
time * Tasklevel	Sphericity Assumed	1.113	2	.556	1.348
	Greenhouse-Geisser	1.113	2.000	.556	1.348
	Huynh-Feldt	1.113	2.000	.556	1.348
	Lower-bound	1.113	2.000	.556	1.348
Error(time)	Sphericity Assumed	26.829	65	.413	
	Greenhouse-Geisser	26.829	65.000	.413	
	Huynh-Feldt	26.829	65.000	.413	
	Lower-bound	26.829	65.000	.413	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
time	Sphericity Assumed	.164	.030
	Greenhouse-Geisser	.164	.030
	Huynh-Feldt	.164	.030
	Lower-bound	.164	.030
time * Tasklevel	Sphericity Assumed	.267	.040
	Greenhouse-Geisser	.267	.040
	Huynh-Feldt	.267	.040
	Lower-bound	.267	.040
Error(time)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	.819	1	.819	1.984	.164
time * Tasklevel	Linear	1.113	2	.556	1.348	.267
Error(time)	Linear	26.829	65	.413		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Partial Eta Squared
time	Linear	.030
time * Tasklevel	Linear	.040
Error(time)	Linear	

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Pre	1.114	2	65	.334
Post	2.016	2	65	.141

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Tasklevel

Within Subjects Design: time

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2376.905	1	2376.905	4999.963	.000	.987
Tasklevel	13.129	2	6.565	13.809	.000	.298
Error	30.900	65	.475			

Estimated Marginal Means

1. Difficulty

Estimates

Measure: MEASURE_1

Difficulty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Easy	4.625	.109	4.407	4.843
Medium	4.200	.109	3.982	4.418
Hard	3.875	.092	3.691	4.059

Pairwise Comparisons

Measure: MEASURE_1

(I) Difficulty	(J) Difficulty	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Easy	Medium	.425*	.154	.023	.046	.804
	Hard	.750*	.143	.000	.399	1.101
Medium	Easy	-.425*	.154	.023	-.804	-.046
	Hard	.325	.143	.078	-.026	.676
Hard	Easy	-.750*	.143	.000	-1.101	-.399
	Medium	-.325	.143	.078	-.676	.026

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	6.565	2	3.282	13.809	.000	.298
Error	15.450	65	.238			

The F tests the effect of Difficulty. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2.6 SPSS Calculation output. Independent sample means test for cohesion score in the easy and moderate task condition.

Group Statistics

	Difficulty	N	Mean	Std. Deviation	Std. Error Mean
Cohesion	Easy	20	18.7900	2.78377	.62247
	Medium	20	18.7400	2.30510	.51544

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cohesion	Equal variances assumed	1.052	.312	.062	38	.951	.05000	.80817	-1.58606	1.68606
	Equal variances not assumed			.062	36.723	.951	.05000	.80817	-1.58793	1.68793

2.7 SPSS Calculation output. Independent sample means test for cohesion score in the moderate/hard task condition.

Group Statistics

	Difficulty	N	Mean	Std. Deviation	Std. Error Mean
Cohesion	Medium	20	18.7400	2.30510	.51544
	Hard	28	17.7946	2.17138	.41035

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cohesion	Equal variances assumed	.027	.869	1.450	46	.154	.94536	.65217	-.36739	2.25811
	Equal variances not assumed			1.435	39.540	.159	.94536	.65884	-.38668	2.27740

2.8 SPSS calculation output. Spearman's correlation for post efficacy and cohesion scores in ranked variable

Correlations

			Rank of Grpefficacy2	Rank of Cohesion
Spearman's rho	Rank of Grpefficacy2	Correlation Coefficient	1.000	.098
		Sig. (2-tailed)	.	.427
		N	68	68
	Rank of Cohesion	Correlation Coefficient	.098	1.000
		Sig. (2-tailed)	.427	.
		N	68	68

2.9 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the easy task condition. (Dependent variable, cohesion).

Easy Condition Regressions

Descriptive Statistics

	Mean	Std. Deviation	N
Cohesion	18.7900	2.78377	20
Performance	36.2570	3.13509	20
Post	4.5000	.51299	20

Correlations

		Cohesion	Performance	Post
Pearson Correlation	Cohesion	1.000	-.097	-.044
	Performance	-.097	1.000	.311
	Post	-.044	.311	1.000
Sig. (1-tailed)	Cohesion	.	.343	.427
	Performance	.343	.	.091
	Post	.427	.091	.
N	Cohesion	20	20	20
	Performance	20	20	20
	Post	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Performance[b]	.	Enter

a. Dependent Variable: Cohesion

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.098[a]	.010	-.107	2.92888

a. Predictors: (Constant), Post, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.406	2	.703	.082	.922[b]
	Residual	145.832	17	8.578		
	Total	147.238	19			

a. Dependent Variable: Cohesion

b. Predictors: (Constant), Post, Performance

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	22.125	8.614		2.568	.020	3.951	40.300
Performance	-.081	.226	-.092	-.361	.723	-.557	.394
Post	-.085	1.378	-.016	-.062	.951	-2.993	2.822

a. Dependent Variable: Cohesion

2.10 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the easy task condition. (Dependent Variable, post-task efficacy).

Descriptive Statistics

	Mean	Std. Deviation	N
Post	4.5000	.51299	20
Performance	36.2570	3.13509	20
Cohesion	18.7900	2.78377	20

Correlations

		Post	Performance	Cohesion
Pearson Correlation	Post	1.000	.311	-.044
	Performance	.311	1.000	-.097
	Cohesion	-.044	-.097	1.000
Sig. (1-tailed)	Post	.	.091	.427
	Performance	.091	.	.343
	Cohesion	.427	.343	.
N	Post	20	20	20
	Performance	20	20	20
	Cohesion	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Performance[b]	.	Enter

a. Dependent Variable: Post

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.311[a]	.097	-.009	.51539

a. Predictors: (Constant), Cohesion, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.484	2	.242	.912	.421[b]
	Residual	4.516	17	.266		
	Total	5.000	19			

a. Dependent Variable: Post

b. Predictors: (Constant), Cohesion, Performance

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.713	1.660		1.634	.121	-.789	6.216
	Performance	.051	.038	.310	1.337	.199	-.029	.131
	Cohesion	-.003	.043	-.014	-.062	.951	-.093	.087

a. Dependent Variable: Post

2.11 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the moderate task condition. (Dependent variable, cohesion).

Moderate condition regressions

Descriptive Statistics

	Mean	Std. Deviation	N
Cohesion	18.7400	2.30510	20
Performance	41.8210	17.24112	20
Post	4.2500	.44426	20

Correlations

		Cohesion	Performance	Post
Pearson Correlation	Cohesion	1.000	.124	-.105
	Performance	.124	1.000	-.764
	Post	-.105	-.764	1.000
Sig. (1-tailed)	Cohesion	.	.301	.330
	Performance	.301	.	.000
	Post	.330	.000	.
N	Cohesion	20	20	20
	Performance	20	20	20
	Post	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Performance[b]	.	Enter

a. Dependent Variable: Cohesion

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.125[a]	.016	-.100	2.41776

a. Predictors: (Constant), Post, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.582	2	.791	.135	.874[b]
	Residual	99.375	17	5.846		
	Total	100.957	19			

a. Dependent Variable: Cohesion

b. Predictors: (Constant), Post, Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	18.673	9.928		1.881	.077	-2.272	39.618
	Performance	.014	.050	.106	.284	.780	-.091	.119
	Post	-.124	1.936	-.024	-.064	.950	-4.208	3.960

a. Dependent Variable: Cohesion

2.12 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the moderate task condition. (Dependent Variable, post-task efficacy)

Descriptive Statistics

	Mean	Std. Deviation	N
Post	4.2500	.44426	20
Performance	41.8210	17.24112	20
Cohesion	18.7400	2.30510	20

Correlations

		Post	Performance	Cohesion
Pearson Correlation	Post	1.000	-.764	-.105
	Performance	-.764	1.000	.124
	Cohesion	-.105	.124	1.000
Sig. (1-tailed)	Post	.	.000	.330
	Performance	.000	.	.301
	Cohesion	.330	.301	.
N	Post	20	20	20
	Performance	20	20	20
	Cohesion	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Performance[b]	.	Enter

a. Dependent Variable: Post

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.764[a]	.584	.535	.30289

a. Predictors: (Constant), Cohesion, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.190	2	1.095	11.937	.001[b]
	Residual	1.560	17	.092		
	Total	3.750	19			

a. Dependent Variable: Post

b. Predictors: (Constant), Cohesion, Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5.109	.578		8.845	.000	3.890	6.327
	Performance	-.020	.004	-.763	-4.840	.000	-.028	-.011
	Cohesion	-.002	.030	-.010	-.064	.950	-.066	.062

a. Dependent Variable: Post

2.13 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the hard task condition. (Dependent variable, cohesion).

Hard condition

Descriptive Statistics

	Mean	Std. Deviation	N
Cohesion	17.7946	2.17138	28
Performance	65.0979	17.13639	28
Post	3.7143	.80999	28

Correlations

		Cohesion	Performance	Post
Pearson Correlation	Cohesion	1.000	.181	.144
	Performance	.181	1.000	-.188
	Post	.144	-.188	1.000
Sig. (1-tailed)	Cohesion	.	.178	.232
	Performance	.178	.	.169
	Post	.232	.169	.
N	Cohesion	28	28	28
	Performance	28	28	28
	Post	28	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Performance[b]	.	Enter

a. Dependent Variable: Cohesion

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.257[a]	.066	-.009	2.18104

a. Predictors: (Constant), Post, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.378	2	4.189	.881	.427[b]
	Residual	118.924	25	4.757		
	Total	127.302	27			

a. Dependent Variable: Cohesion

b. Predictors: (Constant), Post, Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	14.173	2.800		5.062	.000	8.406	19.939
	Performance	.027	.025	.216	1.097	.283	-.024	.079
	Post	.496	.528	.185	.940	.356	-.591	1.582

a. Dependent Variable: Cohesion

2.14 SPSS calculation output. Multiple linear regression results mediator affecting dependent when regressed with predictor for the hard task condition. (Dependent variable, post task efficacy).

Descriptive Statistics

	Mean	Std. Deviation	N
Post	3.7143	.80999	28
Performance	65.0979	17.13639	28
Cohesion	17.7946	2.17138	28

Correlations

		Post	Performance	Cohesion
Pearson Correlation	Post	1.000	-.188	.144
	Performance	-.188	1.000	.181
	Cohesion	.144	.181	1.000
Sig. (1-tailed)	Post	.	.169	.232
	Performance	.169	.	.178
	Cohesion	.232	.178	.
N	Post	28	28	28
	Performance	28	28	28
	Cohesion	28	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Performance[b]	.	Enter

a. Dependent Variable: Post

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.261[a]	.068	-.006	.81257

a. Predictors: (Constant), Cohesion, Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.208	2	.604	.914	.414[b]
	Residual	16.507	25	.660		
	Total	17.714	27			

a. Dependent Variable: Post

b. Predictors: (Constant), Cohesion, Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3.170	1.342		2.362	.026	.406	5.935
	Performance	-.010	.009	-.221	-1.127	.271	-.030	.009
	Cohesion	.069	.073	.184	.940	.356	-.082	.220

a. Dependent Variable: Post

2.15 SPSS calculation output. Multiple linear regression results effect of performance on cohesion when regressed with post efficacy for the easy task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	36.2570	3.13509	20
Cohesion	18.7900	2.78377	20
Post	4.5000	.51299	20

Correlations

		Performance	Cohesion	Post
Pearson Correlation	Performance	1.000	-.097	.311
	Cohesion	-.097	1.000	-.044
	Post	.311	-.044	1.000
Sig. (1-tailed)	Performance	.	.343	.091
	Cohesion	.343	.	.427
	Post	.091	.427	.
N	Performance	20	20	20
	Cohesion	20	20	20
	Post	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.322[a]	.104	-.002	3.13813	.104	.982	2	17	.395

a. Predictors: (Constant), Post, Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.333	2	9.667	.982	.395[b]
	Residual	167.414	17	9.848		
	Total	186.747	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post, Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	29.564	8.175		3.616	.002	12.316	46.812
	Cohesion	-.093	.259	-.083	-.361	.723	-.640	.453
	Post	1.878	1.405	.307	1.337	.199	-1.086	4.841

a. Dependent Variable: Performance

2.16 SPSS calculation output. Multiple linear regression results effect of predictor on dependent variable for the moderate task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	41.8210	17.24112	20
Cohesion	18.7400	2.30510	20
Post	4.2500	.44426	20

Correlations

		Performance	Cohesion	Post
Pearson Correlation	Performance	1.000	.124	-.764
	Cohesion	.124	1.000	-.105
	Post	-.764	-.105	1.000
Sig. (1-tailed)	Performance	.	.301	.000
	Cohesion	.301	.	.330
	Post	.000	.330	.
N	Performance	20	20	20
	Cohesion	20	20	20
	Post	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.765[a]	.586	.537	11.72836	.586	12.030	2	17	.001

a. Predictors: (Constant), Post, Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3309.446	2	1654.723	12.030	.001[b]
	Residual	2338.424	17	137.554		
	Total	5647.870	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post, Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	160.844	35.777		4.496	.000	85.361	236.326
	Cohesion	.334	1.174	.045	.284	.780	-2.143	2.810
	Post	-29.476	6.090	-.760	-4.840	.000	-42.325	-16.627

a. Dependent Variable: Performance

2.17 SPSS calculation output. Multiple linear regression results effect of predictor on dependent variable for the hard task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	65.0979	17.13639	28
Cohesion	17.7946	2.17138	28
Post	3.7143	.80999	28

Correlations

		Performance	Cohesion	Post
Pearson Correlation	Performance	1.000	.181	-.188
	Cohesion	.181	1.000	.144
	Post	-.188	.144	1.000
Sig. (1-tailed)	Performance	.	.178	.169
	Cohesion	.178	.	.232
	Post	.169	.232	.
N	Performance	28	28	28
	Cohesion	28	28	28
	Post	28	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post, Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.282[a]	.080	.006	17.08561	.080	1.080	2	25	.355

a. Predictors: (Constant), Post, Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	630.749	2	315.375	1.080	.355[b]
	Residual	7297.956	25	291.918		
	Total	7928.705	27			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post, Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	52.395	29.400		1.782	.087	-8.155	112.946
	Cohesion	1.679	1.530	.213	1.097	.283	-1.473	4.830
	Post	-4.622	4.102	-.218	-1.127	.271	-13.071	3.827

a. Dependent Variable: Performance

2.18 SPSS calculation output. Multiple linear regression results effect of performance on cohesion when regressed without post efficacy for the easy task condition.

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	36.2570	3.13509	20
Cohesion	18.7900	2.78377	20

Correlations

		Performance	Cohesion
Pearson Correlation	Performance	1.000	-.097
	Cohesion	-.097	1.000
Sig. (1-tailed)	Performance	.	.343
	Cohesion	.343	.
N	Performance	20	20
	Cohesion	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.097[a]	.009	-.046	3.20595	.009	.169	1	18	.685

a. Predictors: (Constant), Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.741	1	1.741	.169	.685[b]
	Residual	185.006	18	10.278		
	Total	186.747	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	38.300	5.016		7.636	.000	27.762	48.839
	Cohesion	-.109	.264	-.097	-.412	.685	-.664	.446

a. Dependent Variable: Performance

2.19 SPSS calculation output. Multiple linear regression results effect of performance on cohesion when regressed without post efficacy for the moderate task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	41.8210	17.24112	20
Cohesion	18.7400	2.30510	20

Correlations

		Performance	Cohesion
Pearson Correlation	Performance	1.000	.124
	Cohesion	.124	1.000
Sig. (1-tailed)	Performance	.	.301
	Cohesion	.301	.
N	Performance	20	20
	Cohesion	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.124[a]	.015	-.039	17.57637	.015	.282	1	18	.602

a. Predictors: (Constant), Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	87.151	1	87.151	.282	.602[b]
	Residual	5560.719	18	308.929		
	Total	5647.870	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	24.409	33.016		.739	.469	-44.956	93.774
	Cohesion	.929	1.749	.124	.531	.602	-2.746	4.604

a. Dependent Variable: Performance

2.20 SPSS calculation output.. Multiple linear regression results effect of performance on cohesion when regressed without post efficacy for the hard task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	65.0979	17.13639	28
Cohesion	17.7946	2.17138	28

Correlations

		Performance	Cohesion
Pearson Correlation	Performance	1.000	.181
	Cohesion	.181	1.000
Sig. (1-tailed)	Performance	.	.178
	Cohesion	.178	.
N	Performance	28	28
	Cohesion	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.181[a]	.033	-.004	17.17390	.033	.882	1	26	.356

a. Predictors: (Constant), Cohesion

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	260.191	1	260.191	.882	.356[b]
	Residual	7668.514	26	294.943		
	Total	7928.705	27			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	39.658	27.280		1.454	.158	-16.416	95.732
	Cohesion	1.430	1.522	.181	.939	.356	-1.699	4.558

a. Dependent Variable: Performance

2.21 SPSS calculation output. Multiple linear regression results: effect of performance on post efficacy when regressed with cohesion for the easy task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	36.2570	3.13509	20
Post	4.5000	.51299	20
Cohesion	18.7900	2.78377	20

Correlations

		Performance	Post	Cohesion
Pearson Correlation	Performance	1.000	.311	-.097
	Post	.311	1.000	-.044
	Cohesion	-.097	-.044	1.000
Sig. (1-tailed)	Performance	.	.091	.343
	Post	.091	.	.427
	Cohesion	.343	.427	.
N	Performance	20	20	20
	Post	20	20	20
	Cohesion	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.322[a]	.104	-.002	3.13813	.104	.982	2	17	.395

a. Predictors: (Constant), Cohesion, Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.333	2	9.667	.982	.395[b]
	Residual	167.414	17	9.848		
	Total	186.747	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion, Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	29.564	8.175		3.616	.002	12.316	46.812
	Post	1.878	1.405	.307	1.337	.199	-1.086	4.841
	Cohesion	-.093	.259	-.083	-.361	.723	-.640	.453

a. Dependent Variable: Performance

2.22 SPSS calculation output. Multiple linear regression results: effect of performance on post efficacy when regressed with cohesion for the moderate task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	41.8210	17.24112	20
Post	4.2500	.44426	20
Cohesion	18.7400	2.30510	20

Correlations

		Performance	Post	Cohesion
Pearson Correlation	Performance	1.000	-.764	.124
	Post	-.764	1.000	-.105
	Cohesion	.124	-.105	1.000
Sig. (1-tailed)	Performance	.	.000	.301
	Post	.000	.	.330
	Cohesion	.301	.330	.
N	Performance	20	20	20
	Post	20	20	20
	Cohesion	20	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.765[a]	.586	.537	11.72836	.586	12.030	2	17	.001

a. Predictors: (Constant), Cohesion, Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3309.446	2	1654.723	12.030	.001[b]
	Residual	2338.424	17	137.554		
	Total	5647.870	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion, Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	160.844	35.777		4.496	.000	85.361	236.326
	Post	-29.476	6.090	-.760	-4.840	.000	-42.325	-16.627
	Cohesion	.334	1.174	.045	.284	.780	-2.143	2.810

a. Dependent Variable: Performance

2.23 SPSS calculation output. Multiple linear regression results: effect of performance on post efficacy when regressed with cohesion for the hard task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	65.0979	17.13639	28
Post	3.7143	.80999	28
Cohesion	17.7946	2.17138	28

Correlations

		Performance	Post	Cohesion
Pearson Correlation	Performance	1.000	-.188	.181
	Post	-.188	1.000	.144
	Cohesion	.181	.144	1.000
Sig. (1-tailed)	Performance	.	.169	.178
	Post	.169	.	.232
	Cohesion	.178	.232	.
N	Performance	28	28	28
	Post	28	28	28
	Cohesion	28	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Cohesion, Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.282[a]	.080	.006	17.08561	.080	1.080	2	25	.355

a. Predictors: (Constant), Cohesion, Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	630.749	2	315.375	1.080	.355[b]
	Residual	7297.956	25	291.918		
	Total	7928.705	27			

a. Dependent Variable: Performance

b. Predictors: (Constant), Cohesion, Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	52.395	29.400		1.782	.087	-8.155	112.946
	Post	-4.622	4.102	-.218	-1.127	.271	-13.071	3.827
	Cohesion	1.679	1.530	.213	1.097	.283	-1.473	4.830

a. Dependent Variable: Performance

2.24 SPSS calculation output. Multiple linear regression results effect of performance on post efficacy when regressed without cohesion for the easy task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	36.2570	3.13509	20
Post	4.5000	.51299	20

Correlations

		Performance	Post
Pearson Correlation	Performance	1.000	.311
	Post	.311	1.000
Sig. (1-tailed)	Performance	.	.091
	Post	.091	.
N	Performance	20	20
	Post	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.311[a]	.097	.046	3.06138	.097	1.926	1	18	.182

a. Predictors: (Constant), Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.050	1	18.050	1.926	.182[b]
	Residual	168.697	18	9.372		
	Total	186.747	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	27.707	6.199		4.470	.000	14.684	40.730
	Post	1.900	1.369	.311	1.388	.182	-.976	4.776

a. Dependent Variable: Performance

2.25 SPSS calculation output. Multiple linear regression results effect of performance on post efficacy when regressed without cohesion for the moderate task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	41.8210	17.24112	20
Post	4.2500	.44426	20

Correlations

		Performance	Post
Pearson Correlation	Performance	1.000	-.764
	Post	-.764	1.000
Sig. (1-tailed)	Performance	.	.000
	Post	.000	.
N	Performance	20	20
	Post	20	20

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.764[a]	.584	.561	11.42495	.584	25.269	1	18	.000

a. Predictors: (Constant), Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3298.340	1	3298.340	25.269	.000[b]
	Residual	2349.530	18	130.529		
	Total	5647.870	19			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	167.865	25.204		6.660	.000	114.913	220.816
	Post	-29.657	5.900	-.764	-5.027	.000	-42.052	-17.262

a. Dependent Variable: Performance

2.26 SPSS calculation output. Multiple linear regression results: effect of performance on post efficacy when regressed without cohesion for the hard task condition

Descriptive Statistics

	Mean	Std. Deviation	N
Performance	65.0979	17.13639	28
Post	3.7143	.80999	28

Correlations

		Performance	Post
Pearson Correlation	Performance	1.000	-.188
	Post	-.188	1.000
Sig. (1-tailed)	Performance	.	.169
	Post	.169	.
N	Performance	28	28
	Post	28	28

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Post[b]	.	Enter

a. Dependent Variable: Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.188[a]	.035	-.002	17.15224	.035	.950	1	26	.339

a. Predictors: (Constant), Post

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	279.522	1	279.522	.950	.339[b]
	Residual	7649.183	26	294.199		
	Total	7928.705	27			

a. Dependent Variable: Performance

b. Predictors: (Constant), Post

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	79.852	15.480		5.158	.000	48.033	111.672
	Post	-3.972	4.075	-.188	-.975	.339	-12.349	4.405

a. Dependent Variable: Performance

Appendix 3
Metalogs Leonardo's bridge Activity guide

Leonardo's Bridge.

Overcoming any obstacle.

Experientially-based learning methods

Congratulations! You are now the proud owner of a METALOG® training tool! With this tool you have chosen a method which can deployed in a variety of different fields and will help you in your work with groups. By letting contents become experiencable, you are therefore enforcing the sustainable transfer into practical experience. If this is your first experience with experientially-based learning methods, we would ask you to read about the concept in the following passages, in order to allow you to get the best from your new training tool. The METALOG® training tools are interactive exercises. What does that mean? Authentic team processes occur in the teams interaction. In a protected room - i.e. free from the challenges of daily life - the participants jointly master a demanding task, through efficient and effective communication. Our training tools 'translate' contents and theory on a level that you can experience with all senses. Learning by doing means actually seeing, hearing and feeling the experience; just like **real learning**. With this experientially-based learning project you establish a direct line to the individual reality of the participants and encourage them to draw their own conclusions and develop solution strategies. The variety and complexity of subjects which the exercise can be used on depend significantly on your own creativity. The more you tailor the exercise specifically for your workgroup, by adapting the setting up, realisation and valuation of the learning project to the culture of the team, the more impressive, effective and fruitful their learning experience will be.

'Leonardo's Bridge' **is an exercise in communication and cooperation, which, as a living metaphor, makes interaction visible, audible and tangible. Some of the issues which can be addressed and illuminated with this exercise include the following: Effective listening techniques, interaction within teams, how managers communicate, problem-solving in groups, factors which determine success or lack of success, cooperation, feedback processes, systemic correlations, and so forth.**

Basic procedure

1. **Introducing the exercise:** Give the project a clear aim. In addition to explaining the framework and rules, take time initially to briefly explain the content and its relevance for the group.
2. **Conducting the exercise:** In this phase the group activity takes precedence. The trainer plays the role of observer.
3. **Interventions:** If the group gets stuck in a dead end for what feels like too long a time, you can interrupt the process and help the team to arrive at their own solutions.
4. **Debriefing:** Collect the various responses to the learning project. The debriefing stage offers multiple opportunities for transfer to real-world situations.

Framework

No. of participants: approx 6-12.

Time frame (excluding debriefing): approx. 45-60 minutes
Space required: A room or space at least 10 x 8 metres long, ideally two rooms.

Aim

The group's task is to build a bridge out of the 28 wooden sticks. This bridge can be up to 4 metres high and must be self-supporting. No other materials may be used. The bridge should span a "moat" which is marked on the floor.

Preparation

Use the enclosed rope or masking tape to mark out a "moat" on the floor about 1.5 - 2 metres wide. You also need to demarcate a 1 metre wide "hedge" on each side. The total length of the bridge should cover the moat and the hedges. The final overall distance from one side to the other should be 3.5 to 4 metres.
Note: to make the activity more impressive, you could also build the bridge over a naturally-occurring obstacle, such as an unused path or a stream.

Procedure

Divide the group into two subgroups of equal size. Each group is assigned a separate area/room and half of the provided materials (i.e. 14 sticks). Ideally, the two groups will not be able to see each other. This stage lasts 15 minutes. (Easier version: one person from each subgroup can look at a photo of the basic construction for 3 minutes and experiment with the constructions sticks. This information can then be passed on to their respective groups. The photo may not be shown to the rest of the group.)
When at least one group has come up with a feasible working concept, stop this planning stage and request all participants to join up a table without their sticks. There they will find 28 miniature sticks, with which they can work together on a model construction to bridge the moat. Following this planning stage, the real construction phase will begin. The group proceeds to build the bridge. The following rules apply:

Rules

The bridge must span the moat and the hedges, i.e. it cannot be built from hedge to hedge. This makes a total length of 4 metres. Construction of the bridge must begin on both sides of the moat simultaneously. The task for the group is to find out how to make the bridge join.

Advice: Some groups build half the bridge on each side and then bring the two halves together hovering in mid-air over the moat. Others decide to throw all the sticks belonging to one group over to the other side of the moat and then to move the whole bridge. Each solution offers useful details for debriefing.

The 1.50 - 2 metre wide moat must not be entered, because of the risk of falling.
The rules for the "hedges" can be adapted according to how challenging you want it to be. For example: two people may stand on the hedge with one foot only (difficult); one person can stand with both feet on the hedge (medium); two people may stand on the hedge with both feet (easy).

Range of application

The scope and complexity of the issues which can be addressed using this activity are limited only by your imagination and how you set up, conduct and debrief the exercise. Take notes while the groups is working to help you ask more precise questions and lead the debriefing discussion more effectively.

Example 1: Two Cultures Meet

Roles to be assigned per subgroup: 1 Head of Construction; 1 Time Manager, and 1 Interface Coordinator.

1. **Introducing the exercise**

”This moat separating the two groups must be bridged with a self-standing structure to be built by the whole team together. Initially, construction planning will take place in two separate groups. Each group will receive 14 construction sticks. After 15 minutes the whole team will meet and work on a model together…So… let’s go.”

2. **Interventions**

Should the participants find themselves in a dead-end situation, which seems to be going on too long, interrupt the process. Although, as a rule, we recommend holding back a little with trainer’s interventions to give teams a chance to work out their own solutions, independently of you. When you intervene you could ask questions such as the following: “This has not worked very well yet. What changes could you introduce now in terms of communication and coordination in order to better attain your goal? What has worked so far? How can you consolidate that?”

We also recommend proceeding in stages and using trial and error to try out a variety of solutions.
You can also direct the discussion to elicit some or all of the following problem-solving concepts:

- We need to pay more attention to the others.
- We need to build trust in order to build a bridge. How can we create trust?
- We need to plan two steps ahead.
- We need one person as “leader”. etc.

3. **Debriefing**

- How did you feel as a team?
- How did the subgroups mutually support each other?
- What were the key moments in the construction of the bridge?
- Did you stick to the assigned roles?
- What have learned from this exercise that can be applied in your everyday life?

Variation:
The bridge is to be constructed from either side and then joined in the middle. This is a more challenging version.

Expect the unexpected

In our experience, different groups find slightly different solutions, reflecting authentic group dynamics. This is a rich source of insights for trainers who are willing to allow their groups plenty of room for experimentation and spontaneous/unusual reactions. Everything that happens can be put to good use in a long-lasting learning experience.

Contents of delivery: 28 construction sticks, 1 bag for transportation, 28 miniature sticks in a container, 4 ropes measuring 3 metres each, 1 set of detailed instructions.

Appendix 4

FDTC Instructors Leonardo's bridge activity guide

Leonardo's Bridge Guide

Instructor - reads entire guide for complete understanding

Set Up
Hedge Width:
1 Stick

Moat Widths:
Easy – 1 Stick
Medium – 1 ½ Sticks
Hard – 2 Sticks

Handouts
Consent form
Information sheet

Brief Challenge using **aims** from activity sheet. Include (Bridge must span hedges and moat).

Separate groups into two rooms with 13 small sticks each, they have 5 mins planning time.

Handout
Pre activity group efficiency questionnaire

Bring groups together sat around the tables in lounge. (see diagram)

Brief group – You have 45 mins task time, your equipment is as follows:

Placed on the tables is:

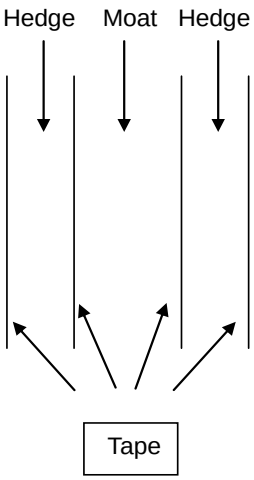
Easy – Small sticks and photo
Medium – Small sticks
Hard – Small sticks

The 28 large sticks are placed on each side moat and hedges

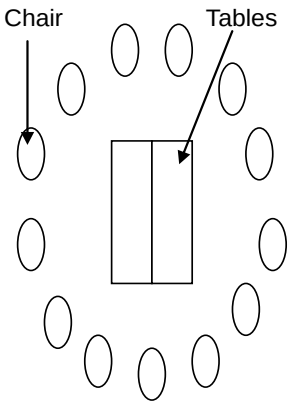
Handout
Post activity
Individual environmental questionnaire.

Both setups complete before challenge brief

Activity setup



Group planning area set up



Appendix 5

UCLAN Participant information sheet

Informed Consent Form for Study Participants

Project Title: Do increases in task difficulty lead to corresponding increases in group efficacy, cohesiveness and performance?

I agree to take part in a University of Central Lancashire research project. I have had the project explained to me, and I have read the Information Sheet, which I may keep for my records. I understand that agreeing to take part means that I am willing to:

- Take part in facilitated group discussion.
- Participate in a group task activity.
- Complete questionnaires asking me about group efficacy and cohesion.

Data Protection

This information will be held and processed for the following purpose(s):

To provide information for quantitative research, exploring; Task difficulty, Group Efficacy, Group Cohesion and Performance.

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation.

I agree to University of Central Lancashire recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.

Withdrawal from study

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Name: .....(please print)

Signature: .....Date: .....

Name of researcher: .....(please print)

Signature: ..... Date: .....

School of Sport, Tourism and The Outdoors

PARTICIPANT INFORMATION SHEET

Study Title: **Do increases in task difficulty lead to corresponding increases in group efficacy, cohesiveness and performance?**

You are being invited to take part in a research study being conducted by the researcher for his MSc by Research in Division of the Outdoors, University of Central Lancashire. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This project will engage students in an outdoor orientated task to investigate the relationship between task difficulty, group efficacy, cohesiveness and group performance.

Why have I been chosen?

You have been chosen because the study may have future training recommendations for Royal Air Force (RAF) training. As current serving serviceman/women your experience and engagement in training at Force Development Training Centre (FDTC) Fairbourne, represents an opportunity to gain valuable information regarding the engagement of RAF personnel in outdoor tasks and activities.

Do I have to take part?

You are, of course, entirely free to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time, and without giving a reason. Your decision as to whether or not to take part in the study, or any decision to withdraw from the study, will not affect your dealings with UCLan or your legal rights.

What will happen to me if I take part?

You will be asked to take part in a study involving a group activity task, which is likely to last between fifteen and forty minutes, focusing on personal and team development. During the activity period you will be given a brief by your facilitator outlining the task and limitations. After considering the limitations, you will be asked to discuss your group likelihood of success (group efficacy) and record this on a questionnaire. After completing

Appendix 6

UCLAN The group efficacy questionnaire

The Group Efficacy Questionnaire

(Gibson, Randel and Earley, 2000)

Please respond by checking a numerical response for each question

Task Level:

Our team is certain that we are able to achieve the task considering the set limitations

Likert Value	1	2	3	4	5
Descriptors	Not possible	Maybe Possible	Neither	Possible	Very possible

Reference

Gibson, C. B., A.E. Randel and P.C. Earley, (2000). `Understanding group efficacy: An empirical test of multiple assessment methods. Group and Organization Management, 25, pp. 67-97.

Appendix 7
UCLAN The group environment questionnaire

The Group Environment Questionnaire (GEQ)

Group Integration Task (GIT) Items
(Adapted from the GEQ Test Manual, Carron, Brawley and Widmeyer, 2002)

Please respond by checking a numerical response for each question

1. Our team is united in trying to reach its goals for performance.

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

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

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

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

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

4. If members of our team have problems during the task, everyone wants to help them so we can get back together again.

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

5. Members of our team do not communicate freely about each other's responsibilities during the task activity*

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

* Reverse scored

Reference

Carron, A.V., L.R. Brawley and W.N. Widmeyer (2002). The Group Environment Questionnaire test manual. Fitness Information Technology, Morgantown, WV.