The relationship between self-efficacy, collective efficacy and sport performance in men's and women's ice hockey goaltender teams

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ABSTRACT

Past research has shown a positive relationship between efficacy and performance (Feltz & Lirgg, 1998). Feltz and Lirgg (1998) found a positive relationship between efficacy and sport performance in hockey players, however they excluded goaltenders due to their unique position. The present study replicated Feltz and Lirgg (1998) with only goaltenders. Data was collected from 12 goaltenders from three Ontario hockey leagues. Efficacy was measured through an online questionnaire and official game statistics provided the performance measures. Data was collected for 70 games to total of 112 responses. Results of this study revealed non-significant relationships between both self- and collective efficacy and all performance indicators. Results of the present study are not consistent with Feltz and Lirgg's (1998), however other published research has found a non-significant relationship between efficacy and sport performance (Sitzmann & Yeo, 2013). Therefore, it is possible that goaltender efficacy is not the most influential psychological construct.

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1.1 *Introduction*

"People have always doubted whether I was good enough to play this game at this level. I thought I was, and I thought I could be. What other people thought was really always irrelevant to me" – Steve Nash

Whether you are a 12 year old basketball hopeful trying to perfect a foul shot, or an Olympic hockey player competing in the gold medal game, the confidence you have in yourself as well as your team can be a crucial element of sport that may need further development. Individual and team success in sport can be influenced by confidence. How can confidence influence sport performance? This is a question that has interested me since my personal ups and downs in sport. This chapter will cover a comprehensive review of the literature written to date on self-efficacy and collective efficacy and how they relate to sport performance.

1.2 *Social Cognitive Theory*

Social cognitive theory (Bandura, 1986) is used by psychologists to understand how humans learn behaviour. According to Maddux (1995), social cognitive theory is an approach to understanding human cognition, action, motivation, and emotion. Furthermore, humans are active shapers of their environments rather than simply passive reactors to them. Sport specific skills do not just happen automatically; the athlete must learn these skills. Social cognitive theory emphasizes the role of observational learning, social experience, and reciprocal determinism in the development of personality (Bandura, 1997, 2001). As humans, our behaviour is purposeful and goal-directed. As agents, people use forethought, self-reflection and self-regulation to influence their own

functioning (Feltz, Short, & Sullivan, 2008). As explained by Bandura (1997), people make causal contributions to their own psychological functioning through mechanisms of personal agency where personal efficacy is the most persuasive.

To apply social cognitive theory (Bandura, 1986) to the area of sport psychology, Feltz et al., (2008) further explained social cognitive theory with a triadic network. The first component of the cycle is environmental conditions. An environmental condition could be a coach's feedback to the athlete or interaction with others. There can be a heavy dependence on a coach's feedback for the athlete to help develop performance. Furthermore, teammates can be used as social models. Through interaction and watching other teammates perform motor skills, athletes can judge their performance and learn how to do it accurately. Modeling behaviour can be an effective method for an athlete to learn how to perfect his/her skills (Bandura, 1994). The second component of is personal factors. This could be an athlete's self-efficacy, knowledge or beliefs. The final factor is agentic behaviours; examples would be an athlete's effort or persistence. This network represents a reciprocal process where the three factors all function as interacting determinants of one another to explain motivation and behaviour (Bandura, 1986, 1997). An example of this network could be the following situation: A coach's positive behaviour can influence what an athlete believes that he or she can achieve and goals the athlete sets, which can then influence the athlete's effort to reach these goals. In turn, an athlete's effort can influence a coach's reaction to the athlete (Feltz et al., 2008). This network helps put social cognitive theory into perspective in a relatable scenario that is applicable to sport.

1.3 *Self-Efficacy*

Self-efficacy has become one of the most frequently cited psychological factors believed to influence sport performance. There have been over 200 published papers on self-efficacy and sport and motor performance (Feltz, et al., 2008). Self-efficacy can be defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 3). Moreover, if an individual does not believe they can do a certain action they are most likely to have little motivation to act. Therefore, people with higher self-efficacy beliefs choose to set more challenging goals for themselves then people with lower self-efficacy beliefs (Locke, Frederick, Lee, & Bobko, 1984). An individual's beliefs vary by level (or magnitude), strength, and generality. The level of magnitude represents an individual's expected performance attainments at different levels of difficulty. For example, to measure the different levels of self-efficacy for a penalty kick in soccer an athlete would judge how successful he/she was on a scale from 1 to 10. The strength refers to an individual's beliefs that they can accomplish different levels of performance from completely uncertain to completely certain, which can also be evaluated using a scale of 1 (*completely uncertain*) to 10 (*completely certain*). In addition, generality indicates the number of domains of functioning in which an individual judges himself/herself to be efficacious and the transferability of one's efficacy judgements across different tasks, such as across different sports. It is important for self-efficacy to be measured specific to the domain of functioning. Bandura (1997) advocates that efficacy measures that are specific to the particular domains of functioning should be used instead of efficacy measures that assess global expectations of performance that are devoid of context. Specific measures of efficacy provide a more accurate prediction of a certain

performance. For example, a global measure that assesses one's efficacy beliefs for sports, in general, would not be as predictive of performance in hockey as a hockey-specific efficacy measure would be.

Previous and current literature has also used the terms "self-confidence" and "sport confidence" which are different from self-efficacy (Vealey, 1986). These terms are similar in that they are goal-oriented terms; however "self-confidence" and "sport confidence" refer to the measurement of people's judgements about their capabilities to accomplish a particular goal in sport or physical education. Although "self-confidence" and "sport confidence" correspond with the self-efficacy definition by Bandura (1977), these terms are used to measure what people think they can do as opposed to what abilities they have (Feltz et al., 2008).

Bandura (1994) proposed that self-efficacy originates from four sources. The first of these sources is 'mastery experiences'. Performing a task successfully strengthens our sense of self-efficacy however failing to adequately deal with a task or challenge can undermine and weaken self-efficacy (Bandura, 1994). If an athlete has repeatedly thought of these experiences as successful, self-efficacy beliefs will generally increase. However, if an athlete has constantly thought of past experiences as unsuccessful then self-efficacy will generally decrease (Feltz et al., 2008). This is the most influential source of self-efficacy because they are based on one's own past performance accomplishments (Bandura, 1997).

The second source of self-efficacy is 'social modeling.' By watching another athlete of similar capabilities as oneself, an athlete believes that he/she also possess the

capabilities to master comparable skills. When an athlete observes performance of one or more other people, the athlete codes the observed information, notes the consequences of performance, and then uses this information to form judgements about one's own performance (Bandura, 1997; Maddux, 1995). Observing repeated demonstrations by a skilful model can provide instructional information on how to perform a task correctly and efficacy information that the task can be learned (Feltz et al., 2008). Furthermore, Bandura (1997) explains that people who are similar or slightly higher in ability provided the most informative comparative information for judging one's own capabilities. Moreover, athletes who want to challenge themselves to reach higher levels than their previous performance will compare themselves to those who are slightly better than their own giving the athlete standards of performance to beat (Bandura, 1997).

The third source is 'social persuasion'. Bandura (1997) emphasized that individuals could be persuaded to believe that they have the skills and capabilities to succeed such as encouragement from a coach, evaluative feedback, self talk and other cognitive strategies used in attempts to influence an athlete's perception of efficacy (Feltz et al., 2008). As social cognitive theory explains (Bandura, 1986), people are responsible for regulating their own thought process. Therefore athletes can convince themselves that they can accomplish a goal through positive self-talk and task-related statements (Feltz et al., 2008).

'Psychological response' is another source of self-efficacy (Bandura, 1994). Moods, emotional states, physical reactions and stress levels can all impact how individuals feel about their personal abilities in a particular situation. Furthermore, how emotional and physical reactions are perceived and interpreted is key, not the intensity of

these reactions (Bandura, 1994). This is an important source of efficacy information with respect to sport (Chase, Feltz & Lirgg, 2003; Feltz & Riessinger, 1990; Feltz et al., 2008). With close resemblance, an athlete's emotional state can also play a crucial role when developing efficacy perceptions (Feltz & Lirgg, 2001). Efficacy judgements can be enhanced by positive affect such as happiness, exhilaration, and tranquility. Negative affective states such as sadness, anxiety, and depression are most likely to hinder perceptions of efficacy (Maddux & Meier, 1995; Treasure, Monson, & Lox, 1996). Furthermore, emotional symptoms that create anxiety might be interpreted to mean that the athlete lacks the required skills to perform a certain task which could also affect efficacy judgements (Schunk, 1995).

Maddux (1995) adds one more source of self-efficacy to the list, 'imaginal experiences.' By imagining themselves or others behaving successfully or unsuccessfully in anticipated performance situations athletes can generate efficacy beliefs (Maddux, 1995). Bandura (1997) labels this as cognitive self-modeling (or cognitive enactment). By imagining oneself winning against an opponent efficacy judgements are heightened (Feltz & Riessinger, 1990). It is also important to be confident in one's imagery ability. Short, Tenute, and Feltz (2005) found that the more athletes were confident in their ability to use a certain image, the more they used it. Moreover, efficacy in using imagery was found to reconcile the relationship between imagery ability and imagery use (Short et al., 2005).

1.4 *Collective Efficacy*

In sport there are not just individual athletes competing; There are athletes competing on teams. Consequently, researchers can examine the confidence of teams.

This is known as collective efficacy.. Collective efficacy is defined as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainment" (Bandura, 1997, p. 3). A slightly altered definition of collective efficacy by Zaccaro, Blair, Paterson, and Zazanis (1995) still offers a similar point. Zaccaro and colleagues' (1995, p. 309) define collective efficacy as, "a sense of collective competence shared among members when allocating, coordinating, and integrating their resources as a successful, concerted response to specific situational demands."

Self-efficacy is an individual-level phenomenon, whereas collective efficacy exists as a group-level attribute. Moreover, Bandura (1997, 2001) conceptualized collective efficacy as a state, rather than a trait. It is important to note that collective efficacy is not simply the sum of the efficacy beliefs of individual members because group functioning is the product of the interactive and coordinative dynamics of its members (Bandura, 1997). Therefore, collective efficacy should assess the respondents' perceptions of how well the group can work together successfully (Maddux, 1995).

Collective efficacy should be measured similarly to self-efficacy. Magnitude, strength, and generality should all be assessed in addition to shared beliefs (Maddux, 1995). Shared beliefs represent a statistically significant high degree of dependence among group members (Maddux, 1995). Moreover, there should be a lesser degree of variability within groups when all other differentiating factors are controlled for (Maddux, 1995).

Bandura (1997) contended that on highly interactive tasks, collective efficacy will be a better predictor of team performance than self-efficacy because members' beliefs about the team include the coordinative and interactive dynamics that operate within a team. Feltz and Lirgg (1998) argued that the obvious success of a team through the wins and losses statistic may have a greater effect on player's efficacy judgements about their team than on their personal self-efficacy. In short, collective efficacy was more affected by previous performance outcome than self-efficacy in the study conducted by Feltz and Lirgg (1998). Furthermore, a serious performance failure could decrease the collective efficacy of its membership, which in turn, could influence subsequent failures. According to Johnston (1967) it is easier for a team member to assess the performance accomplishments of the team as a whole than it is to assess one's own contributions to the team's performance. Team accomplishments are more apparent and less ambiguous than the individual's accomplishments in the team context.

Another factor that influences a team's collective efficacy is the level of interdependence of the task. Sports where interdependence among group members is low, such as a golf team, a summative of individual efficacies may have sufficient predictive power for group outcomes (Bandura, 1997). Members of sports teams with low interdependence do not rely on one another to perform their job, even though they have shared goals and provide mutual social support for each other. The group's level of attainment is the sum of the outcomes produced individually. On the other hand, when group interdependence is high such as in a basketball, soccer or hockey team, the sum of individual efficacies would be the better predictor of team performance (Bandura, 1997). Members work well together to achieve group results. This requires close coordination of

roles and strategies, effective communication, cooperative goals, and mutual adjustments to one another's performances (Saavedra, Earley, & Van Dyne, 1993). Research by Moritz (1998) supports this. Moritz (1998) examined the effect of task type (additive vs. interdependent) on the self-efficacy-performance and collective efficacy-performance relationships using a bowling task. Collective efficacy was a significant predictor of performance in the interdependent condition but not in the additive condition for both individual and team levels of analyses. However, task type did not moderate the relationship between self-efficacy and performance at either the individual or group levels of analyses. Moreover, results revealed that perceptions of efficacy were positively correlated with participant's responses to an item that assessed the amount of effort they perceived they put into the task (Moritz, 1998).

Since collective efficacy is rooted in self-efficacy (Bandura, 1997) some of the sources of collective efficacy should be similar to self-efficacy however focus should be drawn to the group level. For instance, mastery experiences would be based on team masteries, vicarious experiences might incorporate watching a similar team in a similar situation, verbal persuasion would be focussed on the group, and the physiological and affective states could potentially involve perceptions of the group's nervousness (Feltz & Lirgg, 2001). Past experiences are found to be the strongest source of collective efficacy (Feltz & Lirgg, 2001). In addition, the effectiveness of leaders is another critical influence to collective efficacy. Exceptional leadership will influence collective efficacy (Watson, Chemers, & Preiser, 2001). It is a leader's responsibility to model confidence, contribute to solving problems and persuade teammates that the team has the abilities to

succeed. On the other hand, poor leadership can drastically minimize collective efficacy (Watson & Chemers, 1998).

Team size is a potential unique source of efficacy that exists at the team level (i.e., collective efficacy) and not the individual level (i.e., self-efficacy). Members of smaller teams are generally more inclined to put forth more effort, experience less team conflicts and have a higher degree of cohesion (Zaccaro, Blair, Peterson, & Zazanis, 1995). As team size increases, individual effort and performance decline because of social loafing (Hill, 1982; Latané, Williams, & Harkins, 1979). On the other hand, Zaccaro et al. (1995) stated that a larger team size could be positively associated with collective efficacy. Larger teams have more resources available; therefore there could be a higher probability of successful performances as well as greater perceptions of collective efficacy.

The issue of team size has remained one of the most frequently examined topics in social psychology (Carron & Eys, 2012). Steiner's (1972) framework of team size comprehensively describes this concern. As the number of teammates increases, the potential for the group to be more productive also increase due to the increase of team resources. However team productivity only rises to a certain point. Eventually, a team gets too large and resources that are available to the group plateau since there is a point where there are enough resources to achieve the team goal. For example, a hockey coach could have three forward lines, three defensive pairs and two goalies. This coach could add more players to the team to increases the amount of resources available (these resources could include a power-play unit or a checking forward line). Yet if the coach keeps adding more players to the team it becomes unnecessary because the present resources are enough for the team to have a successful season. Moreover, as resources

increase there is a decrease in process efficiency (the effective coordination of resources). In addition, as team size increases it becomes more difficult for the coach to coordinate practices, use all of the players in competition, to provide all players with instruction and to communicate effectively with the total roster. Furthermore, it can be challenging for all players to interact with all of the other teammates. Relative productivity of each individual group member also declines systematically with increases in group size.

The relationship between collective efficacy and team size was examined at the end of a basketball season in a study by Watson, et al. (2001). Twenty-eight (13 female and 15 male) teams in two NCAA Division III basketball conferences participated in the study. Players were asked to fill out two separate questionnaires. The first questionnaire was completed at practice before the beginning of the season. The second questionnaire was to be filled out near the end of the season before the start of the postseason. Measures of this study include collective efficacy, self-efficacy, optimism, leader confidence, leader evaluation, team performance, individual performance, and perceptions of performance. To measure collective efficacy, the questionnaire included statements such as, "This team's confidence helps it to perform its best" and "This team is a very effective team." Players were asked to respond using a 5-point scale where answers ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). To measure self-efficacy the same 5-point scale was used and statements on the questionnaire included, "I have high confidence in my ability to play my position or positions" and "I have all the skills needed to perform the things required of me very well." Furthermore, team performance was measured in three distinct areas: offensive success (team's average points scored per game), defensive success (measured by average points allowed per game), and overall

success (measured by team overall rank). Individual performance was measured by average number of points scored by each player per game. The authors hypothesized that group size would be negatively related to average collective efficacy since Zaccaro and colleagues previously suggested that aforementioned influences team size has on collective efficacy. Watson, et al. (2001) found that the larger the team, the lower collective efficacy at the end of the season.

Watson et al. (2001) concluded that collective efficacy is a multilevel construct as there are multiple antecedents and consequences of collective efficacy. Individual-level influences include self-efficacy, optimism, perceptions of leader effectiveness, and perceptions of recent team performance. Moreover, group-level influences include group size, past team performance, and confident leadership. Due to these influences Watson et al. (2001) believe that a smaller team size, such as a basketball team, have increased collective efficacy beliefs. For example, an increase in group size may negatively influence collective efficacy because coordination difficulties can increase rapidly. This causes an increased chance of potential cliques to form within the group (Zaccaro et al., 1995). Therefore smaller teams are at an advantage in regards to collective efficacy.

1.5 *The Relationship between Self-Efficacy and Sport Performance*

As previously mentioned, there have been numerous studies done examining the relationship between self-efficacy and performance. Research has been done in laboratory and field-based environments, both drawing similar conclusions. Gilson, Chow, and Feltz (2012) studied the relationship of self-efficacy and sport performance using a squat task. Participants consisted of 115 division one collegiate American football

players from five separate teams. During the off-season, data was collected by the head strength and conditioning coach from each university. The task was to successfully complete a one repetition maximum (1RM) test of a squat. In other words, each athlete had to successfully complete one squat with as much weight as possible. The squat was chosen as the most appropriate exercise based on input from four strength coaches as they thought it was the most important for football, it is the least technically difficult, and it is the most often test used by universities. Performance was measured as weight in pounds an athlete could squat. Self-efficacy was measured using a questionnaire developed by the authors using guidelines from Bandura (2006). The questionnaire comprised of three questions in which athletes were asked to rate how confident he was at the present moment to improve his previous performance in the squat by any amount of weight, by at least 10 pounds, and by at least 20 pounds (Gilson et al., 2012). Answers were given on a 10 point Likert-type scale ranging from 0 (*not at all confident*) to 9 (*absolutely confident*). When an athlete experienced improvements in their self-efficacy beliefs, their 1RM squat performance also increased. Conclusions from this study tell us that self-efficacy (relative to past squat performance) was positively related to squat performance.

Gilson et al. (2012) took an interesting approach to researching this topic. Participants in this study were all football athletes and performance was measured using a 1RM squat task at the end of a season. The authors decided to use the squat task as it is relevant to the sport of football. By choosing to look at self-efficacy and performance with this laboratory based task, the authors illustrated great transferability of the research findings. Although the task was a controlled in a laboratory based experiment the authors could generalize the findings to sport since the squat task is representative of football

performance. Gilson et al. (2012) concluded that as self-efficacy beliefs increased, performance increased as well. Therefore, increasing self-efficacy can help increase sport performance.

Competitive weight lifting is a unique sport to self-efficacy research. Carnahan, Shea, and Davis (1990) looked at the effects of motivational cues (i.e., verbal, visual, verbal-visual, and no cue) on bench-press exercise performance and self-efficacy. Eleven male undergraduate students participated in this study. Participants had no more than three years of weight-lifting experience. The task was to perform the bench-press exercise on a standard Olympic flat bench. Baseline performance was measured for each participant to determine the amount of weight they could do successfully eight times. In each condition (verbal, visual, verbal-visual, and no cue) participants performed four sets of eight repetitions, where participants had two minutes of rest between each set and each condition was completed 48 hours apart. Following sets, participants were asked to rate their self-efficacy beliefs on the next set (i.e., if they would be able to do the same number of reps, or more, than they had just completed on the next trial). A 4 X 3 (motivational cue x set) repeated measures ANOVA was used to assess self-efficacy. Results showed only a main effect for set, furthermore as the number of lifts across sets decreased, self-efficacy ratings increased. The conclusions drawn from this study agree with social cognitive theory but do not agree with previous research finding on self-efficacy since self-efficacy was not shown to be a primary determinant of performance. Reasoning for this could be due to the small sample size since there were only eleven participants. Also, fatigue could play a crucial role. No participants attributed their

performance to task difficulty which could reflect insensitivity to the importance of fatigue in performance.

Barling and Abel (1983) looked at the relationship between self-efficacy and tennis performance. The sample included forty experienced tennis players. Thirty-two of the participants played in a league while the remaining eight did not play in a league but were active in the sport. Tennis performance was measured using a 37-item scale which defined twelve behavioural categories specific to the sport. These categories included: knowledge, experience, dependability, accuracy, consistency, variation, power and spin, footwork, anticipation, style, concentration, and competition. Self-efficacy was measured using three 10-item scales to quantify their self-efficacy in their strength ("I can play most of my shots correctly"), response-outcome ("Improving my strokes will win me more points"), or valence ("Winning more points is very important to me"). Results drawn from this study revealed significant correlation between task-specific measures of self-efficacy and tennis performance ($p < .01$). This study was one of the first studies to show generalizability of the self-efficacy-performance relationship. Moreover, the self-efficacy beliefs were related consistently to different aspects of tennis performance (Barling & Abel, 1983).

The self-efficacy-performance relationship was assessed with U.S. Olympic athletes of the 1996 Atlanta summer Olympics and the 1998 Nagano winter Olympics in a study by Gould, Greenleaf, Chung, Guinan (2002). The study included 296 athletes representing the United States of America in 27 sports in the Atlanta 1996 summer games, and 83 U.S. athletes from the 1998 Nagano winter games incorporated from 14 different sports. In addition to multiple other variables that influence Olympic athlete

performance such as performance relating factors (e.g., previous experience competing in Olympics; outside factors disrupting routines), environmental factors (e.g., opening ceremonies too close to competition, Olympic village distractions), media (e.g., too much attention), the self-efficacy construct is one of the most influential psychological constructs of sport (Gould et al., 2002).

Other concepts such as causal attributions, competitive state anxiety, and effort expenditure have been incorporated into research exploring the self-efficacy and performance relationship. More specifically, Gernignon and Delloye (2003) used 62 French national sprinters (42 males, 20 females) to look at the relationship between unexpected outcome, causal attributions, self-efficacy and performance. The task used was to run 60-meters alone. First, participants did a physical warm-up, next they completed a self-efficacy measure questionnaire, followed by the 60-meter run. Following the run participants were given falsified performance times according to the success or failure of manipulation. After the run, participants recovered and then completed an attributions questionnaire as well as another self-efficacy measure. To complete the process the participants were asked to run the 60-meter dash again. After the second run participants were given accurate performance times. It was hypothesized that telling an athlete an unexpected success or failure on the first trial would increase self-efficacy beliefs and performance on the next trial. On the other hand, the authors hypothesized that telling an athlete an unexpected failure would lead to decreased self-efficacy and performance. Results from this study showed that success conditions lead to increased self-efficacy and performance for both male and female participants. Moreover, participants in the success condition had higher levels of self-efficacy than those in the

failure condition since their self-efficacy decreased across trials. Practical implications for this study to real-world sport are important for coaching strategies. For example, feedback during recovery times can be influential to athletic performance and should be implemented appropriately by coaches.

Competitive state anxiety and effort expenditure were added to the mix in a study George (1994) who wanted to look at baseball performance. Participants included fifty-three male intercollegiate and interscholastic baseball players. Athletes completed self-reported measures of self-efficacy over a nine game period during a baseball season. Variables measured included perceptions of self-efficacy, competitive state anxiety, effort expenditure, and objective hitting performance. Questionnaires were used to quantify self-efficacy, anxiety and effort. George (1994) revealed moderate support of Bandura's model of self-efficacy. More specific conclusions from this study include: a higher performance predicted stronger perceptions of efficacy in six games, and lower levels of somatic and cognitive anxiety were associated with stronger self-efficacy beliefs in seven games. Moreover, athletes with higher self-efficacy predicted they would have greater effort in six games as well as a higher hitting performance in five games. This study agrees with the consistent finding that successful elite athletes report greater self-confidence than do less successful athletes (Gould, Weiss, & Weinberg, 1981; Highlen & Bennett, 1979, 1983; Mahoney & Avener, 1977). Overall, results from this study showed that self-efficacy is the strongest predictor of baseball hitting performance.

Due to the high volume of research done on the self-efficacy-performance relationship a meta-analysis was done by Moritz, Feltz, Fahrbach, and Mack (2000). In their review of the literature they found that correlations between self-efficacy and

performance ranged from a high of $r = .79$ (e.g. Martin & Gill, 1991) to a low of $r = .01$ (e.g., McAuley, 1985) and in some situations correlations were negative (e.g., McCullagh, 1987). Derived from 45 studies (102 correlations) the average correlation between self-efficacy and sport performance was $r = .38$. Therefore self-efficacy beliefs have a positive and small to moderate relationship with performance in sport. Due to the wide variety of self-efficacy and performance measurements used in these 45 studies the conclusions of the Moritz et al. (2000) meta-analysis reveal a substantial amount of generalizability across the sport domain. As a final point, the meta-analysis by Moritz et al. (2000) provides valid support for a significant relationship between self-efficacy and sport performance.

Another meta-analysis was done by Woodman and Hardy (2003) to study the relationship between self-efficacy and sport performance. This study involved 48 studies that examined the relationship between state and cognitive anxiety and performance and between self-confidence and performance in a field setting. The main method of measuring self-efficacy included the Competitive State Anxiety Inventory-2 (Martens, Vealey, & Burton, 1990). The self-efficacy mean effect size was $r = 0.24$ and was statistically significant ($p < 0.001$). Results also revealed that self-efficacy was significantly more strongly related to sport performance than cognitive anxiety.

1.6 *The Relationship between Collective Efficacy and Sport Performance*

To understand how efficacy beliefs and sport performance are related, researchers have closely examined this psychological construct in both a laboratory setting as well as in the field. Lichacz and Partington (1996) used a tug-of-war laboratory based task with groups of three to four male undergraduate students. Two teams were comprised of

varsity rowers (one group of three and one group of four); two teams were made up of varsity basketball players (two groups of two) as well as two student ad hoc groups (one group of three and one group of four). Subjects were required to pull on the rope both individually and collectively. To derive a collective performance efficacy index the researchers added the collective and individual performance. This index indicated if social loafing occurred. Judgements of collective efficacy was measured using rating scales which asked "Do you think that your group will achieve a better pull than the normative pull?" where answers ranged from 0 (*no chance in obtaining the best score*) to 10 (*will obtain the best score*). Lichacz and Partington (1996) concluded that teams with higher collective efficacy outperformed teams with low collective efficacy. Furthermore, performance failures resulted in lower collective efficacy on successive performance trials (Lichacz & Partington, 1996).

Similar to the research by Lichacz and Partington (1996), research by Hodges and Carron (1992) also looked at the effect of collective efficacy on a muscular endurance task performance. The sample consisted of 25 female triads, 26 male triads as well as two confederate groups (one male and one female). A dynamometer was used to record collective strength of the group. Collective efficacy was manipulated through bogus feedback from the researcher. Teams belonging to the high efficacy condition were told that their total group score was substantially superior to those of the confederate group and teams belonging to the low efficacy condition were told that they did not perform as well as the confederate group. Next a medicine ball task was done where the teams of three were required to extend their dominant arm out to the side (at shoulder height) and together these three teammates would hold a six kilogram medicine ball in the platform

their hands created. Hands were not allowed to overlap. The confederate groups used an identical looking medicine ball however it was filled with foam. Performance was measured in time (seconds) the medicine ball was held in position and the trial ended once the medicine ball hit the ground. Both the experimental groups and confederate groups were told that they would perform two trials. The goal was to hold the medicine ball in position longer than the confederate group. During each trial the confederate group, in the same room, would hold their medicine ball for five to ten seconds longer than the experimental group's performance had stopped (i.e. once their ball hit the ground). Collective efficacy was measured prior to each trial on the medicine ball task. Subjects were asked to give a collective response to the following question, "What do you think you group's chances are of winning?" Answers ranged from 0% (*definitely lose*) to 100% (*definitely win*). This study found that high collective efficacy teams outperformed and persisted longer than low efficacy groups. Additionally, performance failure resulted in lower collective efficacy on successive performance trials.

Bray (2004) used a similar medicine ball task and also looked at groups of three. Thirty-seven same sex triads comprised the sample. Group performance was measured in a similar way as Hodges and Carron (1992). The key difference between this study and the research done by Hodges and Carron (1992) was that between each trial the groups were asked to collectively determine their collective efficacy as well as come up with a group goal. This was done by casual conversation during the rest period between trials one and two. The conclusion of this study was that what members come to believe about their capabilities as a team also plays a significant role in how they perform. Moreover, groups with high collective efficacy set higher goals (Bray, 2004).

In addition to these laboratory-based studies, previous research has also observed the relationship between collective efficacy and performance over a season in real world sports teams. Feltz and Lirgg (1998) looked at the relationship among player efficacy, team efficacy and performance in men's collegiate ice hockey across a season. The sample had 159 hockey players (excluding goaltenders due to their unique position). Team efficacy was measured using seven items that asked players to assess the degree of confidence they had in their team's ability to perform important game competencies. These game competencies included being able to a) outskate, b) outcheck, c) force more turnovers, d) bounce back from performing poorly, e) score on power plays, f) kill penalties against the opposing team, and g) have an effective goaltender who could block a high percentage of goal attempts. Ratings were made on an 11-point scale ranging from 0 (*cannot do at all*) to 10 (*certainly can do*). Team efficacy scores were calculated by averaging the seven ratings made by each player. Player efficacy measures consisted of three questions that required participants to rate their ability to a) out-perform their defensive opponent, b) out-perform their offensive opponent, and c) bounce back from performing poorly. Player efficacy ratings were computed the same way as team efficacy. Game statistics were obtained from the league headquarters after each game and consisted of only team data. These statistics included a) margin of win, b) game outcome (won, lost, tied), c) shot attempts, d) power play percentage, e) power play shots attempted, f) power play percentage, and g) short-handed defensive percentage (defence against power plays). Questionnaires were completed no more than 24 hours before each game and were distributed by the athletic trainer for the team (who was given $100 at the end of the season for their efforts). Questionnaires were submitted to the researchers by

mail after each weekend. The results of this study explain that collective team efficacy beliefs are a stronger predictor of team performance than cumulative player efficacy beliefs.

This finding was also examined with female hockey players. Research by Myers, Payment, and Feltz (2004) looked at the relationship between collective efficacy and team performance in women's intercollegiate ice hockey over one season. The authors of this study statistically controlled for previous performance within teams in order to examine the team's collective efficacy of their performance on the second game. More specifically, the teams would play one game on Friday followed by another game on Saturday, Friday's performance was statistically controlled for. What sets this study different from the research done by Feltz and Lirgg (1998) and Myers, Feltz and Short (2004) is that neither of these studies statistically controlled for previous performance. Research by Myers, Payment et al. (2004) provides additional evidence to the majority of research that suggests a positive influence of efficacy beliefs on performance across time (Bandura & Locke, 2003).

Edmonds, Tenenbaum, Kamata, and Johnson (2009) examined the relationship between collective efficacy and performance in a single competition of adventure racing. Teams were made up of three athletes (two male and one female). Adventure racing is a team based sport that involves the multidisciplinary tasks of trekking, mountain biking, canoeing, and climbing to navigate through a predetermined race course. Prior performance, preparation effort, collective efficacy and race performance were measured using seventeen teams. Collective efficacy was measured using a five-item scale that was developed based on suggestions from Bandura (1997) and Feltz and Chase (1998) and

that reflected the variety of tasks, which were required of the group or team (Edmonds et al., 2009). The strength of collective efficacy was measured by asking the participants to rate the degree to which a team member is confident in his or her team's ability to execute a particular portion of the race. For example, "How confident are you in the team's ability in executing the mountain biking portion of the race in order to secure a top-place finish?" Responses ranged from 0 (*not confident at all*) to 100 (*extremely confident*). Team efficacy scores were calculated by taking the average of the five ratings made by each teammate to make up the team score. Prior performance was determined as a part of the prerace questionnaire. Participants were asked if they had competed with their teammates before, and if so how many races. Athletes were also asked to report their perception of their team's prior performance quality in adventure racing using a 7-point rating ranging from 1 (*not good at all*) to 7 (*very good*). Preparation effort was also recorded with the use of the prerace questionnaire. Athletes were asked how much sport-specific physical training and conditioning and how much conventional or general physical training and conditioning the team had done to prepare themselves for the race. A 7-point scale ranging from 1 (*none*) to 7 (*a lot*) was used. Race performance was calculated by recording time (hours and minutes) it took for each team to finish the race. Edmonds et al. (2009) found that there is a strong moderate relationship between perceptions of collective efficacy and subsequent performance throughout the race. These findings provide some support for the structure and relationship defined by the theoretical concept.

In addition to these field based studies, Myers, Feltz et al. (2004) surveyed ten American football teams prior to competition over the course of eight consecutive weeks.

Of those teams, 197 offensive football players participated. Only players from offensive teams were used in this study in order to minimize interdependency. Participants were asked to complete self-efficacy and collective efficacy measures within 24-hours prior to each Saturday afternoon game. Results from this research provide some empirical evidence for the presumed reciprocal relationship between collective efficacy and performance across time (Myers, Feltz et al., 2004). Moreover, the sum of collective efficacy prior to performance was a positive predictor of subsequent performance. The results from this study were consistent with Feltz and Lirgg (1998); as hypothesized, aggregated collective efficacy appeared to positively influence offensive performance within teams and across games however aggregated self-efficacy did not.

Magyar, Feltz and Simpson (2004) looked at 154 junior rowers (58 male, 96 female) ages 13-18 years old representing seven competitive junior rowing teams in the Northwest and Western regions of the U.S. Several different team sizes were included in this study: women's and men's varsity eight (four and one team respectively); women's and men's varsity four (three and one team respectively); women's and men's junior varsity eight (one team each); women's and men's junior varsity four (one and two teams respectively); women's varsity double scull (two teams); women's and men's novice eight (three and two teams respectively); women's and men's novice four (one and four teams respectively); women's and men's lightweight eight (one and two teams respectively); men's lightweight four (one team); women's and men's quadruple scull (one team each); and men's double scull (one team). Participants were asked to complete a survey approximately 24-hours before the final championship regatta of the season. Self and collective efficacy were measured based on recommendations from Bandura (1997).

Athletes were asked to think about their own ability and respond to the question stem: "How confident are you that you can...?" and for the collective efficacy questions they were asked to respond to the question stem: "how confident are you that your crew can...?" This study made important contributions to the literature. Findings show that athletes who were more confident in their own ability to row were more likely to believe in their crew's ability to row successfully.

1.7 *Conclusions*

In today's sport athletes are doing everything they can to get the upper hand on their competition. When it comes to ice hockey, the game is evolving season after season. The speed of the game and the skill level is constantly increasing. In today's high level hockey leagues, players and members of coaching staff are looking for the upper hand in player development. Whether it is keeping up with the latest fitness trends or the best nutrition plans, athletes are willing to do what it takes to reach their maximal potential. As previously highlighted, research has made progress in understanding how self-efficacy and collective efficacy can improve sport performance. This is a psychological advantage to the sport and can be an advantage to athletes looking for the best ways to improve their performance.

CHAPTER 2: RATIONALE, RESEARCH QUESTION, HYPOTHESES

2.1 *Definitions and Key Terms*

2.1.2 *Self-efficacy*

a. The belief one has in being able to execute a specific task to obtain a certain outcome (Bandura, 1997)
b. Not concerned with the skills an individual has but rather the judgements of what one can do with whatever skills he or she possesses
c. Can be considered a situational specific self-confidence (Feltz, 1988)

2.1.3 *Collective Efficacy*

d. A group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainment (Bandura, 1997)
e. Collective efficacy is not the sum of each individual's perceived personal efficacies. Instead it is an developing group-level attribute (Bandura, 1997)

2.1.4 *Performance*

Performance is a quantifiable measure that can be used in research to observe efficacy beliefs. Research on sport performance has supported a consistent positive and moderate relationship with efficacy beliefs from a variety of sport tasks and competitions and with the use of different research designs (Feltz & Lirgg, 2001; Moritz et al., 2000). For the purpose of this study, performance will be measured using goalie statistics from hockey league websites. These statistics will include: number of shots, number of saves,

goals against, game outcome (i.e., win/loose), save percentage, and minutes played. These goaltender statistics will be obtained to represent game by game performance. These performance variables will be used separately as performance variables.

2.1.5 *Team*

In the world of sport a "team" can hold a very different meaning for some sports compared to others. For example, the thought of a football, basketball or hockey team might automatically think about several team members. On the other hand, sports such as badminton or tennis might bring upon the assumption of smaller teams such as dyads. According to Carron and Eys (2012) a group consists of two people or more. However, a group is not just a collection of any two or more people (McGrath, 1984, p. 6). A sports team is defined 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 and instrumentally interdependent, reciprocate interpersonal attraction, and consider themselves to be a group. (Carron & Eys, 2012, pp. 14).

For example, three friends playing in a three-on-three basketball team tournament on the weekend is still classified as a team. All three members share all of the characteristics Carron and Eys (2012) consider imperative for a team.

With reference to the definition of a team provided by Carron and Eys (2012), a pair of goaltenders (the starter and the back-up) may be considered a team. Each dyad of

goaltenders in an ice hockey organization share the same qualities as the three-on-three basketball teams Carron and Eys (2012) described. More specifically, goaltender dyads share a common identity, for example both athletes are goaltenders representing the same organization. They share common goals and objectives (e.g., to save as many goal opportunities and to win the game) and a common fate (e.g., if the entire hockey team loses a game then the goaltender team loses as well). A goaltender dyad shows structured patterns of interaction and communication. This could be conversations about strategies in practice, before a game, or encouraging the other teammate during a game. The team has common perceptions about group structure, more specifically both goaltenders in the team understand each role as either the starting goaltender or the back-up. Furthermore they are personally and instrumentally interdependent. For instance each team member depends on each other in order to perform at their best. The team reciprocates interpersonal attraction, perhaps by showing each teammate that they appreciate the hard work that he/she puts forth in practices. Finally, each member of a goaltender dyad considers themselves to be a group. Considering these characteristics, a pair of two goaltenders can be considered a team.

2.2 *Limitations*

This study aims to expand the current literature on the relationship between self-efficacy, collective efficacy and performance in sport. Since previous research has not looked at this relationship with dyads within a larger sports team, it is important to mention a few limitations that could play an important factor when interpreting the results. Firstly, because this study intends to observe goaltenders in elite level ice hockey the results of this study may not be transferable to other ice hockey positions or other

sports that also have a dyad within a larger team, such as baseball. More specifically, a first string and second string goalie may not be equivalent to a pitcher and catcher dyad in baseball.

The method used to measure self-efficacy and collective efficacy can also be a limitation to this study. Questionnaires were used to measure athlete efficacy. The questionnaires used a scale from 0 (*cannot do at all*) to 10 (*highly certain can do*) however this might not fully represent the true thoughts and feelings of the athlete. A cross methods approach incorporating quantitative and qualitative research methods would increase the validity of this study. Qualitative questions could help measure each participant's thoughts and feelings. In combination with the quantitative scale these comments could help draw conclusions that might not be revealed from a Likert-type scale. A cross methods design is not within the scope of this thesis; therefore quantitative methods were only used.

The questions asked on the questionnaires could also limit the findings of this study. Although an expert panel evaluated and confirmed the goaltender game competencies used in the self and collective efficacy questionnaires, it is possible that these goaltender specific skills are not accurate and comprehensive judgements imperative to goaltender performance. This could be because there has not been an efficacy scale developed specifically for goaltenders. Feltz and Lirgg (1998) used an efficacy scale specific for ice hockey players however goaltenders were excluded due to their unique position.

Also, the statistics chosen to represent goaltender performance (shots, saves, game outcome, goals against, and save percentage) might not be accurate judgements of how

well or poorly a goaltender performs. These goaltender performance statistics might not be true measures of performance since a goaltender could perform well but have poor game statistics. Perhaps there are more advanced methods of assessing goaltender performance instead of these stats.

2.3 *Delimitations*

The aim of this study is to take an in-depth look at the relationship between efficacy beliefs in ice hockey goaltender teams and how this relates to team performance. Due to the specific research question there are various delimitations that need to be outlined. As mentioned previously, a limitation of this study could be the lack of transferability from ice hockey to another sport such as baseball. A delimitation that goes hand in hand with this point is that the purpose of this study is not to compare the relationship between efficacy beliefs and performance with dyads across different sports or tasks. To look at differences across different sports and/or tasks would advance research; however it is not relevant to the research question at hand. Another potential delimitation in this study could be how efficacy beliefs of these goaltender dyads change from season to season. This is beyond the scope of the research question being asked as well as not feasible to ask for the purpose of this research project. Lastly, goaltenders on the same team may not rate confidence (especially collective efficacy) the same. Discrepancies in collective efficacy might be due to different athletes being more critical of their performance than others. This may be influenced by the "above-average-effect" (Alicke, 1985; Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995) which explains that individuals rate themselves higher than average.

2.4 *Rationale*

In order to be successful in team sport athletes needs to have a strong skill set and the ability to cope with performance pressure but it is just as important that they need to have confidence in themselves and their teammates. The confidence (self-efficacy) an athlete has in oneself will greatly alter their ability to perform well. Furthermore, the confidence a team has in their combined ability to perform well (collective efficacy) also has a great impact on the team's likelihood to succeed.

Previous research has generally found that individual athletes with high self-efficacy as well as teams with high collective efficacy will outperform those with low self and collective efficacy respectively. In sport this can be crucial for athletes playing significant roles such as the goaltender in ice hockey or the pitcher in baseball. For these specific positions the individual (i.e., goaltender in hockey) must have optimal confidence in their own abilities (self-efficacy) as well as the team must have optimal combined confidence in their teammate's ability (collective efficacy) in order for the most successful performance.

There have been numerous studies done in years past focusing on the influence of self-efficacy/collective efficacy on team performance in sports teams. Teams assessed in previous research have included ice hockey (Feltz & Lirgg, 1998; Myers, Payment et al., 2004), football (Myers, Feltz et al., 2004) and rugby (Greenlees, Graydon, & Maynard, 1999). Specifically, Feltz and Lirgg (1998) looked at men's collegiate ice hockey and the relationship among player efficacy, team efficacy and performance over the course of one season. The authors of this study specifically excluded goalies from this study due to

their unique position. A hockey team characteristically has two goalies, a starting goalie and a backup goalie. It is also typical for hockey teams to carry a third goaltender. The combined pair of two goaltenders, or sometimes three goaltenders, per hockey team makes up an interested sub team dyad or triad. A question that has not been asked in the current literature is how team performance and self-efficacy and collective efficacy may be related with a small two or three person team such as hockey goaltenders as well as pairs tennis and pairs badminton.

2.5 *Research Question*

The purpose of this study is to examine the relationship between self-efficacy, collective efficacy and performance in goaltender teams in Ontario elite hockey leagues including the Ontario University Association (OUA), Provincial Women's Hockey League (intermediate 'AA') (PWHL), and the National Capital Women's Hockey League (senior 'A') (NCWHL).

2.6 *Hypotheses*

1. It was hypothesized that:
    a. Goaltender self-efficacy will be significantly positively correlated with performance.

       Rationale: Self-efficacy in sport is a widely covered topic. Moritz et al. (2000) conducted a meta-analysis on the relationship between self-efficacy and performance in sport. The meta-analysis included 45 studies which together reflected that self-efficacy has a positive and moderate relationship with performance in sport (r = .38).

b. Goaltender collective efficacy will be significantly positively correlated to performance.

Rationale: Gully et al. (2002) conducted a meta-analysis of the relationship between efficacy and sport performance. This research covered 67 studies and found a significant positive relationship between collective efficacy and performance. Moritz et al. (2000) also conducted a meta-analysis and drew consistent conclusions on the self-efficacy-performance relationship.

CHAPTER 3: METHODOLOGY

3.1 *Participants*

Participants for this study included 12 goaltenders from three elite Ontario hockey leagues including the OUA, PWHL, and the NCWHL ($n_{OUA} = 6$; $n_{PWHL} = 5$; $n_{NCWHL} = 1$). Participant responses to questionnaires ranged from one to 19 times where the average number of responses was 9.3 times. A total of 20 goaltenders originally consented to participate in the present study, however only 12 participants contributed to the study. More specifically, 14 goaltenders from the OUA, five goaltenders from the PWHL, and one goaltender from the NCWHL agreed to participate in the study however five females and three males from the OUA failed to participate once the study began. Ages of participants ranged from 16 to 30 years of age ($M = 19.37$, $SD = 1.99$). The first few weeks of regular season games were not included in this study. It was intended to allow team dynamics to develop and teams to settle into individual roles before data was collected. Data collection officially began November 15, 2012 and extended to February 24, 2013 which included valid data from 70 games. A total of 112 surveys were collected, 61 of these surveys were completed by goaltenders that played in the games. One of these surveys was then removed from further analysis since the goaltender played less than one minute and had no performance statistics during his time in the game. Therefore a total of 60 questionnaires were assessed following the data collection period.

3.2 *Measures*

3.2.1 *Self-Efficacy*

Self-efficacy was measured with an online questionnaire using an online survey generator website (www.surveymonkey.net). The self-efficacy questionnaire was developed base on Feltz and Lirgg (1998) hockey study and modified for the goaltender position (refer to Appendix C). The questionnaire was consulted and validated by a panel of experts. A rough list of goaltender competencies was brought to a meeting with a head coach and goaltender coach from the OUA. This list was discussed and modified until an agreement was made on a comprehensive list of relevant goaltender skills that would accurately represent goaltender performance. The item "the ability to stop breakaways" was removed since breakaways do not happen constantly. Also, "the ability to make the big save" was added to the list to analyze a goaltender's efficacy in making a potential game changing save. A conclusive list of goaltender skills and definitions of these skills was then finalized at the conclusion of the meeting. The self-efficacy questionnaire asked goaltenders to assess the degree of confidence he/she had in outperforming the opposition's goaltender with respect to eleven game competencies including: skating (e.g., skating to the corner or behind the net to retrieve the puck, telescoping); hand-eye coordination, puck control (e.g., passing/stopping puck behind the net, passing the puck or clearing the puck from defensive zone); rebound control (e.g., can the individual handle rebounds appropriately?); positioning (e.g., can the individual cut down angles of shooters?); stance (e.g., is it individual comfortable in their "ready position"); getting/remaining focus (e.g., is the individual focused before the game? Can the individual remain focused in the game after allowing a goal or having a poor save); save

execution; ability to make the "big save" (e.g., making a save to keep your team tied or in the lead) and physical conditioning (e.g., is the individual at an optimal level of fitness or are they dealing with any injuries?). An eleven point Likert-type scale was used where answers range from 0 (*cannot do at all*) to 10 (*highly certain can do*). The link to the questionnaire was emailed to each participant the day before the participant's next competition. Participants were asked to complete the questionnaire 24-hours before their next regular season game. This time frame is consistent with the procedures used by Feltz and Lirgg (1998). Each item on the questionnaire was randomized to prevent participants from memorizing the question order.

3.2.2 *Collective Efficacy*

Collective efficacy was also measured with an online questionnaire using Survey Monkey (www.surveymoneky.net). The collective efficacy questionnaire was developed based on Feltz and Lirgg (1998) hockey study and modified for the goaltender position (refer to Appendix C). Similar to the self-efficacy questionnaire, the collective efficacy questionnaire was also consulted and validated by an expert panel consisting of an OUA head coach and an OUA goaltender coach in the same meeting. Each participant was asked to rate the degree of confidence he/she had in their team's (team = goaltender dyad/triad) ability to successfully perform eleven goaltender specific game competencies. These game competencies included: physical conditioning (e.g., are the team of goalies at an optimal level of fitness or are they dealing with any injuries?); skating (e.g., skating to the corner or behind the net to retrieve the puck, telescoping); hand-eye coordination; puck control (e.g., passing/stopping puck behind the net, passing the puck or clearing the puck from defensive zone); rebound control (e.g., can the goaltender team handle

rebounds appropriately?); positioning (e.g., can the goaltender team cut down angles of shooters?); stance (e.g., are the goaltenders comfortable in their "ready position"); getting/remaining focus (e.g., is the goaltender team focused before the game? Can the goaltender team remained focus in the game after allowing a goal or having a poor save); save execution; ability to make the "big save" (e.g., making a save to keep your team tied or in the lead). An eleven point Likert-type scale was used where answers range from 0 (*cannot do at all*) to 10 (*highly certain can do*). Questionnaires were completed 24-hours prior to regular season games for the second half of the regular season. This is consistent with methods used by Feltz and Lirgg (1998). Also, the questionnaire items were randomized to prevent participants from memorizing the order of questions.

3.2.3 *Performance*

Goaltender game statistics was obtained through game sheets found on each respective league site. OUA game sheets were retrieved from the OUA website (http://oua.ca), PWHL game sheets were retrieved from the league website (http://pwhl.pointstreaksites.com/view/pwhl), and LLFHL game sheets were retrieved from their league website (http://www.llfhl.ca/stats.html). Statistics used to measure goaltender performance for this study include: shots, saves, goals against, game outcome (i.e., win/loss), save percentage, and minutes played.

3.3 *Procedures*

Ethical clearance was obtained from the Brock University Research Ethics Board (refer to Appendix E). Participants were recruited for the study through contacting each team's head coach. A total of 19 coaches from the OUA (men's), 11 coaches from the

OUA (women's), 11 coaches from the PWHL, 8 coaches from the GOJHL (Junior B), and 8 coaches from Niagara District Junior C Hockey League (OHA) were contacted. An invitation email (refer to Appendix A) was sent to each head coach requesting their permission for their goaltenders to participate in the study. A follow up email was sent to remind coaches that they can have their goaltenders participate in the study if there was no response after the initial email (refer to Appendix B). After receiving approval from 11 coaches, each coach contacted the goaltenders on their respected teams and explained a brief overview of the participation requirements. Each head coach was asked to forward the original email to the goaltenders and reply to the researcher with participant names and email addresses. Each goaltender that chose to participate in the study was given an overview of the study requirements through email contact. Participant consent was provided when they contacted the researcher with agreement to participate in the study. If a participant had questions regarding the research project they were asked to contact the researcher by email when necessary. Each week the researcher emailed participants a link for the questionnaires 24-hours prior to their game. As previously mentioned, the online questionnaires was created using Survey Monkey (www.surveymonkey.net). Participants were asked to complete the online questionnaires within 24-hours prior to each scheduled game from November 15, 2012 through until February 24, 2013. Participants and coaches were debriefed through an email sent April 18, 2013 to explain the overall findings of the study (see Appendix F).

3.4 *Statistical Analysis*

3.4.1 *Research Question*

To determine if there is a statistically significant relationship between self-efficacy, collective efficacy and performance in men's and women's ice hockey goaltender teams a series of regressions were done where self-efficacy and collective efficacy were predictors of performance.

3.4.2 *Sampling*

The present study will utilize purposive non-probability based sampling. The target population was specific to goaltender teams in: men's and women's Ontario University Association (OUA), Provincial Women's Hockey League (PWHL), and National Capital Women's Hockey League (NCWHL) 'Senior A' leagues. These teams were selected since these leagues can be considered elite, therefore no other sampling method is appropriate. It is recognized that the choice of sampling may restrict the transferability to a larger population.

CHAPTER 4: RESULTS

4.1 *Sample*

The sample consisted of 112 complete cases. These cases included the starters, backups and third string goaltenders that did not dress in competition. Sample size for the present study was calculated using the following equation: $N = 8*IV + 50$ (Field, 2009) suggesting that there must be a minimum of 66 observations in the data set. Data from goaltenders that did not play in games were excluded from the sample. This was done so efficacy measures were consistent with individual athlete performance. Therefore, goaltenders that did not play that did not play were removed from the sample. This resulted in a new total of 60 cases that were used for data analyses. The number of goaltender responses ranged from 1-19 times where the mean number of responses was 9.33.

Collective efficacy and self-efficacy were independent variables used in the regression analyses. Performance indicators used as the dependent variables included save percentage and minutes played. The first regression analysis was done with collective efficacy and performance (save percentage and minutes played). The second regression was done with and self-efficacy and performance (save percentage and minutes played).

4.2 *Data Analysis*

All data was analyzed using SPSS 20.0. Prior to data analysis, data was screened for entry errors, missing data and to check the assumptions of the statistical tests. The assumptions of the regression analysis include independence of observations, normality,

linearity, homoscedasticity of residuals, multicollinearity, independence of errors, and univariate distribution of errors (Tabachnick & Fidell, 2007).

4.2.1 ***Screening Data*.** Prior to any statistical analyses, frequency tables were examined to reveal missing data in all independent and dependent variables. Missing values were found in the individual items of the self-efficacy questionnaire and the collective efficacy questionnaire. To correct for this, missing values were replaced with new variables using the series mean method. These independent efficacy item variables were then factored into the variables SE_AVERAGE and CE_AVERAGE. These new variables were then used for the statistical analyses.

4.2.2 ***Screening for Assumptions of Data Analyses*.** All data was examined to ensure that assumptions of regression analyses were met. These assumptions included normality, linearity, homoscedasticity of residuals, multicollinearity, independence of errors, and univariate normal distribution of errors (Tabachnick & Fidell, 2007).

4.2.2.1 ***Independence of Observations*.** This assumption was violated due to the design of the study. Goaltenders participated multiple times, therefore values of the outcome variables (shots, saves, goals against, save percentage, game outcome, and minutes played) do not come from separate entities. This implies that the results from the appropriate statistical analyses might be most useful when interpreting the results individually.

4.2.2.2 ***Normality*.** Measures of central tendency (mean, median and mode) were all relatively equal across all predictors (self-efficacy and collective efficacy)

and predicted variables (shots, saves, goals against, game outcome, save percentage, and minutes played). These values were calculated using a frequency table.

A frequency table for all dependent (shots, saves, goals against, save percentage, minutes played) and independent variables (self-efficacy average, collective efficacy average) were analyzed to determine the levels of kurtosis in the distribution. Goals against (kurtosis = 1.09), save percentage (kurtosis = 1.13), minutes played (kurtosis = .88), self-efficacy average (kurtosis = 3.1) and collective efficacy average (kurtosis = 1.14) were all found to be leptokurtic distributions. However, shots had a platykurtic distribution (kurtosis = -.19) and saves had a normal distribution (kurtosis = .02).

The same frequency table was used to analyze the level of skewness in the data. Skewness represents the level of symmetry of the distribution. If a distribution is symmetrical (i.e., normally distributed) the skew would be zero. Save percentage (skewness = -1.29), minutes played (skewness = -1.35), self-efficacy (skewness = -1.65) and collective efficacy (skewness = -1.15) all illustrate a negatively skewed distribution. Negatively skewed distributions indicate a build-up of high scores in the data, which is understandable since the same pool of goaltenders responded multiple times in the sample. Shots (skewness = .279), saves (skewness = .273) and goals against (skewness = .912) all have positive values for skewness thus they are positively skewed. Positively skewed distributions indicate a build-up of low scores in the data. This could also be because of the same group of goaltenders providing data in this project.

Histograms for the independent variables (self-efficacy and collective efficacy) and the dependent variables (shots, saves, goals against, save percentage, game outcome and minutes played) were visually inspected to confirm these conclusions.

4.2.2.3 ***Linearity.*** In order to go forth with a regression analysis the data must represent a linear relationship. A linear relationship is defined as two separate variables are best described by a straight line relationship. Linearity is important to regression analysis because Pearson's *r* only captures the linear relationship among variables (Tabachnick & Fidell, 2007). To examine this, bivariate scatterplots were used for all possible combinations of variables. Weak positive linear relationships were found between shots and self-efficacy, saves and self-efficacy, save percentage and self-efficacy, shots and collective efficacy, save percentage and collective efficacy, and minutes played and collective efficacy. Small linear relationships were found between minutes played and self-efficacy, and saves and collective efficacy. A weak negative linear relationship was found between goals against and self-efficacy. Furthermore, a moderate negative linear relationship was found between goals against and collective efficacy.

4.2.2.4 ***Homoscedasticity of residuals*****.** A scatterplot between the standardized predictor value (save percentage) and the standardized residual value was examined to determine if the assumption of homoscedasticity of residuals was met. In order for this assumption to be met, the variance of the residual terms should be constant at each level of the predictor variables (self-efficacy and collective efficacy). If the residuals at each level of the predictors have the same variance the data is considered to be homoscedastic. However, if the variances are very unequal the data is heteroscedastic.

The assumption is met since all of the residual values are equally distributed around the line of best fit.

4.2.2.5 ***Multicollinearity*****.** The data must not be multicollinear. If the data has multicollinearity it would suggest that independent variables are too highly correlated. The assumption of multicollinearity was checked by examining collinear diagnostics. The whole regression model is looked at when interpreting the Variance Inflation Factor (VIF) value. There is a cause for concern if the VIF is greater than 10 (Bowerman & O'Connell, 1990; Myers, 1990). On the other hand if the VIF is substantially greater than 1 then the regression may be biased (Bowerman & O'Connell, 1990). In the present study, the VIF values are as follows: self-efficacy average (VIF = 4.989), collective efficacy average (VIF = 5.1), shots (VIF = 343.25), saves (VIF = 330.54), goals against (VIF = 10.51), save percentage (VIF = 5.14) and minutes played (VIF = 1.67). The VIF values revealed that shots (VIF = 343.25), saves (VIF = 330.54), and goals against (VIF = 10.51) are considered to be redundant and therefore they were removed from further analyses.

The tolerance statistic is also an important factor in determining if there is multicollinearity. The TIF statistic looks at individual predictors and it is ideal if this value is close to 1. A tolerance value of 0.1 indicates a serious problem and a value of 0.2 is even a potential problem (Menard, 1995). Tolerance values for the variables self-efficacy average (.20), collective efficacy average (.196), shots (.003), saves (.003), goals against (.095) and minutes played (.600) and save percentage (0.195) are close to 1.00 therefore the assumption of multicollinearity is met.

4.2.2.6 *Independence of errors*.

If the residual terms are uncorrelated (or independent) then the assumption of independence of errors is met. To determine this, the Durbin-Watson test was used which tests for serial correlations between errors. A value greater than 2 indicates a negative correlation between adjacent residuals and a value below 2 indicates a positive correlation. As a general rule of thumb, values less than 1 or greater than 3 are causes for concern. As shown in the model summary, the value for the Durbin-Watson test was 2.355. Therefore the assumption of independence of errors is met.

4.2.2.7 *Univariate normal distribution of errors*.

This assumption means that the differences between the model and the observed data are most frequently zero or close to zero. Measures of central tendency were examined and were all very close to zero. The skewness value was .035 which indicates that the distribution of errors is not heavily weighed on the high or low end of scores. The value for kurtosis was 1.662 which suggests that the distribution of errors is slightly heavy-tailed and peaked. These values suggest that the distribution of errors is slightly platykurtic.

4.2.3 *Hypothesis Testing*.

It was hypothesized that self-efficacy and collective efficacy would be positively correlated with performance. Performance measures included in the present study include shots, saves, goals against save percentage, and minutes played. However, due to redundancy in the data due to the assumptions of regression (multicollinearity, VIF and tolerance values) the variables shots, saves and goals against were removed from further

statistical analyses. Therefore save percentage and minutes played were the two performance variables analyzed.

To determine if self-efficacy had an influence on save percentage and minutes played two simultaneous multiple linear regressions were done. In the first analysis save percentage was entered as the dependent variable and self-efficacy average was entered as the independent variable. Results show that 0.7% of variance in save percentage is due to self-efficacy (adjusted $R^2 = .07$). A small positive non-significant relationship was found between self-efficacy and save percentage [$\beta = .10$, $t_{(58)} = .78$, $p = .44$] and the overall model was non-significant [$R^2 = .012$, $F_{(1, 58)} = .617$, $p > .05$]. This means that save percentage cannot be predicted from self-efficacy. In the next regression analysis minutes played was entered as the dependent variable and self-efficacy was entered as the independent variable. Results show that 1.3% of variance in minutes played is due to self-efficacy (adjusted $R^2 = .013$). Moreover, a small positive non-significant relationship was found between self-efficacy and minutes played [$\beta = .17$, $t(58) = 1.34$, $p = .186$] however the model is non-significant [$R^2 = .03$, $F_{(1, 58)} = 1.79$, $p > .05$]. Therefore, minutes played cannot be predicted from self-efficacy. Due to differences in the length of game between the PWHL and OUA leagues a new variable, percentage of game played, was created. This variable represented the amount of time a goaltender played out of the entire game. In order to test the relationship between self-efficacy and percentage of game played a simultaneous regression was done. Results of this regression showed a non-significant positive relationship [$\beta = .192$, $t(58) = 1.49$, $p = .142$] and the overall model was found to be non-significant [$R^2 = .04$, $F_{(1, 58)} = 2.22$, $p > .05$]. In short, there is no significant

relationship between the length of time a goaltender played in the game and the individual's self-efficacy.

To determine if collective efficacy had an influence on save percentage and minutes played two simultaneous multiple linear regressions were done. To begin with, save percentage was entered as the dependent variable and collective efficacy average was entered as the independent variable. Results show that -0.5% of the variance in save percentage was due to collective efficacy (adjusted R^2 = -.005). Furthermore, a small positive non-significant relationship was found between collective efficacy and save percentage [β = .109, $t_{(58)}$ = .84, p = .41] although the overall model was non-significant [R^2 = .012, $F_{(1, 58)}$ = .700, p > .05]. This means that save percentage cannot be predicted from collective efficacy. Lastly, minutes played was entered as the dependent variable and collective efficacy average was entered as the independent variable. Results showed that -1.7% of the variance in minutes played was due to minutes played (adjusted R^2 = -.017). Despite a small positive non-significant relationship between collective efficacy and minutes played [β = .017, $t_{(58)}$ = .13, p = .898] the model was non-significant [R^2 = .000, $F_{(1, 58)}$ = .017, p > .05]. Therefore, minutes played cannot be predicted from collective efficacy. The variable "percentage of game played" was used to account for differences of game length between the different leagues. As mentioned previously, this variable represented the amount of time a goaltender played out of the entire game. In order to test the relationship between collective efficacy and percentage of game played a simultaneous regression was done. Results of this regression showed a non-significant positive relationship [β = .076, t(58) = .582, p = .563] and the overall model was found to be non-significant [R^2 = .006, $F_{(1, 58)}$ = .339, p > .05]. In conclusion, there is no significant

relationship between the length of time a goaltender played in the game and collective efficacy.

4.2.4 *Reliability of Efficacy Measures*

4.2.4.1 *Self-Efficacy*

The self-efficacy measure consisted of 11 items which asked participants to rate their confidence that they can outperform their upcoming opposition's goaltender with respect to 11 separate goaltender specific game competencies. These game competencies included: Skating, hand-eye coordination, puck control, rebound control, positioning, stance, getting/remaining focus, emotional/arousal control, ability to make the big save, and physical conditioning. Self-efficacy items (N = 112) were normally distributed (Table 6). A correlation matrix revealed all items were strongly correlated. Bivariate correlations ranged from .58 to .87 (Table 2) therefore there was no multicollinearity as no regression exceeded .90 (r < .90). To check for reliability of the self-efficacy measure, Cronbach's alpha was calculated. The self-efficacy measure showed exceptional internal consistency (Cronbach's α = .97). Therefore, it is acceptable to use a self-efficacy mean as the appropriate variable for statistical analyses.

4.2.4.2 *Collective Efficacy*

The collective efficacy measure consisted of 11 items. The questionnaire asked participants to rate their confidence that their team's goaltenders can outperform your upcoming opposition's team's goaltenders with respect the same 11 goaltender specific goaltender competencies (skating, hand-eye coordination, puck control, rebound control, positioning, stance, getting/remaining focus, emotional/arousal control, ability to make

the big save, and physical conditioning). Collective efficacy items (N = 112) were normally distributed (Table 7). A correlation matrix revealed all items were strongly correlated (Table 3). Bivariate correlations ranged from .58 to .84 therefore there was no multicollinearity as no regression exceeded .90 (r < .90). To check for reliability of the collective efficacy measure, Cronbach's alpha was calculated. The collective efficacy measure showed exceptional internal consistency (Cronbach's α = .97). Therefore, it is acceptable to use a collective efficacy mean as the appropriate variable for statistical analyses.

CHAPTER 5: DISCUSSION

The purpose of this study was to determine if there is a relationship between self-efficacy, collective efficacy, and sport performance with hockey goaltender teams. Consistent findings in the literature reveal that with higher perceptions of self and collective efficacy, athlete performance is superior to those athletes with lower perceptions of efficacy (Feltz & Lirgg, 1998; Hodges & Carron, 1992; Lichacz & Partington, 1996; Moritz et al., 2000; Watson, Chemers, & Preiser, 2001;;;). However, smaller sport teams such as dyads and triads have been neglected. It is important to understand this concept for smaller teams as there are many dyad and triad teams in sport such as badminton, tennis and sub-team dyads such as goaltenders and pitcher-catcher teams. Teams of different size differ in terms of resources. Teams with more members are exposed to more resources as there are more individuals contributing to the collective goal of success. Therefore, teams with fewer members have to divide resources differently when compared to larger teams. Differences in team resources can contribute to the efficacy dynamics within a team (Feltz & Lirgg, 2001). Despite some studies done with smaller teams such as Lichacz and Partington (1996), Hodges and Carron (1992), Bray (2004), and Edmonds et al. (2009) there has limited published research on the efficacy-performance relationship in small teams. The present study intended to fill this gap and look at this relationship in the real world sport environment.

It was hypothesized that goaltender self-efficacy and collective efficacy would be positively correlated to performance. This hypothesis was developed based on results from previous literature as self-efficacy and collective efficacy have been consistently shown to positively impact sport performance. Despite this rationale, results from the

present study did not support the hypotheses. Data analyses showed a small linear relationship between self-efficacy, collective efficacy and sport performance however simultaneous regression analyses indicated that self-efficacy and collective efficacy did not significantly predict goaltender save percentage or minutes played. This study contributes to a growing body of research supporting the idea that perhaps there is more to the confidence-performance relationship.

5.1 *Self-Efficacy*

The present study found no relationship between self-efficacy and performance. Along with the collective efficacy questionnaire, participants were asked to complete a self-efficacy questionnaire online within a 24-hour period before their next game. Similar to collective efficacy scores, self-efficacy scores were calculated by taking an average score for all completed questionnaires. Goaltender performance was measure by two performance variables, save percentage and minutes played. It was hypothesized that goaltender self-efficacy would be positively correlated to performance. Furthermore, as perceptions of self-efficacy increased it was hypothesized that goaltender performance would also increase. Two simultaneous regression analyses were done to examine the relationship between self-efficacy and performance. In the first simultaneous regression, self-efficacy was entered as the independent variable and save percentage was entered as the dependent variable. A non-significant small positive linear relationship between self-efficacy and save percentage was found, however the model was found to be non-significant. These results show that although self-efficacy is not predicted by save percentage there is a small positive linear relationship. The second simultaneous relationship was done with self-efficacy entered as the independent variable and minutes

played entered as the dependent variable. Despite a small positive relationship between self-efficacy and minutes played the model was also found to be not statistically significant. Moreover, there was a non-significant relationship between self-efficacy and percentage of game played therefore there is also no significant conclusion to report. The present study found that self-efficacy could not be predicted by minutes played by a goaltender. Since both regression analyses failed to support the hypothesis it can be concluded that self-efficacy does not relate to goaltender performance despite small positive relationships across variables.

As previously mentioned there has been ample literature investigating the relationship between self-efficacy and sport performance. The concept of self-efficacy was proposed by Bandura (1977) and since then countless studies have been done to understand the importance of this psychological construct in sport. Martens et al. (1990) theorized a positive linear relationship between self-efficacy and performance. This relationship has been supported by previous literature (e.g., Barling & Abel, 1983; Gilson et al., 2012; Moritz et al., 2000; Woodman & Hardy, 2003). The overwhelming amount of studies that support this relationship between self-efficacy and performance is what derived the hypotheses for the present study.

As mentioned previously, self-efficacy research has generally focused on larger teams and smaller dyads have been ignored. The present study contributes to the growth of previous research as it concentrated on goaltender teams within a hockey team. Relationships among dyads of athletes are an important consideration in the development of an athlete's self-efficacy (Ede, Hwang, & Feltz, 2011). Although there were no significant relationships between self-efficacy and save percentage or self-efficacy and

minutes played, the small positive linear relationship may suggest that there is a potential relationship between self-efficacy, collective efficacy and sport performance in goaltenders that the data in this study failed to reveal.

The results of the present study contribute to a growing body of research that challenges the relationship between self-efficacy and performance. Although there have been consistent findings showing that confidence is positively related to performance, there is a growing body of research evidence that suggests this relationship is not simply positive and linear (Gould, Petlichkoff, Simons & Vevera, 1987; Hardy, Woodman, & Carrington, 2004; Vancouver, More, & Yoder, 2008; Vancouver, Thompson, & Williams, 2001; Vancouver, Thompson, Tischner & Putka, 2002; Woodman, Akehurst, Hardy & Beatie, 2010; Beattie, Adamoulous, & Oliver, 2010). Gould et al. (1987) examined the relationship between self-efficacy and performance in a pistol shooting task. Results revealed a negative relationship between self-confidence and shooting performance. Beattie et al. (2010) found that self-efficacy beliefs of novice golfers were higher than actual golf performance scores, indicating that participants believed they could perform better than their actual abilities. Thus, high levels of self-confidence may hinder performance due to complacency in the task (i.e., overconfidence) (Jones, Swain, & Hardy, 1993). Furthermore, research by Woodman et al. (2010) manipulated self-efficacy and found that participants whose confidence decreased experienced an increase in performance. This increase in performance supports Bandura and Locke's (2003) proposal that perhaps a little bit of self-doubt can help increase effort which can lead to improved performance. There are many different factors that influence self-efficacy. The amount of effort a goaltender invests in the game can persuade performance. The group's

effort exerted in a task and the persistence it displays after failure is influenced by collective efficacy (Bandura, 1977). Thus, goaltender performance will suffer if both goaltenders do not feel they have what it takes to perform well. This also applies at the individual level. If a goaltender does not feel that they have what it takes to play well then they may put forth less effort and lack perseverance in a game.

Some authors have suggested a conceptual reason for this lack of relationship. A meta-analysis by Sitzmann and Yeo (2013) found that over one third of studies showed the relationship between self-efficacy and performance within-persons to be negative. Therefore, self-efficacy is not beneficial under all circumstances. This suggests that contextual factors affect this relationship (Bandura, 2012; Vancouver et al., 2001; Vancouver et al., 2008). Bandura and Locke (2003) theorized that a reduction in self-confidence such as an element of self-doubt may be beneficial to performance. This may be due to an increase in effort as a result of an athlete lacking confidence. Furthermore, Bandura and Locke (2003) suggest that "some self-doubt about one's performance efficacy can provide incentive to acquire the knowledge and skills required to master the challenges" (p. 96). Self-doubt can come from the individual or the coach. For example, coaches inform the athletes of their opponents, or their team's weaknesses in order to introduce a level of doubt to keep their athletes from becoming complacent when competing against an opponent that is not considered a threat (Bandura, 1977). Hardy et al. (2004) found that high self-efficacy was associated with decreased golf performance scores. To explain this, the authors suggested that high confidence can lead to risk taking (Campbell, Goodie, & Foster, 2004) and/or complacency (Jones et al., 1993) which may be harmful for performance. Risk taking is an inevitable component to sport and in some

sports/positions it could be detrimental to performance. For example, a goaltender in hockey can make inappropriate judgements of the play in front of them which may result in a goal against. Although taking risks could be harmful to performance it is a compulsory element to the sport. This could be a strong factor in the present study since participants frequently reported their self-efficacy to be high and had poor performance. Participants may have not had enough self-doubt to keep their self-efficacy at the appropriate level. Likewise, participants might have had to take risks during competition. Goaltenders need to take risks in some situations such as making a crucial save or to playing the puck up ice to an appropriate teammate.

5.2 *Collective Efficacy*

The present study found no significant relationship between collective efficacy and performance. Participants completed an online questionnaire to measure collective efficacy the day before each game. An average score for collective efficacy was calculated and game statistics (i.e., save percentage and minutes played) were recorded to symbolize goaltender performance. A simultaneous regression analysis was done where collective efficacy was the independent variable and save percentage was the dependent variable. Although there was a non-significant small positive significant linear relationship between collective efficacy and save percentage, overall the model was found to be non-significant. This suggests that even though the model was not statistically significant, as collective efficacy increases performance increases as well. A second simultaneous regression was done where collective efficacy was entered as the independent variable and minutes played was entered as the dependent variable. There was also a small positive non-significant relationship between collective efficacy and

minutes played however the overall model was not found to be statistically significant. Therefore, there is a non-significant small positive relationship between collective efficacy and minutes played (see Table 5). Furthermore, a non-significant relationship was found between collective efficacy and percentage of game played. In summary, neither regression model was found to be statistically significant. It was hypothesized that goaltenders would have a significant positive relationship between collective efficacy and performance, meaning as collective efficacy increases, goaltender performance would also increase. This was not the case in the present study as there was no significant relationship between collective efficacy and goaltender performance.

Theoretically, collective efficacy is said to be a strong indicator of sport performance. Albert Bandura introduced the concept of collective efficacy as an expansion of self-efficacy to incorporate a collective group's beliefs in their abilities to achieve a common goal (Bandura, 1997). Since the development of this term, collective efficacy has been examined with some degree of regularity in sport psychology in sport psychology research. Past research has investigated the relationship between collective efficacy and performance with sports such as hockey (Feltz & Lirgg, 1998), football (Feltz & Short, 2004) and baseball (Feltz & Hepler, 2012). Consistent research has shown that collective efficacy has a positive linear relationship with sport performance. For instance, Feltz and Lirgg (1998) examined collective efficacy and sport performance in men's intercollegiate ice hockey across a season. Participants included 159 players (excluding goaltenders). Feltz and Lirgg (1998) found collective team efficacy beliefs to be a strong predictor of team performance. This study was replicated by Myers, Payment et al. (2004) who examined this relationship in women's intercollegiate ice hockey over a

season. A total of 12 teams (243 athletes) participated in the study. Myers, Payment, et al. (2004) also found collective efficacy positively influences performance.

An important component of the hockey team was omitted by Feltz and Lirgg (1998) since the authors excluded goaltenders due to their unique position. To understand this relationship the present study included only goalies. The results of the present study suggest that there may be a different story for the relationship between performance and self and collective efficacy in goalies. Due to their unique role on the team there may be different perceptions of collective efficacy between goaltenders than there are between forwards and defensemen on the team. Since hockey teams only have two to three goaltenders, perceptions of collective efficacy may be estimated differently. For example, a goaltender on a team only has one or two other goaltenders that influence the perceptions of collective efficacy. Each of these other goaltenders plays a significant impact on efficacy since each goalie makes up a half or a third of the goaltender team. Furthermore, goaltenders in a senior role on the team may persuade younger goaltenders perceptions of the goaltender team's abilities (George, 1994). Zaccaro et al. (1995) suggested that larger teams could be positively correlated to collective efficacy and performance. Since larger teams have more resources available there could be a higher probability of successful performances as well as greater perceptions of collective efficacy (Zaccaro et al., 1995). Thus teams with fewer members may not view collective efficacy to be as important as self-efficacy. It is possible that goaltenders view self-efficacy as a more impactful construct to their performance than collective efficacy.

When comparing the present study to the past literature on collective efficacy and sport performance, the conclusions drawn help advance an overall understanding on

efficacy. Since there are unique positions within a sport team, for example pitchers and catchers in baseball or other goaltender teams, it is important to understand the relationship between collective efficacy and performance in athletes with these roles. The results of the present study may not match up with previous literature due to the small number of goaltenders on a team.

Upon examination of the design of the present study, there are possible reasons for why a non-significant relationship was found between collective efficacy and sport performance in hockey goaltenders. Participants in the sample were a unique collaboration of male and female goaltenders from university and junior level hockey teams. The difference in participant judgement in these levels of hockey may be impactful on collective efficacy judgements (George, 1994). Since some of the participants were in high school and others were in the middle of their university careers there could be a difference in their abilities to assess their collective efficacy. According to Beilock and Feltz (2006), increased task proficiency and experience that experts have is accompanied by an increase in ability to assess and recollect past performance which enables them to form more accurate efficacy beliefs. Therefore, goaltenders that have been involved in the league longer (i.e., veteran goaltenders or experts) than other goaltenders (i.e., rookie goaltenders or novices) have superior abilities to measure the team's collective efficacy because they possess these capabilities.

In conclusion, the present study makes a good effort at drawing inferences on the relationship between collective efficacy and sport performance in goaltenders. As outlined in Chapter Two, it is important to look at the influence efficacy plays on goaltender performance as it has been shown in previous literature to be a strong

predictor of performance. Although collective efficacy was not a statistically significant predictor of performance there was small positive relationship found between collective efficacy and save percentage, and between collective efficacy and minutes played. This tells us that there is a trend between collective efficacy and performance and perhaps further efforts in research can expand on this.

5.3 *Limitations*

As with all research, it is important to highlight the limitations of the present study to gain a better understanding of the results and help advance further research. The present study looked at hockey goaltenders as their own team. Although each group only had two to three members it was hypothesized that self-efficacy and collective efficacy would have a similar relationship with sport performance as found in previous research such as Feltz and Lirgg (1998). A potential limitation of the study is that a goaltender tandem may not be a team; rather the goaltenders are individual athletes with a common position. As mentioned in Chapter Two, a sport team is defined 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 consider themselves to be a group" (Carron & Eys, 2012). In our sample one goaltender plays at a time, therefore goaltender performance is not shared. Due to the nature of the sport, goaltenders do not share a common fate since only one goalie is playing at a time therefore there is a low level of interdependence between each of the goaltenders. For example, team members on a track and field team have a low level of interdependence. This is because each individual athlete's performance is summated to represent the team's performance. Moreover, an athlete competing in the high jump event does not

directly influence the performance of an athlete competing in the shot put event. This level of interdependence is similar to goaltenders. The goaltender sitting on the bench has little impact on the performance of the goaltender on the ice. This raises another argument, goaltenders do not share a common fate. The fate of the goaltender playing in the game would be the outcome of the game (i.e., win or loss) whereas the fate of the backup goaltender is not since he/she is not on the ice. This provides some evidence that goaltenders are not necessarily a team. Furthermore, the present study looked at goaltender performance as team performance statistic. Goaltender save percentage and minutes played do not represent all of the goaltenders, these statistics only represent the performance of the goaltender on the ice. Due to the individuality of goaltender performance (i.e., save percentage and minutes played) it is justifiable that self-efficacy is relevant to goaltenders. However, collective efficacy is not representative of goaltender tandems since these athletes are more individual than collective. The present study may have not found a significant relationship between collective efficacy and goaltender save percentage or minutes played because of the individuality of the dependent variables.

There were only 12 goaltenders who participated in the present study. Including more goaltenders in the study may enhance the validity of the results. Furthermore, if this number was larger a more comprehensive conclusion could be drawn. Participants were analyzed as collectively (i.e., a between-persons level of analysis was taken). Although participants provided repeated measures suggesting a nested design (i.e., a within-persons level of analysis) it was decided to look at participants as a whole. Moreover, if the same goaltenders were studied through an entire season this may ensure a better understanding of a goaltenders self-efficacy and collective efficacy beliefs. Additionally, participants in

the study were not matched with their teammate goaltender; this could also be another limitation as team efficacy is not represented by all relevant members. Moreover, the sample in the present study was heavily concentrated on two goaltender teams. Since these two goaltender teams predominately made up the sample the outcome of the analysis was heavily influenced by the scores of these participants.

In addition, efficacy could have been measures erroneously. The self-efficacy and the collective efficacy questionnaires were both developed based on the efficacy measurements used by Feltz and Lirgg (1998). The collective efficacy questionnaire used by Feltz and Lirgg (1998) contained eight items that measured the degree of confidence an athlete had in his team's ability to perform significant game competencies against the next opponent. These game competencies included: outskate, out check, force more turnovers, bounce back from performing poorly, score on power plays, kill penalties against the opposing team, have an effective goaltender who could block a high percentage of goal attempts, and their team's ability to win the game against the opposing team. Self and collective efficacy measures were adapted to represent game competencies reflective of the goaltender position. Goaltender competencies included: skating, hand-eye coordination, puck control, rebound control, positioning, stance, getting/remaining focus, emotional/arousal control, save execution, the ability to make the "big save", and physical conditioning. These goaltender skills were evaluated and confirmed by a panel of hockey experts comprised of a head coach and goaltender coach from the OUA. These competencies made up the efficacy measures represented in eleven items on each questionnaire. Perhaps these game competencies were inaccurate judgements of critical goaltender competencies. If overall sport performance is trying to be predicted, then a

comprehensive assessment is needed. This would include measuring psychological skills, strategic skills as well as physical skills (Feltz et al., 2008). Also, the present study assumed that the efficacy measures were unidimentional however this was not tested empirically (i.e., through factor analysis) which according to Myers & Feltz (2007) has been reported to be problematic. Despite the criticisms of the efficacy measures mentioned above, overall the efficacy measures are acceptable for this study since the present study was a replication of Feltz and Lirgg (1998). Research by Feltz and Lirgg (1998) found a significant relationship between efficacy and sport performance and efficacy and performance were measured in a similar fashion. Therefore, it is important to introduce potential criticisms of the measures used however it is not a detrimental component to the present study.

Collective efficacy might not have been truly measured through the online questionnaire. Each participant was asked to rate how confident he/she was in the team's ability to outperform the opposition's goaltenders with respect to 11 goaltender skills as mentioned previously. Due to the participants in the sample, it was not possible to take the collective efficacy score from each member of each goaltender dyad or triad since some participants were the only goaltender participating in the study out of his/her team. Had there been collective efficacy questionnaire responses from each member of the teams a combined average of collective efficacy could be calculated to provide a more conclusive collective efficacy score.

Another reason the self-efficacy and collective efficacy questionnaires might have been a limitation to the present study is because of the difference between the operational and conceptual definitions of self and collective efficacy. The conceptual definition of

self-efficacy was defined by Bandura as, “the beliefs in one’s capabilities to organize and execute the courses of action required to produce given levels of attainments” (Bandura, 1977, p. 477). This definition does not match the operational definition used in the self-efficacy measure. The questionnaire asked participants to “rate your confidence that YOU can outperform your oppositions team’s goaltenders with respect to the following 11 game competencies.” The operational definition focused on a comparison between the individual and the opposition. This does not match the conceptual definition that focused directly on the individual’s beliefs in one’s own abilities. This could be problematic because the participants could have been more focused on comparing themselves to others instead of focusing on assessing their own capabilities to perform the skills well. The same limitation applies for the collective efficacy questionnaire. The conceptual definition of collective efficacy was defined by Bandura as, “a group’s shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainment” (Bandura, 1997, p. 447). This definition also doesn’t match the operational definition of collective efficacy used on the collective efficacy questionnaire. The collective efficacy questionnaire asked participants to “rank your confidence that “your team’s goaltenders" can outperform your upcoming opposition’s goaltenders in your upcoming game with respect to the following 11 game competencies.” Again, the participants could have been more focused on predicting how well his/her team’s goaltenders would match up against the other team’s goaltenders instead of how well the collection of goaltenders can successfully perform the 11 goaltender competencies.

Also, there should be concordance between efficacy and sport performance assessments (Moritz et al., 2000). A lack of agreement may have caused efficacy judgements to be less predictive of performance. Moreover, the efficacy items should be targeted to the factors of performance that are measured. For example, the present study asked participants to rate their degree of confidence they had in themselves and the team with respect to rebound control. Rebound control was not included as a measure of performance therefore efficacy and performance measures lacked concordance. Furthermore, the use of final performance scores to measure efficacy is problematic. According to Feltz (1992), self-efficacy will not be a strong predictor of performance because final performance scores are determined by many other factors as well. The performance measures used in the present study may have been inaccurate in terms of predicting efficacy.

Furthermore, the timing of the self and collective efficacy questionnaires was controlled to a certain extent. Efficacy questionnaires were emailed to participants 24-hours prior to each game and each participant was asked to complete the questionnaire within this time window. The time provided for participant responses was consistent with Feltz and Lirgg (1998). Feltz and Lirgg (2001) recommend that efficacy measures be taken at least 24-hours prior to performance, however it is beneficial for efficacy to be measured as close to performance as possible. If the time lapse is too long, efficacy beliefs could be altered by intervening experiences (Feltz & Lirgg, 2001). In some circumstances participants completed the questionnaire 24-hours prior to performance and others only a few hours before leaving for the rink. Perceptions of efficacy may have changed over this time period. Also, some of the participants knew who was starting the

game when they completed the survey and others did not know. For a goaltender, knowing who is going to start the game for their team is crucial in order to prepare for a game thus perceptions of both self and collective efficacy can by influenced by the order of the line-up. Moreover, efficacy can change moments before the game or during the game. Pre-game emotions, players on the team outside of the goaltender tandem or the coach's speech may increase or decrease efficacy. This may then cause efficacy to differ from what was reported on the questionnaire. Overall, understanding how efficacy influences goaltender performance is a complex task. Design flaws such as characteristics of the sample and timing of the study may help to explain why the current study did not find a significant relationship between efficacy and performance

Another limiting factor that could have influenced the findings of the present study could be the potential inability of self-assessing efficacy. The tendency for individuals to inaccurately judge their own abilities can be described by the "above-average effect," which explains that the average person tends to believe he or she is above average (Alicke, 1985; Alicke et al., 1995). As a result, individuals tend to overestimate their skills and abilities. If self-efficacy is too high it could produce overconfidence resulting in poor performance (Gist, 1987). This could have been a limitation to the present study as participants may have over qualified themselves with respect to their confidence in the game competencies included in the efficacy measures. Perhaps participants over inflated their self-appraisals.

In the present study, performance was measured using game statistics that represented game-end totals. These measures initially included shots, saves, goals against, save percentage and minutes played. Although save percentage and minutes

played were the only performance measures used for statistical analyses it is important to notes the nature of these variables and how they reflect goaltender performance. Minutes played represents a goaltender's involvement in the game. If a goalie does not play many minutes in a game then this tells us that the goalie might have been pulled due to poor performance, injury or sometimes even strategy. Some inferences can be made by looking at the amount of minutes played by a goaltender; however it only gives a brief snapshot of the goalie's true performance.

Save percentage is a ratio of shots on net and goals against. This value gives a comprehensive understanding of how well a goaltender performed in a game. However, save percentage is not necessarily the most accurate judgement of goaltender performance. There are many scenarios in hockey that can result in a low or high save percentage. For example, a goalie might face a less than average amount of shots in a game and a lucky bounce causes a goal against. This could lead to a satisfactory save percentage although the goalie might have played well and could have been confident in his/her abilities throughout the game. Alternatively, a goalie could have had more shots than typically faced and not let many shots in. This could result in a high save percentage although the goalie could have had luck on their side. Also, within continuous sport performance such as hockey, new information is gathered and is used to re-evaluate self-efficacy. This may cause a modification of efficacy beliefs which may affect performance (Bandura, 1997). For instance, a goaltender may have high self confidence in his/her ability to stop a shot from the blue line but have low confidence when it comes to stopping a breakaway. When tasks vary within one trial (i.e., continuous sport) self-efficacy must be measured specific to the task. A general measurement of efficacy may

not produce a significant relationship with continuous sport performance (LaForge-MacKenzie & Sullivan, 2013) Perhaps goaltender efficacies change throughout the game. In conclusion, the true performance of a goaltender could change throughout the game. Although save percentage is a good indicator of goaltender performance it doesn't always tell the entire story. Perhaps goaltender performance is situation specific and there is a more accurate way of evaluating their performance.

5.4 *Implications*

The present study is distinctive as it takes a unique twist on the current body of literature done to date on the relationship between efficacy and sport performance. Goaltenders are an important component of a hockey team although previous research by Feltz and Lirgg (1998) excluded them from their study due to a goaltenders unique position. The present study chose to do the opposite - include goaltenders and exclude other players on a hockey team. By only focusing on the goaltenders within the hockey team there are possible implications for further research as well as coaches and players.

The present study did not find a significant positive relationship between goaltender self and collective efficacy and sport performance as previous research has consistently reported. If goaltender performance is not influenced by efficacy then perhaps there are more important psychological factors that should be the focus of goaltender development. For instance, if a goaltender's performance is enhanced by attention training, goal setting, using mental imagery in pre-performance routines, or using positive self-talk during competition then these psychological elements should be improved instead of building confidence.

In summary, efficacy is not beneficial under all circumstances as the relationship between self-efficacy and performance has been shown to be null (Stizmann & Yeo, 2013). This suggests that contextual factors affect this relationship (Bandura, 2012; Vancouver et al., 2001, 2008). These results are implicit for goaltenders and coaches as it suggests that a goaltender's perceived self and collective efficacy does not predict how they will play. Despite these findings, goaltenders and coaches should still work at increasing goaltender efficacy in small manageable steps. This will ultimately enhance the productivity of goaltender performance which is beneficial since previous research has told us that efficacy may be positively related to goal setting (Locke et al., 1984), satisfaction, and other outcomes of value to the entire hockey team (Feltz & Lirgg, 1998).

5.5 *Future Directions*

Future research should investigate the relationship of self-efficacy, collective efficacy, and performance in other dyads such as a baseball pitcher and catcher or goaltender dyads in other sports such as soccer or lacrosse. Although the present study suggests that hockey goaltenders might not be a "team" these other dyads may find contradicting results. It is important to be able to transfer to different domains of functioning to obtain a better understanding of the efficacy-performance relationship (Feltz et al., 2008). As mentioned in previous chapters, teams with fewer members face different challenges than larger teams. In order to generalize the findings of the present study it is necessary to look at the efficacy-performance relationship in small teams of similar circumstances.

Looking forward, future studies should also look at this relationship in a controlled laboratory based setting. Laboratory studies afford control over factors that may bias the

results. Conversely, field studies sacrifice control for understanding how constructs are related in natural settings (Sitzmann & Yeo, 2013). Although it was relevant for the present study to observe the relationship between efficacy and sport performance in the field, a controlled laboratory based study might be able to prevent some of the limitations as outlined previously. Moreover, a controlled lab environment might expose relationships that were not seen in the present study.

5.5.1 *Future Directions for Collective Efficacy Research*

Teammates can differ in their efficacy beliefs about the team's collective capabilities. In some circumstances, one team member may believe that his/her team is very capable of performing well while another teammate may think the opposite. Due to the nature of individual differences, the variability of collective efficacy beliefs may have important implications related to the team's performance (Feltz et al., 2008). The degree of variability on constructs such as collective efficacy ratings, cohesion, team satisfaction, and performance should be accounted for by using the variability as a variable in future research (Moritz & Watson, 1998).

Coaches devote the beginning of each season to team building interventions. Teams may go camping or participate in team building games such as the "human-knot" or the "trust fall." Team members may feel a sense of belonging and togetherness after these activities. Previous literature has suggested that team-building exercises enhance team cohesion (Stevens & Bloom, 2003; Burke, 2006; Loughead & Hardy, 2006). Since perceptions of efficacy are related to group performances it is appropriate for an efficacy approach to group training and team-building to be utilized by teams (Gist, 1987). There

has been limited published research investigating the effect of these team-building exercises on collective efficacy. Moving forward, research should look into the effect of these team building efforts on efficacy.

Collective efficacy research can be extended further by examining the effect one goaltender can have on a goaltender team's functioning. Since there are only two to three members on a team, further research should investigate if one goaltender's slump in performance has a meaningful impact on the team's overall performance. As found by Bandura (1997), modeled ineffectiveness could depress a team's performance by inflating perceptions of how overpowering opponents are. Conversely, would a goaltender teammate with an overwhelming success influence efficacy of the team? Perhaps high efficacy beliefs are contagious. Further investigation should be done to expand on these ideas.

5.5.2 *Future Directions for Self-Efficacy Research*

Hockey goaltenders evolve through the season and through their careers. Longitudinal-type research must be continued to track efficacy levels. This can be achieved by using a cross-methods design where quantitative research is meshed with qualitative analyses. Since self-efficacy can fluctuate over time, it is imperative to understand what causes these fluctuations. For example, in hockey a goalie might play better in the first period when compared to the second or third period. It would be understandable for a goalie's efficacy to change from period to period, game to game, or season to season. Furthermore, athletes can experience downward efficacy-performance spirals which are difficult to break out of. Feltz et al. (2008) suggested future research

should incorporate an intraindividual design to follow patterns of efficacy beliefs, goals, performance, and self-reactions over time. If past literature has shown that past-performances have influenced subsequent performance (Myers, Payment et al., 2004) then do goaltenders with previous experience as the first string goaltender have a decrease in efficacy when they are moved to the second or third string? Or do goaltenders who were the prodigy of their previous team have a change in efficacy when they are the rookie on a new team? It is recommended that future research tackle these questions.

According to Gist (1987), low self-efficacy may be induced by negative performance appraisals. If so, self-efficacy may inhibit effort even when an athlete possesses the required skills which may lead to discouragement. Further research is needed to determine if performance can be improved by enhancing self-efficacy perceptions. Also, Gist (1987) recommends that further research is needed to develop efficacy mechanisms for enhancing self-efficacy perceptions in conjunction with evaluations of performance.

Moreover, further research needs to be done to clarify how self-efficacy relates to expert performance in sport (Feltz et al., 2008). Experts have been found to be highly confident in their ability to read shifting game situations, to select effective performance strategies, to predict opponent's likely actions, to make "in the moment" decisions, to utilize imagery, to manage pressure and setback situations, and to manage distractions (Bandura, 1997; Bull, 1991; Highlen & Bennet, 1983; Tenenbaum, Levy-Kolker, Sade, Lieberman, & Lidor, 1996). Future observations need to be done to understand what aspects of self-efficacy (e.g., task, self-regulatory, coping) differentiate expert athletes

from novices. With respect to the present study rookies goaltenders might potentially differentiate from veteran goaltenders.

Lastly, self-efficacy is not the driving force compelling higher performance, rather it is an indicator of whether people have been successful in the past (Sitzmann & Yeo, 2013). The most influential source of efficacy is mastery experiences (Bandura, 1997). Future research should investigate the influence past performance has on goaltender efficacy. Performance influences self and collective efficacy, efficacy does not necessarily influence performance (Sitzmann & Yeo, 2013).Further, the strong positive relationship previously reported by countless studies in the past two decades are a function of performance's influence on self-efficacy, not the influence of self-efficacy on performance. Moreover, future research should focus on the influence of previous performance on the self-efficacy and sport performance relationship.

5.6 *Conclusion*

Ice hockey goaltenders may have one of the most mentally demanding positions to play. With no opportunities other than intermission between periods, there is no opportunity to debrief the game with teammates or coaches. Goaltenders spend the entire game tracking the play and anticipating what is going to happen next. According to Daccord (1998) professional goaltenders claim that mental skills contribute the most to their ability to stop the puck. Psychological skills can be influential on goaltender success due to the isolation of their position on the ice (Daccord, 1998). Despite copious research, the relationship between efficacy and performance is not black and white.

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Table 1

Mean, Standard Deviation, Skewness, and Kurtosis Values for Performance and Efficacy Scores

Variable	*M*	*SD*	Skewness	Kurtosis
Self-Efficacy Average	8.44	1.18	-1.65	3.1
Collective Efficacy Average	7.99	1.3	-1.15	1.14
Shots	27.27	9.76	.28	-.19
Saves	24.72	9.5	.27	.019
Goals Against	2.55	1.67	.912	1.09
Save Percentage	.897	.77	-1.29	1.13
Minutes Played	50.3	13.12	-1.35	.88

Note: Efficacy scores ranged from 0 to 10; Performance scores ranged from

Table 2

Bivariate Correlations for Self-Efficacy Items

	SE 1	SE 2	SE 3	SE 4	SE 5	SE 6	SE 7	SE 8	SE 9	SE10	SE 11
SE 1	-	.798	.707	.698	.700	.790	.736	.688	.748	.665	.683
SE 2		-	.677	.793	.868	.868	.850	.783	.848	.829	.680
SE 3			-	.615	.575	.592	.697	.709	.629	.580	.601
SE 4				-	.809	.803	.800	.643	.813	.804	.656
SE 5					-	.867	.816	.743	.851	.824	.605
SE 6						-	.810	.684	.849	.819	.634
SE 7							-	.769	.848	.829	.688
SE 8								-	.757	.727	.646
SE 9									-	.849	.715
SE 10										-	.634
SE11											-

Note: Correlations are reported using Pearson's correlation coefficients

SE = Self-Efficacy item

Table 3

Bivariate Correlations for Collective Efficacy Items

	CE 1	CE 2	CE 3	CE 4	CE 5	CE 6	CE 7	CE 8	CE 9	CE10	CE 11
CE 1	-	.694	.802	.688	.649	.695	.577	.620	.699	.600	.692
CE 2		-	.803	.777	.796	.803	.718	.724	.802	.753	.754
CE 3			-	.769	.766	.736	.678	.703	.752	.688	.721
CE 4				-	.766	.756	.702	.729	.821	.744	.714
CE 5					-	.804	.784	.764	.759	.769	.727
CE 6						-	.696	.710	.768	.752	.686
CE 7							-	.739	.742	.806	.667
CE 8								-	.840	.723	.802
CE 9									-	.788	.780
CE 10										-	.698
CE11											-

Note: Correlations are reported using Pearson's correlation coefficients

CE = Collective Efficacy item

Table 4

Summaries of Simultaneous Regression Analysis for Variables Predicting Save Percentage

Variable	β	*t*	*p*	R^2	ΔR^2
Self-Efficacy	.10	.78	.44	.011	-.007
Collective Efficacy	.109	.84	.41	.012	-.005

Table 5

Summaries of Simultaneous Regression Analysis for Variables Predicting Minutes Played

Variable	β	*t*	*p*	R^2	ΔR^2
Self-Efficacy	.17	1.34	.186	.03	.013
Collective Efficacy	.017	.13	.898	.000	-.017

Table 6. Normality of Self-Efficacy Items Table

		SE_1	SE_2	SE_3	SE_4	SE_5	SE_6	SE_7	SE_8	SE_9	SE_10	SE_11
N	Valid	112	112	112	112	109	112	111	112	112	112	112
	Missing	0	0	0	0	3	0	1	0	0	0	0
Mean		8.38	8.16	8.06	7.71	8.03	8.21	8.27	8.20	7.96	7.89	8.07
Median		9.00	8.00	8.00	8.00	8.00	9.00	8.00	8.00	8.00	8.00	8.00
Mode		9	9	8	8	9	9	9	8	8	9	9
Std. Deviation		1.383	1.418	1.331	1.385	1.560	1.562	1.348	1.279	1.335	1.533	1.327
Variance		1.912	2.010	1.771	1.918	2.434	2.440	1.817	1.637	1.782	2.349	1.761
Skewness		-1.244	-.985	-.747	-1.088	-1.268	-1.375	-.938	-1.191	-1.206	-.795	-.534
Std. Error of Skewness		.228	.228	.228	.228	.231	.228	.229	.228	.228	.228	.228
Kurtosis		1.871	.825	.812	1.006	1.563	1.853	1.359	2.488	2.220	-.038	-.062
Std. Error of Kurtosis		.453	.453	.453	.453	.459	.453	.455	.453	.453	.453	.453

Table 7. Normality of Collective Efficacy Items Table

		CE_1	CE_2	CE_3	CE_4	CE_5	CE_6	CE_7	CE_8	CE_9	CE_10	CE_11
N	Valid	112	112	111	111	109	112	111	112	111	112	111
	Missing	0	0	1	1	3	0	1	0	1	0	1
Mean		7.70	8.06	7.41	7.52	7.97	8.26	7.66	7.62	7.81	7.68	7.62
Median		8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Mode		8	9	8	8	8	9	7[a]	8[a]	8	8	8
Std. Deviation		1.334	1.460	1.516	1.374	1.350	1.307	1.528	1.797	1.392	1.502	1.607
Variance		1.781	2.131	2.299	1.888	1.823	1.707	2.336	3.230	1.937	2.256	2.583
Skewness		-.258	-1.136	-.638	-.712	-1.030	-.815	-.725	-1.179	-1.035	-1.042	-.927
Std. Error of Skewness		.228	.228	.229	.229	.231	.228	.229	.228	.229	.228	.229
Kurtosis		-.227	1.724	.356	1.167	1.044	.916	.513	1.252	1.286	.920	.734
Std. Error of Kurtosis		.453	.453	.455	.455	.459	.453	.455	.453	.455	.453	.455

a. Multiple modes exist. The smallest value is shown

APPENDIX A

Recruitment Script

Hello – my name is Sarah Ditmars and I'm currently in my second year of the Master's program in Applied Health Sciences at Brock. I am emailing you to formally invite your team to participate in a research study that will examine how confidence functions within sport performance. In order to participate in the study, the goaltenders on your team will be asked to complete a questionnaire within 24 hours of every regular season games where confidence and performance are measured. Participation in this study will require no more than 15 minutes of the athletes time at various scheduled sessions.

Although there are no direct benefits for your team's participation, your team's involvement in this study is strictly voluntary. You may decide to withdraw from this study at any time and may do so without any penalty.

Only the primary investigator, Dr. Philip Sullivan, and principal student investigator, Sarah Ditmars, will be permitted access to view results. Results from this study may be participated in conference presentations and published in professional journals. There are no foreseeable risks are associated with participation in this study.

This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University. If you have any questions about this study or require further information, please feel free to email either Dr. Sullivan at ***psullivan@brocku.ca*** or myself at **sd07ti@brocku.ca**

If you wish to let your goaltenders participate in the study, please forward this email to each goaltender on your roster and have each goalie contact me at **sd07ti@brocku.ca** with their name (first and last) as well as which University team they play for. I will contact your goaltenders by email with further information at that time.

At this point, I would like to take this opportunity to extend a BIG thank you for your time and consideration. Any help that you will provide will be very much appreciated. Thank you.

Sarah Ditmars
Masters Candidate
Brock University

APPENDIX B

Reminder Email to Coaches

Hello Coach:

This is a reminder that your team is invited to participate in a research study. The purpose of this study is to examine how confidence functions within sport performance in OUA goaltenders. In order to participate in the study, the goaltenders on your team will be asked to complete an online questionnaire within 24 hours of every regular season games where confidence and performance are measured. Participation in this study will require no more than 15 minutes of the athletes time each week. This project runs until the end of the 2012-2013 regular season.

If you wish to let your goaltenders participate in the study, please forward this email to each goaltender on your roster and have each athlete contact me at sd07ti@brocku.ca with their name (first and last) as well as which team they play for. I will contact your goaltenders by email with further information at that time.

Although there are no direct benefits for your goalies participation, their involvement in this study is strictly voluntary. They may decide to withdraw from this study at any time and may do so without any penalty. Their interest in this study will greatly benefit the progression of this masters thesis!

Only the primary investigator, Dr. Philip Sullivan, and principal student investigator, Sarah Ditmars, will be permitted access to view results. Results from this study may be participated in conference presentations and published in professional journals. There are no foreseeable risks are associated with participation in this study.

This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University. If you have any questions about this study or require further information, please feel free to email either Dr. Sullivan at psullivan@brocku.ca or myself at sd07ti@brocku.ca.

At this point, I would like to take this opportunity to extend a BIG thank you for your time and consideration. Any help that you will provide will be very much appreciated. Thank you.

Sarah Ditmars, MA (Candidate)
Brock University, Department of Kinesiology
500 Glenridge Avenue, St. Catharines, ON L2S 3A1
brocku.ca

Dr. Philip Sullivan
Associate Professor
905-688-5550 ext 4787
psullivan@brocku.ca

APPENDIX C

Collective Efficacy Questionnaire

Rate YOUR confidence that YOUR TEAM'S GOALTENDERS can outperform your upcoming oppositions team's goaltenders with respect to the following:

1. Skating (e.g., Skating to the corner to retrieve the puck, telescoping)

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

2. Hand-eye coordination

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

3. Puck control (e.g., Passing/stopping puck behind the net)

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

4. Rebound control (e.g., Handle rebounds appropriately)

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

5. Positioning (e.g., Cut down the angles of shooters)

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

6. Stance (e.g., Be comfortable in the "ready position")

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

7. Getting/remaining focus (e.g., Be focused before the game; remain focused in the game after allowing a goal or having a poor save)

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

8. Emotional control/Arousal control

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

9. Save execution

Cannot do at all				*Moderately certain*					*Highly certain can do*	
0	1	2	3	4	5	6	7	8	9	10

10. Ability to make the "big save" (i.e. Making a save in the game to keep your team in the lead)

Cannot do at all				*Moderately certain*					*Highly certain can do*	
0	1	2	3	4	5	6	7	8	9	10

11. Physical conditioning (e.g., Is the team performing at an optimal level of fitness? Dealing with any injuries?)

Cannot do at all				*Moderately certain*					*Highly certain can do*	
0	1	2	3	4	5	6	7	8	9	10

APPENDIX D

Self-Efficacy Questionnaire

Rate YOUR confidence that YOU can outperform your upcoming opposition's goaltender with respect to the following:

1. Skating

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

2. Hand-eye coordination

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

3. Puck control

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

4. Rebound control

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

5. Positioning

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

6. Stance

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

7. Getting/remaining focus

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

8. Emotional control/Arousal control

Cannot do at all *Moderately certain* *Highly certain can do*
0 1 2 3 4 5 6 7 8 9 10

9. Save execution

Cannot do at all				*Moderately certain*						*Highly certain can do*
0	1	2	3	4	5	6	7	8	9	10

10. Ability to make the "big save"

Cannot do at all				*Moderately certain*						*Highly certain can do*
0	1	2	3	4	5	6	7	8	9	10

11. Physical conditioning

Cannot do at all				*Moderately certain*						*Highly certain can do*
0	1	2	3	4	5	6	7	8	9	10

APPENDIX E

Brock University
Research Ethics Office
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE:	10/20/2012		
PRINCIPAL INVESTIGATOR:	SULLIVAN, Philip Kinesiology		
FILE:	12-064 - SULLIVAN		
TYPE:	Masters Thesis/Project	STUDENT: SUPERVISOR:	Sarah Ditmars

TITLE: The relationship of self-efficacy, collective efficacy and sport performance in OUA Men's and Woman's ice hockey goaltenders

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 10/31/2013

The Brock University Social Sciences Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from 10/20/2012 to 10/31/2013.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 10/31/2013. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at http://www.brocku.ca/research/policies-and-forms/research-forms.

In addition, throughout your research, you must report promptly to the REB:

a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
c) New information that may adversely affect the safety of the participants or the conduct of the study;
d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

Jan Frijters, Chair
Social Sciences Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

APPENDIX F

Brock University, Faculty of Applied Health Sciences
Debriefing Form

Title of Study: The relationship of self-efficacy, collective efficacy and sport performance in Men's and Women's ice hockey goaltender teams

Principal Investigator: Dr. Philip Sullivan, Associate Professor, Department of Kinesiology, Brock University

Principal Student Investigator: Sarah Ditmars, M.A. Candidate, Faculty of Applied Health Sciences, Brock University

Contact Information: sd07ti@brocku.ca or psullivan@brocku.ca

Thank you for your involvement in this research study. The data has been analyzed and an overall conclusion has been drawn from the results. Statistical analyzes revealed no significant relationship between goaltender confidence and self-efficacy (the confidence an individual has in themselves) or collective efficacy (the confidence an individual has in the team of goaltenders) and goaltender performance. This means that the confidence reported by goaltenders in the online surveys did not relate to the performance of each game. These findings are not consistent with previous research; however it is important to note that previous literature has typically examined this relationship in larger teams such as basketball, baseball, and rugby. Further efforts to expand on these conclusions are encouraged.

If you have any questions or comments regarding the study, feel free to contact Sarah Ditmars or Dr. Philip Sullivan at the above e-mail addresses. Thank you once again for your participation.

This project has been reviewed by, and received ethics clearance through the Office of Research Ethics Board (File# 12-064).