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ENHANCING COMPETITIVE PERFORMANCE OF ICE HOCKEY GOALTENDERS USING CENTERING AND SELF-TALK

by
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Abstract

The purpose of this study was to examine the effects of two mental skills on ice hockey goaltender performance. The mental skills utilized were relaxation, in the form of centering, and self-talk. The participants were five male junior A hockey goaltenders from the Winnipeg area. A single-subject multiple baseline across individuals design was employed to evaluate the use of the mental skills. The results demonstrated that the mental training skills were effective in improving the save percentage of the goaltenders receiving the intervention. The social validation results were favorable indicating that the participants enjoyed using the mental skills and were satisfied with the results obtained from using them. Furthermore, the coaches were very satisfied with the results and felt that the skills were an important ingredient for improving performance.

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Introduction

In sport psychology, there are numerous studies and publications that support the use of mental skills training programs for athletes (Ming & Martin, 1996; Orlick, 1986; Wanlin, Hrycaiko, Martin, & Mahon, 1997). Although of a variety of mental skills have been used it is unclear which skills are most appropriate for athletes or whether specific skills are most appropriate for specific athletes. However, an extensive review by Greenspan and Feltz (1989), concluded that relaxation and remedial cognitive restructuring interventions are effective in improving performance in competitive situations.

Many successful athletes use self-talk and relaxation in competition to improve performance (Mahoney & Avener, 1977; Orlick, 1986). Rushall (1984) proposed that self-talk for a competition should include three features; task-specific content, positive self-talk and mood words. Rushall further suggests that players who are nervous and tense are not likely to play up to their potential. An effective strategy that helps players to relax involves centering (Nideffer, 1985; National Coaching Certification Program, 1994). Relaxation, usually in the form of progressive muscular relaxation, involves the tensing and relaxing of various muscle groups. Centering is a specific way of breathing which when combined with muscle relaxation, helps players relax or "loosen up".

Halliwell (1990) suggested that ice hockey players often use both self-talk and centering to perform at high levels. Professional

players seem particularly receptive to self-talk techniques and find that using it gives them control over their internal dialogue which enables them to approach the game with a confident, positive frame of mind. They also use centering techniques during competition. Centering has been suggested to be an effective way to help players refocus after a bad shift (Halliwell, 1990; Martin, 1993). Therefore, refocusing may be especially important to the goaltender. Although there is little research examining the goaltenders' use of mental skills, it is suggested that they too can benefit from these techniques (Smith, 1991).

An obvious situation where mental skills could prove to be important to goaltenders is described best by Bellefleur (1983), "hockey is a team sport, but few players feel more lonely than the goaltender after the red-light has blinked behind him" (p. 101). The goaltender is certainly a candidate for refocusing and positive self-talk techniques.

Mental Training Skills

Self-talk

The act of talking to oneself is constantly occurring with athletes in many situations. However, this type of self-talk is usually unstructured and can be detrimental to performance. It is important to become aware of any existing self-talk and use it to an advantage. It has been suggested that self-talk can correct bad habits, help prepare for performance, focus attention, create a

positive mood and build confidence (Botterill & Patrick, 1996; National Coaching Certification Program, 1994; Green, 1994; Nideffer, 1985; Ungerleider, 1996). Ungerleider (1996) stated that the "ultimate goal of teaching self-talk is to have the athlete achieve a sense of mastery - a proficiency that becomes automatic" (p. 20). This observation has been supported by elite athletes in an exploratory study by Mahoney & Avener (1977). In this study the use of self-talk during training and competition was high, containing both negative and positive statements. The researchers were able to demonstrate a positive correlation between positive self-talk and higher self-confidence. Nideffer (1992) believes confidence is a requirement of all athletes who wish to be successful. Gould, Eklund & Jackson (1992) in a study on Olympic wrestlers lend support to Nideffer's belief. The wrestlers in this study expressed feelings of high confidence prior to their best ever performance.

Taylor (1979) demonstrated a physiological basis for promoting positive self-talk as a means of performance enhancement. A difference between positive and aversive conditions and their physiological effects on performance were reported. Nideffer (1985) also suggested that positive self-talk can reduce the negative thoughts and feelings that are linked to physiological reactions. When there is an increase in muscle tension, arousal levels and/or breathing rate the reaction can result in the unconscious selection of an inappropriate behavior. This reaction is brought on by arousal: worry about competition, anger or frustration (Nideffer, 1985).

The initial step in using self-talk is to identify when self-talk takes place and the specific thoughts that accompany or follow self-talk. An effective method of doing this is by keeping a daily log (Bunker, Williams & Zinsser, 1996; Silva, 1982). Often the patterns of thought found during competition are a reflection of what occurs in practice, thus, it is important to record thoughts in all areas of performance (Bunker et al. 1996). Once negative thoughts are identified, the steps for using positive thoughts in their place can begin. Although there are many different methods describing how positive thoughts can be used, they all achieve the same outcome - positive thinking. Some examples include; thought - stopping (Ziegler, 1987), reframing (Botterill & Patrick, 1996), countering (Bunker et al. 1993), changing negative to positive (Orlick, 1986) and using positive statements before any negative thoughts occur (Green, 1994; Kendall, Hrycaiko, Martin & Kendall 1990; Ming & Martin, 1996). The importance is not on which method is used but the content of the positive thinking employed (Rushall, 1984). Rushall suggests that positive self-talk should emphasize self-encouragement, effort control, performance goal achievement and general self-talk. Rushall (1984) concluded that a combination of positive self-talk and task specific thought content enhances performance to a greater degree than either does alone. Although there is no general consensus in the literature concerning positive thought content, it appears to be comprised of three categories:

1. Technical/tactical - includes task specific content, instructional words and thoughts on personal skills.

2. Self-affirming - ego boosting/complimentary thoughts, confidence building and thoughts to keep perspective/focus.
3. Mood words - key words to keep a desired feeling/image, to keep a positive mind set for performance, and to control activation levels.

Rushall (1984) recommended that 70% of thoughts should employ task specific items and 30% should use general positive self-talk and/or mood words. Each type should be spread out and alternated throughout performance. Likewise, Martin (1994) suggested that positive self-talk and mood words should be changed every few games so the effect is not minimized.

Self-talk is a widely used mental training technique but it is usually combined with other skills such as relaxation or imagery (see Kendall et al., 1990; McAuley & Rotella, 1982; Palmer, 1992). There are few published studies, which utilize self-talk alone and the studies that are reported have varying results. One study by Van Raalte, Brewer, Petitpas and Rivera (1994) reported on observable self-talk by competitive junior tennis players. Using a rating scale it was found that overall self-talk was mostly negative and it both followed and preceded points lost. These findings suggest that negative self-talk may be harmful to performance; the more points lost that were followed by negative talk, the more likely the players were to lose sets. On the other hand, positive self-talk followed points won and winners tended to use less negative self-talk. However, there were no findings suggesting that positive self-talk improved performance. A limitation to this study was the

absence of any assessment of private talk that may have taken place. Ming and Martin (1996) found that positive self-talk led to an increase in the performance of skaters' figures. Novice skaters used a self-talk package while practicing their figures and answered questions relating to their thoughts during the performance of those figures. It is clear that the use of self-talk has the potential to affect performance, but the degree to which the performance is changed remains unanswered.

Centering

Relaxation is a widely used and very important psychological skill (Botterill & Patrick, 1996; Nideffer, 1992; Orlick, 1990). The physiological benefits of relaxation include a decreased heart rate, decreased blood pressure, better muscular control and a decrease in respiration. Progressive muscle relaxation is one of the most common techniques used to achieve relaxation. It involves the progressive tensing and relaxing of various muscle groups to help the athlete learn to recognize small changes in muscle tension and to relax them at will (Gill, 1986). Relaxation is often a precursor for other mental skills including imagery, self-talk and attentional control. Having control over attentional focus and concentration is necessary for high levels of performance.

Athletes must have the ability to focus on task relevant cues to perform effectively. As outlined by Nideffer (1985), four different types of attentional focus can be attained; broad-internal, broad-external, narrow-internal and narrow-external. Internal focusing is

used when rehearsing a skill or mentally planning a strategy. External attention requires the athlete to focus on people, events, or objects in the external environment. Broad focus should be used when several different situations or objects need to be taken into account and narrow focus should be used when only one object/cue needs attention (Table 1).

Table 1

	Broad	Narrow
External	Reading the environment	Zeroing in on task relevant cues
Internal	Planning a strategy or problem solving	Rehearsing or focusing a key thought or feeling

Nideffer's Attentional Focus, 1979.

Nideffer (1985) hypothesizes that the ability to shift focus is influenced by the arousal level of the athlete. He suggests that when in a stressful situation the athlete will tend towards his/her dominant response. In addition, there is a tendency for attention to narrow and become more internally focused. The goal of shifting focus is to remove the athlete from the distractions of their immediate surroundings and allow the athlete to pay attention to the details of executing a specific task or to something unrelated to evaluation or outcome (Orlick, 1990). When athletes are attending to irrelevant cues, they must change their focus and center their

attention on relevant cues. Nideffer (1985) calls this the centering procedure; it involves relaxing, taking a deep breath and exhaling slowly. This form of centering involves directing thoughts internally for a moment to mentally check and to adjust breathing and muscle tension. This momentary clearing and readjustment maximizes the likelihood that the athlete will be able to zero in on task-relevant cues (Nideffer, 1985).

The National Coaching Certification Program Manual (level 2 theory) describes five different types of controlled breathing, which can be used in centering. Specific types may involve visualization (three-part and visual), while others utilize the sense of feelings and sound (kinesthetic and audio). These techniques include a deep breath, an awareness of muscle tension and a strong exhalation to relax the muscles. Instead of breathing up in the chest, the breath is down in the stomach; the stomach should bulge out when inhaling and collapse when exhaling (Martin, 1993). Centering may be followed by some or all of the following steps, which can help, control focus (Nideffer, 1985; Orlick, 1990):

1. Displace any negative thought with a positive thought
2. Focus attention on important cues relevant to success
3. Concentrate on a task-oriented suggestion with proper form
4. Use internal attention to form a mental image of success

Centering is a good example of using relaxation in combination with other mental skills because it can be easily employed with both imagery and/or a form of self-talk.

Many sport psychologists have used techniques similar to Nideffer's centering by including different variations of the steps involved (Botterill & Patrick, 1996; Orlick, 1986; Martin, 1993). Botterill and Patrick (1996) stated that deep breathing can have a "huge effect on an individual's ability to become relaxed" (p.29). Ungerleider (1996) added that deep breathing using the diaphragm "enhances performance by oxygenating the blood and energizing the brain, nerves, and muscles" (p.22). Finn (1985) used a simple centering format involving a brief self-statement followed by a deep breath and saying 'relax' while exhaling. Finn (1985) has suggested this procedure can trick the mind into thinking everything is fine even if it is not.

Another technique to achieve attentional control is refocusing (Friesen, 1994; Martin, 1993). Refocusing is the process of returning attention to relevant stimuli after being distracted. To incorporate this technique both Friesen (1994) and Martin (1994) used a three R method: Relax, Regroup, Refocus. Friesen (1994) also included a review stage to search for any possible solutions to mistakes. Orlick (1990) suggested that in real situations the one breath relaxation technique is the most useful. Despite the importance of being focused before, during and after competition, this technique was found to be one of the least practiced skills by high performance athletes (Orlick, 1986). When learning to refocus or center, it is a good idea to experiment first in practice and with

varying situations before trying the skill in competition. Also, athletes should practice relaxing while in a ready position to help transfer the skill to competition easily (Orlick, 1986).

Relaxation is an important skill, which all athletes should learn because it affects both the mind and the body in preparing for action, or reaction. Regardless of the variations in the types of relaxation used, it is difficult to find a mental training package that doesn't include relaxation either alone or in conjunction with other psychological skills.

Multi-Component Packages

The effects of mental preparation strategies on athletic performance have received considerable attention by sport psychologists. Many strategies involve a combination of mental skills including relaxation, self-talk, goal-setting and imagery. A survey of elite lacrosse players by Heishman and Bunker (1989) concluded that athletes do employ mental skills and tend to use some skills more than others. Heishman and Bunker (1989) found that imagery, visualization and mental practice were the most frequently used skills followed by self-talk. These findings support Mahoney and Avener (1977) who suggested that the use of imagery and self-talk distinguished Olympic gymnasts from nonqualifers. Gould, Eklund and Jackson (1992) had similar findings with Olympic wrestlers. Athletes who followed a mental preparation plan had their best performances. High confidence, focus and optimal arousal characterized these athletes. Furthermore, the Olympic medallists used very systematic pre-performance routines that

were consistently adhered to. This finding supports the results found with Olympic athletes reported by Orlick and Partington (1988).

The results of these studies using athletes in different sports and using different skills, makes it difficult to compare findings. As cited earlier, Greenspan and Feltz (1989) analyzed research addressing different psychological interventions but limited the research to competitive situations. They concluded that educational relaxation-based and remedial cognitive restructuring interventions were most effective in improving competitive performance. For example, Kendall et al. (1990) examined the effects of imagery, relaxation and self-talk on a basketball defensive skill during actual competitive games. The four participants that were observed demonstrated an increase in game performance in the defensive skill monitored. A unique feature of this study included the enhancement of a skill which was not outcome oriented (i.e., points scored). Savoy (1993) implemented a case study that also focused on basketball skills. A collaborative mental training program was devised including imagery, centering, focusing and energizing. Over a year, the athlete indicated a decrease in pregame anxiety and an improvement in game statistics. The coach's assessment of the improvements were also favorable.

Other studies have concentrated on different types of tasks such as strength, endurance, and fine motor coordination. Straub (1987) compared three different methods of mental training using a dart-throwing task. The various methods included relaxation, imagery, concentration, goal setting and cognitive restructuring

skills. The results indicated that all groups improved in motor performance regardless of the program received. Mental preparation strategies also improve strength performance. Weinberg, Gould and Jackson (1980) conducted two experiments to determine if utilizing different strategies would produce different results. The conditions included attentional focus, imagery, preparatory arousal, a control-rest condition and a cognitive distraction condition. Interviewing the athletes derived that only preparatory arousal was found to consistently increase performance with imagery facilitating performance in one experiment. Elko and Ostrow (1992) found opposing results in a similar study. These researchers found that only imagery enhanced performance. An interesting finding in this study is the possibility that age has no influence on the effectiveness of the mental strategies used. Patrick and Hrycaiko (in press) also found positive effects for endurance athletes. They examined the effects of relaxation, imagery, self-talk and goal-setting package on endurance performance during a 1600 metre run. All three participants in the study realized an improved running time deemed significant by their coaches.

Studies using mental skill packages beg the question; Which skills are necessary to yield results and in what combination? This question has been explored by Weinberg, Chan, and Jackson (1983). The free-throw skill in basketball was used to compare imagery, relaxation, and imagery plus relaxation conditions to a control group. Results did not support the contention that a combination of techniques was better than a single technique. In

this study, only relaxation alone improved performance. After examining post-interviews with the participants it appears that a period of time needs to be devoted to practicing the use of the new techniques so that concentration during actual performance isn't affected. Nonetheless, Azrin (1977) suggested that using a combination of skills enhances the probability of an effect and gives the athlete a number of skills to work with in a systematic manner. Intuitively Azrin's observations make sense. Recent sport research (e.g., Kendall et al., 1990; Wanlin et al., 1997; Wolko, Hrycaiko, and Martin; 1993) supports the utility of the package approach. However, an often asked question is whether one or two components of the package are most responsible for the positive effects?

Mental Training in Hockey

Ice hockey is one of the fastest of all contact sports. It involves skill, speed, balance, strength and endurance. These skills combine to create the fluid movements that the fans watch. Yet the players know that the mental aspects of the game are just as important as the physical (Smith, 1991). Potentially good players often don't realize their true ability because of a lack of mental skill development. Mental skills rarely receive the attention they require to produce beneficial effects. In Canada, the National Coaching Certification Program has included some basic mental skills training to ensure that coaches have the knowledge to include them in

sport. However, this doesn't guarantee the skills get enough practice to be used in competition effectively.

Sport psychologists have used various mental skills with hockey players and a great deal have been written about how the players might use these skills. As early as 1985, Nideffer provided examples of how some techniques may be used in the sport of ice hockey. These techniques were directed at the warm-up, prior to a face off, when experiencing negative thoughts and prior to a shot on goal. Botterill (1990) provided an overview of a comprehensive program developed for the Chicago Blackhawks. He describes it as "a development and application program based on an assessment of needs and potential within the organization" (p. 358). Botterill used a variety of skills and emphasized the use of these skills at the rink and outside of sport.

A similar article by Halliwell (1990) also discussed the use of mental skills in professional hockey. In essence he "combined the mental skills of refocusing and relaxation with positive self-talk to help the players regroup" (p. 372). He noted that rebounding from a bad play or a bad shift has been rated by players and coaches as a very important mental skill. In conclusion, although there are some consultants working with professional hockey teams, there generally is a lack of research to conclude that their interventions are effective.

Research that is available on ice hockey includes studies focused on; personality differences among players (Man & Wohl, 1985; Kalliopuska, 1993), physiology/training (Rhodes & Twist, 1989; Watt, 1979), injury prevention/rehabilitation (Tegner &

Lorentzon, 1991) and studies examining the violence associated with hockey (Isberg, 1984; Svenningsen, 1993). Research in the area of personality compares the personality traits of players in different positions. For example, goaltenders are found to be more introverted than other players are. Physiology and training research includes information on techniques for improving skills and workout programs specific to the game. Rehabilitation research examines common hockey injuries and how to recover from them. Finally, research on the violence in hockey examines the role of the enforcer on a team, the crowds, and the external events, which compel players to act violently.

A small number of studies utilizing mental training have involved various sports including ice hockey. For example, Hall, Rodgers and Barr (1990) looked at the use of imagery among six sports including ice hockey. Imagery was used more in competition than in practice and more often as the level of play increased. Athletes also indicated that the imagery used was largely unstructured. A study on nonsport imagery was completed by Davis (1990) to determine its effect on elite ice hockey performance. The athletes imagined achieving success in non-sport contexts and it was concluded to be related to performance success. Bakker and Kayser (1994) examined the effects of relaxation, concentration and imagery on women's hockey performance. Results yielded an increase in performance including an increase in self-confidence and better concentration. A significant finding in this study was the small role the researcher

played in the intervention as the skills were practiced via a self-help program.

The most common skills utilized by sport consultants include relaxation, centering and self-talk (Botterill, 1990; Halliwell, 1990; Martin, 1993; Smith, 1991). These skills enable players to quickly get back into the game and improve performance. Smith (1991) suggests that relaxation can lower arousal and tension, promote concentration, and provide a method of confronting fears with the emphasis on breathing. She further implies that players should be trained to be focused for the length of time the player typically needs to perform without a break. Martin (1994) used the Relax, Regroup, Refocus method with hockey players. This is an effective strategy to eliminate/replace negative thoughts and improve concentration. It is encouraging that the professional leagues have adopted the use of these mental skills and that there are numerous consultants applying them. It is unfortunate, however, that research demonstrating the utility of the interventions in ice hockey is scarce.

Goaltenders

Goaltending is a unique and challenging position. "Most coaches will agree that the success of a team depends largely upon an aggressive, dependable and consistent goaltender who instills confidence" (p.1) (Bellefleur, 1983). Similarly, O'Shanter (1977) has stated that the goaltender is an "individual filling one of the most challenging and pressured positions in sport" (p.94). Any error made is not only obvious but can be incredibly dramatic.

There is a lack of research in the sport of hockey with even fewer studies focusing on the goaltender. If the goaltender is truly the most important position in hockey how is it that this position is overlooked? Newman (1992) conducted an exploration of goaltenders' thoughts, beliefs and perceptions. Although the study involved the sport of soccer there are parallels within the position to hockey. Recurrent themes were keeping perspective, accepting that you can't be 100% all the time, and that you must be ready at the start of the game. McFadden (1982) compared psyching-up strategies using both internal and external imagery with goaltenders. Results demonstrated that the use of imagery outperformed the other conditions on both number of saves made and reaction time. Another study involving reaction time of the goaltender explored visual cues given by a shooter in ice hockey (Salmela & Fiorito, 1979). The goaltenders watched films and learned different behaviors that are associated with each type of shot made. The purpose of this training was to increase confidence in anticipating the shooters move. The results indicated that performance precision was aided by the increased availability of pre-shot visual cues. In an article discussing skill evaluation, Lariviere and Lamontagne (1981) stated that information on performance is rather limited. Performance depends on several factors which are very difficult to measure and the importance of these factors could vary according to the goaltenders style.

Barbour & Partington (1993) stated that "all goalies possess some degree of mental toughness, which, like all skills, can be developed or refined through careful attention to detail" (p.98). Any

loss of emotional control has a detrimental effect on the goaltender and the team. Goaltenders who let frustration get out of control can be intimidated, and get upset with the resulting loss of efficiency. For example, Bellefleur (1983) suggested that the goaltender should shrug off his disappointment at a goal and take the attitude that the opposition will not get another goal. The goaltender must also be constantly on his guard against that momentary lapse where concentration lags.

Goaltenders must not be denied the same opportunities to learn mental skills that are available to other players. Goaltenders also have special needs. They need to concentrate for longer periods of time; therefore, practice sessions using relaxation and focusing must be extended to last the length of a period. During pauses, goaltenders should take a short mental break to relax the mind (Smith, 1991). If goaltenders are trained to scan themselves for inappropriate thoughts, they can identify them and refocus. Young and Walker (1994) stated that "negatives get turned into positives by an honest appraisal of abilities and game performances" (p.33). Finally, more motivational programs must be concerned with the problems of coping with frustration and losing (O'Shanter, 1977). In order to assess any changes in goaltender performance, it is important to use a design that allows for an ongoing assessment of the performance variable.

Single Subject Designs

Choosing a research design is the most important aspect of research. It is the responsibility of the researcher to appraise each situation and choose the most appropriate design keeping in mind both advantages and limitations (Shambrook & Bull, 1996). An appropriate design should be chosen based on its ability to answer the research question. Over the past decade numerous articles have called for an increased use of single-subject designs (Aeschleman, 1991; Bryan, 1987; Hrycaiko & Martin, 1996). Single-subject designs are described by five characteristics (Hrycaiko & Martin, 1996). The first characteristic is the ongoing assessment of the dependent variable (DV). This repeated measurement is potentially valuable to coaches and athletes. Secondly, interobserver reliability (IOR) of the DV is required. During observation sessions, two trained observers independently record the DV in a way as to not influence each other. The assessments are most often compared by dividing the smaller total of the DV (recorded by one observer) by the larger total (recorded by the other observer) and then multiplying the dividend by 100% (Martin & Pear, 1996). It has been suggested that scores of 80% or greater are considered acceptable (Kazdin, 1982). A third characteristic involves procedural reliability. This is typically a checklist of critical components involved in the treatment. Observers assess whether or not the treatment was applied in a consistent fashion. Adequate assessments help to ensure treatment integrity, increase research

replicability, and enhance interpretation of results. Also, all participants, at one time or another, are studied under all conditions of the experiment. Lastly, these designs rely on visual inspection of the data to determine the effects of treatment. Specific guidelines to determine if the intervention has clearly improved performance have been identified by Martin and Pear (1996). These include the following: (a) the baseline performance is stable or in a direction opposite to that observed for the effects of treatment; (b) the greater the number of times that an effect is replicated both within and across participants; (c) the fewer the overlapping data points between baseline and treatment phases; (d) the sooner the effect is observed following the introduction of the treatment; and (e) the larger the effect in comparison to baseline.

Despite the growing applicability of single-subject designs in applied sport psychology, Greenspan and Feltz (1989) found only six studies that adhered to the strict guidelines necessary. They noted that most interventions using this design showed significant improvements in performance (i.e., Hamilton & Fremouw, 1985; Heyman, 1987). A call for an increased use of the single-subject design is prevalent in recent literature (Bryan, 1987; Hrycaiko & Martin, 1996; Wollman, 1986). The response has been slow, but a number of researchers have employed this methodology (e.g., Kendall et al., 1990; Ming & Martin, 1996; Wolko et al., 1993). Single-subject designs were also used by Shambrook and Bull (1996) to examine the efficacy of imagery training. They measured the accuracy of four female elite basketball players on the free-throw skill. The participants were sequentially administered an

imagery training routine during the course of twenty-six trials. Overall the intervention did not seem to significantly improve performance. However, when using elite participants, high levels of performance are the norm. Despite this observation, there were still some improvements in performance. From the techniques used, the researchers agreed that this "design can provide a sound framework on which to assess sport psychology interventions" (p.41).

Single-subject designs, like all research designs, have some limitations. For example, in the multiple-baseline design across individuals, it is possible that altering the behavior of one person influences others who have yet to receive the intervention (Kazdin, 1982). However, in carefully monitored designs, this can be controlled. Other limitations have been cited in the literature but many are the result of a lack of understanding of these designs (Aeschleman, 1991; Bryan, 1987; Hrycaiko & Martin, 1996). One criticism has been the lack of internal and/or external validity. Internal validity is achieved by staggering the intervention phases over time for each participant. External validity is demonstrated across individuals by using several participants, behaviors or settings . For example, a study by Koop and Martin (1983) used both a multiple baseline across participants and across behaviors to evaluate an error-correction strategy designed to reduce errors in swimming strokes. The interventions effectiveness was demonstrated with a decrease in error rates immediately following the intervention. The procedure also showed generality by being reproduced by three of four swimmers.

Another misunderstanding is the assumption that the use of the visual inspection of data is too subjective a form of analysis. This criticism is only appropriate if the guidelines for inspection are not followed (see Martin & Pear, 1996). Concern has also been raised when single-subject designs fail to use inferential statistics. The lack of statistical analysis leads some to question the design's credibility. However, as discussed in Hrycaiko & Martin (1996), statistics are available for those who think it is necessary such as time-series analysis. Finally, criticism has been directed at the design's ability to compare two treatments or examine interaction effects. This can be accomplished by using an alternating-treatments design, in which the different interventions are applied to the same individual at separate times and the results are compared across sessions (Wolko et al., 1993).

The advantages of single-subject designs are that they focus on the ongoing assessment of the dependent variable. An additional advantage of the across individual design is that it eliminates the need for a non-treatment group by staggering when the intervention is applied. Alternatively, if training effects are expected one participant may be kept in baseline until the end of the study. Single-subject designs eliminate the problem of group averages and the fact that often in group design studies a lack of statistical significance obscure improvements in individual performance (Bryan, 1987). Small but consistent changes in performance can be noted by monitoring the dependent variable. Another advantage of these designs is that all participants at some point will receive the treatment. In clinical or applied research the

opportunity for all participants to benefit from the treatment is an important consideration. Finally, these designs allow for treatments to be individualized according to the participant's behavior patterns.

Appropriate single-subject designs should be encouraged because they can provide an effective way to evaluate treatment-produced effects in applied settings and detect even small changes in performance over time (Bryan, 1987). Wollman (1986) noted that experiments with single-subject designs are particularly effective for individuals engaged in real-life athletics. Further research using these designs are needed during actual sport competition (Kendall et al., 1990), and should assess the degree that the participants are affected by individual components of mental skill packages. It also remains to be determined how interventions affect nontargeted performance areas (Greenspan & Feltz, 1989).

Summary

Previous research supports the role that mental skills play in improving sport performance. Of particular interest to the present study is the application of centering and self-talk. The literature suggests these mental skills can aid athletes in performance. More importantly, these skills are recommended by sport consultants for use by professional athletes. Centering and self-talk are among the most common skills used by successful athletes, but their application in actual competitive situations is scarcely documented.

Mental training has been found to be beneficial in many sports settings, including ice hockey, but there is surprisingly little research

conducted in the sport of hockey. It has been suggested that the skills of relaxation, centering and self-talk can elevate the play of even professionally ranked hockey players (Botterill, 1990; Halliwell, 1990). Furthermore, within the game of ice hockey, research on the goaltender is rare. Studies that have been reported focus on improving the goaltenders physical skills, injury prevention and the goaltenders' anticipation. Young and Walker (1994) state that the "psychology of the goaltender is as important as any other position in hockey because the mental approach has a direct impact on performance, and therefore on the length of the goaltenders career" (p. 27).

The purpose of this study was to examine the use of relaxation/centering and self-talk on a goaltenders performance during actual game situations. This study attempted to enhance the literature by:

1. Using actual competitive situations to assess the experimental treatment effectiveness.

2. Examining the unique and often overlooked position of the goaltender in ice hockey.

3. Investigating the effectiveness of two mental skills advocated by sport psychology consultants in the sport of hockey.

4. Investigating the use of two specific components often used in sport psychology intervention packages as opposed to a multiple component package approach including three or more components.

5. Extending the use of single-subject designs in applied sport psychology research.

In conclusion, this study attempted to demonstrate that mental skills can be introduced quickly, used in competitive situations, and would result in improved goaltender performance.

Methodology

Participants

The participants of this study were five junior A male goaltenders. All participants were considered the "starting" goalie for their team. A "starting" goaltender is considered the best goaltender on the team and tends to play the majority of the games. In the situation where the goaltenders shared the "starting" position, both goaltenders completed the intervention. Participant 1 was in the first year at the Jr. A level and was seventeen years of age. Participant 2 had more experience, was in the second year at this level and at nineteen years of age was the oldest participant. Participant 3 was eighteen years old and in his first year at the Jr. A level. Participant 4 was also eighteen but was in his second year at this level. Lastly, participant 5 was the youngest at sixteen and in his first year of Jr. A play. The goaltenders were selected from teams within and surrounding the city of Winnipeg for ease of data collection. The participants had limited knowledge of mental skills

training and had not previously undertaken any systematic mental skills training.

Independent Variable

The independent variable consisted of two mental skills, which were applied during practice and in competitions. The mental skills used were relaxation, in the form of centering, and self-talk. Centering is a procedure in which an individual takes a deep breath from the stomach and focuses on that breath momentarily. Self-talk is the act of talking to oneself and in this intervention was used to enhance the probability of keeping a positive frame of mind throughout the game.

Dependent Variable

The dependent variable assessed was save percentage. Save percentage was defined as the number of shots stopped, divided by the number of shots on goal, and multiplied by 100. For the purpose of this study a shot on goal consisted of any shot that went into the net, hit a goal post, cross bar or was stopped by the goaltender while in the crease area. To assess the effect of the intervention in other related performance areas additional statistics were obtained. These included:

1. Number of minutes played by a specific goaltender.

2. Goals against average: The number of goals given up in a game by a team with a particular goaltender in net, multiplied by 60 (the number of minutes in a game), divided by the number of minutes that same goaltender played in the game.
3. Shots on goal.

Rebounds were initially included, as a possible statistic in this list but because of the intensive monitoring needed was not available as a statistical measure.

Experimental Design

This study utilized a single-subject multiple-baseline across individual design to assess performance changes in the dependent variable. Initially, participants were monitored to establish a stable baseline. One participant was then given the intervention while the others remained on baseline. The intervention was then introduced sequentially to the second, third and finally the last two participants. The second and third participants were intervened together because they were on the same team and shared the starting goaltender position. A similar situation occurred for participants four and five. Analysis of the data was conducted by visual inspection (Martin & Pear,1996). A tally sheet was used to calculate the shots on goal, minutes played, goals given up, save percentage, and goals against average (Appendix A). Participants were asked to complete a self-assessment form to motivate and remind them to use the mental skills at the appropriate times. The approach

ensured the intervention was being applied as directed. The participants and the coaches completed a post-study questionnaire to assess the social validity of the interventions (Appendix B & C). In addition, all coaches were given an evaluation form to complete on their goaltenders' performance both prior to and after the intervention (Appendix D). As suggested by Wolf (1978), the forms were designed to provide social validation of the study on three levels: (a) by examining the extent to which the dependent variable was important to the participant; (b) by ensuring the procedures used were acceptable to the participants; and (c) by ensuring that the subjects are satisfied with the results. Participants were asked to answer all questions honestly, follow the intervention as given, and to keep the intervention confidential until the end of the study is completed.

Procedure

Permission to conduct the study was first obtained through consent forms distributed to the coaches (Appendix E). The mental skills training session was scheduled with the participants so as to not interfere with schooling or practices. The training session was held at their respective arenas. The session lasted approximately 40-60 minutes each. The intervention was applied when the participant had no scheduled games on that day. When providing the intervention to subjects on the same team, the intervention was applied when one of the goalies was deemed ready (i.e., subjects showed a stable baseline). Periodic checks on the participant's

progress and continued use of the skills were monitored by phone. Data collection took place during home games or in the case of two participants playing each other, data was taken simultaneously. After each game, a copy of the 'statistics sheets' was obtained from the official score keeper of that arena or from the company in charge of game statistics; Achievement Plus. These statistic sheets were used to assess interobserver reliability (IOR). The statistics of save percentage was compared by dividing the smaller total (recorded by one observer) by the larger total (recorded by the second observer) and then multiplying the dividend by 100%. If they received an IOR rating over 80% then the statistics are considered to be reliable (Kazdin, 1982). In order to gather data for the IOR, three games were scored both before and after the intervention for each goaltender.

Intervention

The intervention included a brief introduction to the study, some personal background on the researcher, her interest in the sport of hockey and the distribution of the workbook (Appendix F). Self-talk was introduced with a definition and examples of each specific type (Appendix F, p. 4). The use of self-talk in hockey was discussed as it relates to the goaltending position. A worksheet was completed listing examples of each type of self-talk taken from personal experiences (Appendix F, p. 5). The examples were then discussed. Positive and negative self-talk was examined and the differences explored. A second worksheet was completed using

examples of negative self-talk in goaltender situations (Appendix F, p. 7-9). These worksheets were adapted from Martin, Toogood and Tkachuk (1996). This approach was designed to enhance the understanding of the skills used and to provide a dictionary of self-talk phrases for later use.

Next, relaxation was introduced with a definition, including how it works and the specific application to hockey. The subjects completed a muscle tensing and relaxing exercise to help demonstrate the difference between tensed and relaxed muscles. The skill of centering was introduced. The breathing skill was introduced with an exercise to ensure its' proper usage. Breathing must come from the stomach and not the chest. Some self-talk statements were practiced with centering utilizing some simulated situations from the worksheets (Appendix F, p. 11). A discussion took place on using the procedure in practices and in game situations. The participants were instructed to use these skills after every whistle during their games, and to say the statement outloud to begin with. Participants were encouraged to incorporate the skills into their normal routines. A self-assessment form was provided and used until the conclusion of the study (Appendix F, p. 14). The participants were informed of the importance of using the techniques regularly and directed that they would be monitored every three weeks to ensure that it was. The participants were also informed that the researcher was available for help with the techniques or to answer any questions that may arise.

Immediately, upon conclusion of the study, the social validation questionnaires were sent out by mail and the coaches

were requested to complete the goaltender evaluation forms. Once the coach questionnaires were returned, the coaches were made aware of the exact skills studied.

Results

Reliability

The IOR scores for the two observers ranged from .923 - .998. It is suggested that scores of .80 or greater are considered acceptable (Kazdin, 1982). Following the initial six games, all scores were obtained from Achievement Plus and compared with the researcher's assessment. Achievement Plus is considered the Manitoba Junior Hockey League's official statistic record keeper. They are responsible for publishing and circulation of all game results. Correlations for the initial six games were obtained by comparing the researcher's assessment with the official game scorekeeper's report.

Procedural Reliability

All participants completed the worksheets in the handbook in the presence of the researcher. Subsequently, every intervention session included the completion of the worksheets, completion of

the breathing exercise, and instructions to complete the self-assessment forms.

Independent observers verified that all aspects of the intervention were delivered to each participant via an intervention checklist (Appendix G). The IOR scores between observers on the intervention checklist were 100%. Participants also received a follow-up phone call every three weeks after the intervention, to ensure proper usage of the self-assessment forms. The participants were asked the following questions: were they still using the mental skills, were they recording usage of the skills on the self-assessment forms, and did they have any problems utilizing the skills. The forms were returned to the researcher upon completion of the study.

Intervention Effects

The effect of the intervention on each participants' save percentage (S%) is shown graphically in Figures 1 through 5 and a numerical comparison of the average S% before and after the intervention is shown in Table 2.

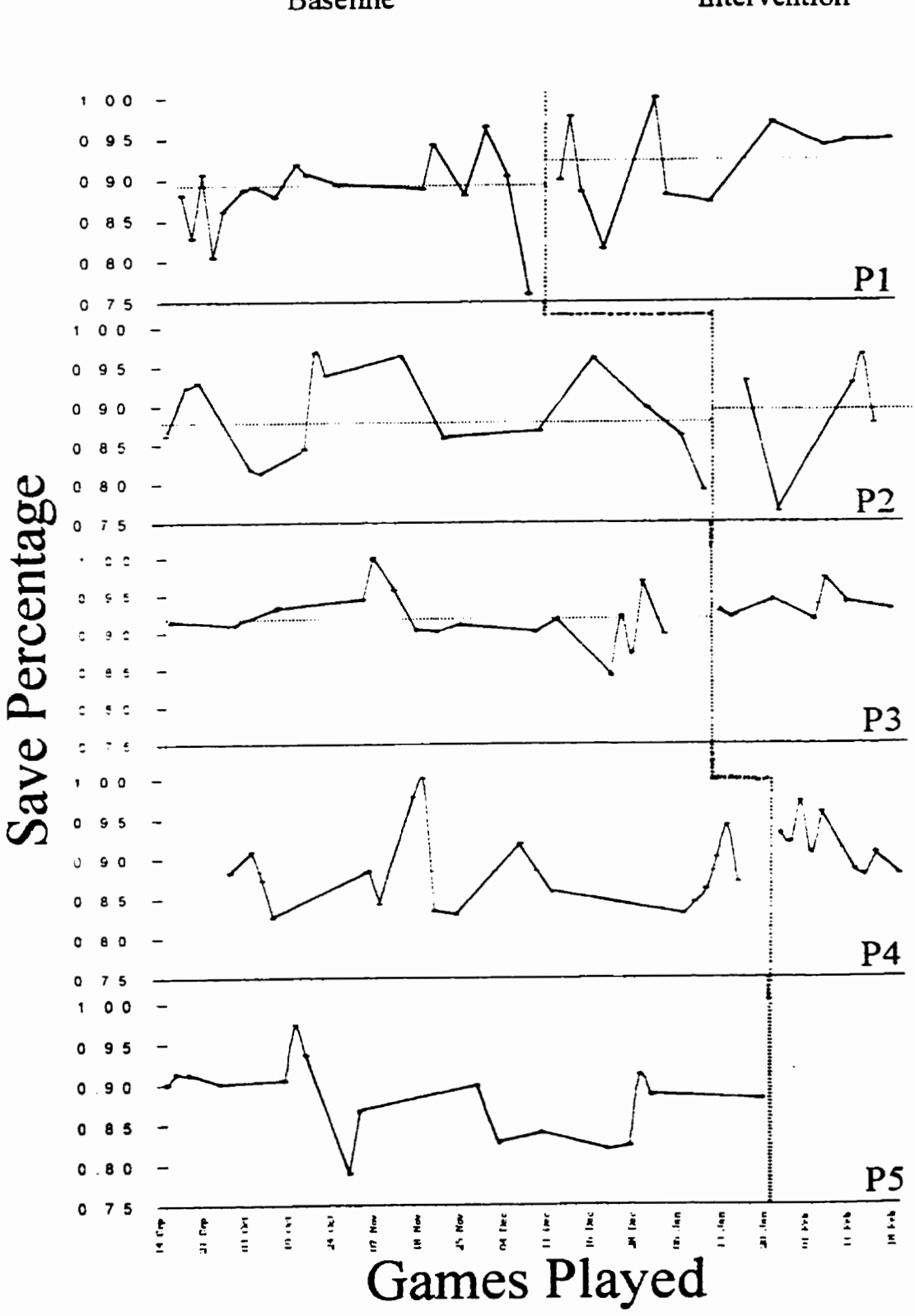
Participant 1 received the intervention first approximately three months into the regular season. The baseline performance prior to the intervention was variable but heading in the opposite direction than expected after the intervention. The intervention produced an immediate effect. The initial post intervention data point was above the mean line and the second

data point continued well above the baseline mean. On average, participant 1 demonstrated a .033 percent (%) increase in save percentage after the intervention. However, until the last four games the participant's performance remained quite variable. There were numerous overlapping data points with this participant.

Participant 2 received the intervention in the fourth month of regular season. The baseline data points were heading in a downward direction, opposite to that expected after the intervention. The effect of the intervention was immediate. Participant 2 showed a large increase in S% immediately following the intervention. With the exception of one data point, all post intervention data points were above the baseline mean performance. Participant 2 recorded the smallest change in save percentage at .015 %. There were also many overlapping data points for this participant, as post intervention performance remained quite variable.

Participant 3 also received the intervention in the fourth month of regular season. The baseline data was variable with the last data point heading in a downward direction. The effect of the intervention was immediate. With the exception of one data point all post intervention points were above the baseline mean until completion of the study. Participant 3 showed an improvement of .017% and displayed some overlapping data points. In contrast to participant's 1 and 2, participant 3's S% became very stable and this individual played at a high level throughout the remainder of the season following the intervention.

In the fifth month participant 4 and participant 5 received the intervention. Although participant 4's baseline data was heading in


Baseline
Intervention
Save Percentage
1 00
0 95
0 90
0 85
0 80
0 75
P1
P2
P3
P4
P5
Games Played

an upward direction, the last data point was opposite to that expected by the intervention. Due to time restrictions in the regular season the intervention was administered at this time. There was an immediate effect and improvement continued to stay very close to or above the baseline mean after the intervention. Participant 4 demonstrated a large change in S% increasing .033 % with some overlapping data points. Participant 4 showed signs of stabilizing his game as displayed in the last few data points, however the stable play was below the overall post intervention performance mean.

Due to coaching strategy, participant 5 only played one game following the intervention and as a result could not be assessed for an intervention effect. Instead, participant 5 was assessed for a training effect by dividing the regular season into two equal halves. When looking at participant 5's data half way through the season and comparing it with the latter half, there does not appear to be any training effect. In fact, the early baseline mean performance is higher than the later baseline mean performance. Somewhat, surprisingly, it appears that the goaltenders' performance actually decreases during the regular season.

The data showed an overall improvement in S% for the four participants. Each participant displayed an immediate improvement following the intervention, moving the data trend in an upward direction. Also, all participants improved enough to display a positive change in mean performance after the intervention. Three of the four participants showed a "leveling off" of performance suggesting consistency in their play.

As suggested by Greenspan and Feltz (1989) a nontargeted performance area was monitored for intervention effects. Goals against average (GAA) were recorded as an additional statistic and are displayed in Table 3. Participant 4 showed the largest decrease in GAA at 1.56. Participant 3 showed the smallest decrease of 0.03. Participant 2 also displayed a small decrease of 0.67. Participant 1 showed a large decrease in GAA with a change of 1.33.

Table 2

Save Percentage

	Participant 1	Participant 2	Participant 3	Participant 4
Before intervention	88.9	87.6	91.7	88.2
After intervention	92.2	89.1	93.4	91.5
Difference	3.3	1.5	1.7	3.3

Table 3

Goals Against Average

	Participant 1	Participant 2	Participant 3	Participant 4
Before intervention	4.04	4.01	2.29	4.34
After intervention	2.71	3.34	2.26	2.78
Difference	1.33	0.67	0.03	1.56

Social Validation by Participants

The four participants were asked to complete a social validation questionnaire (see appendix B) at the end of the study. All four participants indicated that it was very important (5 out of 5) to improve their save percentage. Three of the four participants rated improving their goals against average as important (4 out of 5). The fourth participant rated it as very important.

When asked about the improvement of playing consistency, participant's 1 and 2 rated consistent performance as important (4 out of 5). All other participants rated it 'very important'. The participants were asked if they felt that they displayed consistent game improvements between September to December and January to March. All participants felt that they did not consistently improve

in the first half of the season, but did improve consistently in the second half.

The participants were then asked to rate how useful they thought the mental skills were. Participant 1 and participant 4 rated them as somewhat useful (3 out of 5) and participant 2 and 3 rated them as very useful (4 out of 5). When looking at centering and self-talk separately, the participants each had different responses. Participant 1 rated centering, (the breathing component), as somewhat useful and the self-talk component as very useful. Participant 2 rated both components as very useful. Participant 3 rated centering as not useful scoring only a 1 out of 5, but rated the self-talk as very useful. Participant 4 felt the centering was more useful than self-talk, rating the components 4 out of 5 and 3 out of 5 respectively.

The self-assessment forms that were completed after each game enabled the mental skills to be broken down and assessed game by game. Each participant used the skills throughout different periods of play and used the different types of self-talk as they felt they needed too. There was no clear pattern as to which type of self-talk was used more often. Some participants reported not using the skills near the end of the study, but admittedly agreed that they were probably using them automatically, without thinking. All but participant 2 felt the skills had become a comfortable part of their routine. This admission supports Ungerleider (1996) who identified the importance of self-talk becoming automatic.

Overall, the participants found the mental skills to be enjoyable, rating them at a 3 or higher. Also, the participants found

the results achieved from the study to be very satisfactory (rated 4 out of 5 or higher). All participants agreed that they would continue to use the skills as needed in their game. Each participant also felt that they performed more consistently after using the skills and stated that this achievement was very important. In the comment section, participant 4 noted that the skills were important and useful, but felt that they should be introduced at a earlier age when goalies are less likely to have a focusing pattern already developed.

Social Validation by Coaches

All three coaches were asked to complete a questionnaire to compare the results of each goaltender anonymously (see appendix C). When asked to rate the importance of improving save percentage (S%) and goals against average (GAA), coach's 1 and 3 rated S% as very important (5 out of 5). Coach 2 rated S% as important (4 out of 5). Coaches 1 and 2 rated GAA as very important and coach 3 rated GAA as important. All coaches agreed that improving consistently throughout the regular season was very important and rated it a 5 out of 5.

Each coach was then asked to rate if they thought their goalie(s) improved consistently from September to December and from January to March. All the coaches felt that their goaltender(s) did not improve consistently in the first half of the season but did in the second half. This perception was consistent with that of the goaltenders.

Finally, the coaches were instructed to review four graphs revealing the S% of the four participants in the study to assess whether there was an important change in performance. The save percentage graphs were divided into two phases, before and after mental skills training. Coach 1 felt that participant 1 and participant 2 did not display an important change in performance, but the other participants, 3 and 4, did. In the comment section, this coach believed the first two participants still had too many "highs and lows" in their performances. However, the last two participants began to display a "leveling off" of performance after the mental skills training. Coach's 2 and 3 felt differently and suggested that all goaltenders showed an important change in performance after the mental skills were introduced. Coach 2, in particular, noted the pattern of performance consistency in participant 4.

Discussion

The present research has demonstrated that the mental skills of centering and self-talk were effective in improving goaltending game performance. Overall, an evaluation of the participants' performance throughout the regular season found that each participant demonstrated an improvement in save percentage (S%).

The effectiveness of self-talk, as a mental skill, has been demonstrated in several publications (e.g., Halliwell, 1990; McAuley & Rotella, 1982; Ming & Martin, 1996; Silva, 1982). Halliwell (1990)

observed that professional hockey players are very receptive to self-talk techniques and the players found that by using positive self-talk they were able to approach the game with a confident, positive frame of mind. The hockey players also admitted to using deep centering breathing techniques during their games. Similarly, McAuley & Rotella (1982) have suggested that using a cognitive self-control intervention package may improve gymnast's performance. Their package included cognitive restructuring techniques (thought-stoppage, rational thinking and self-talk), relaxation techniques (such as controlled breathing), and mental imagery. These techniques were encouraged prior, during and following performance. This program is similar to the treatment used in the present study with its ease in adapting to most sports and most athletes as suggested by McAuley and Rotella (1982).

Ming and Martin (1996) found that a self-talk package lead to an increase in performance of figure skaters. A mean improvement over baseline was established across four participants. The self-talk package incorporated the planning and memorizing of key words, which were said out loud. In the present study, key words were also used as part of the self-talk skill. However, most of the self-talk used was done silently. Silva (1982) investigated a form of cognitive restructuring and imagery in competitive sport environments via case studies on three different athletes involving three different situations. He demonstrated improved performance in all three cases. Although it can not be determined how much of the effect was due to each specific skill, based on the previous research, cognitive restructuring might play a part in improving

performance. The present research lends further support to this suggestion. The self-talk component (a form of cognitive restructuring) combined with centering improved performance in all four participants. Self-talk was consistently used among all four participants, whereas; centering was used only when needed throughout a specific game.

Self-talk and centering (a form of relaxation) has also been used successfully in multi-component packages (e.g., Kendall et al., 1990; Patrick & Hrycaiko, 1997). Kendall et al. (1990) used self-talk and relaxation skills with imagery in a multicomponent package. The mental skills package was successful in improving performance of a defensive basketball skill during competition. Patrick and Hrycaiko (in press) demonstrated an increase in an athlete's endurance running times utilizing a relaxation, imagery, self-talk and goal-setting package. The 'package' approach has been suggested to enhance the probability of a treatment effect (Azrin, 1977) and to encourage athletes to incorporate mental skills into their training routines (Patrick & Hrycaiko, 1997). However, a study by Greenspan and Feltz (1989) analyzed nineteen published studies using many different interventions. A recommendation resulting from this analysis highlighted the need for intervention packages to include evaluation of separate elements in order to determine the most efficient intervention procedures. The present study illustrates that a package approach may have as few as two components. It is possible that the more components added to a package, the longer it would take for an athlete to adopt them into training routines. The intervention phase in the present study was fairly short (40-60 min.),

introduced into competition immediately, and resulted in improvements to performance. A program of this type could be important to athletes and coaches who would like to introduce some mental skills training, quickly, at a specific point in the season, without negatively affecting game performance.

As previously mentioned, an area of importance within this study was to investigate the effectiveness of the mental skills in actual competition. Few studies have been published assessing this domain (e.g., Heyman, 1987; Kendall et al., 1990; Silva, 1982) and Martin (1994) has observed that research demonstrating the utility of interventions in actual competition is scarce. Similarly, research specific to ice hockey goaltenders is also scarce. One study by McFadden (1982) investigated imagery with hockey goaltenders and concluded that imagery was effective in improving skilled goaltender performance. He suggested that the mental skill of imagery could be taught to coaches without difficulty. McFadden (1982) also recommended that mental preparation strategies should be introduced around fifteen years of age while the goaltenders are open minded and receptive to new ideas. The present study lends some support to this idea as participant 4 stated that a younger age group would be best to start with because they haven't yet established a definite routine.

This study extends the literature relative to the applicability of using single-subject designs within applied sport psychology (Bryan, 1987; Hrycaiko & Martin, 1996; Wollman, 1986). Although single-subject designs have been used in the past to determine the effectiveness of an intervention on sport performance, none to date

have investigated the efficacy of using mental skills in competitive ice hockey. A number of studies utilizing single-subject designs have been published recently assessing different mental skill interventions (e.g., Patrick & Hrycaiko, 1997; Ming & Martin, 1996; Wolko et al., 1993). The positive results of the present study provide additional support for using these designs in applied settings. This study also demonstrates that single-subject designs are an effective way to measure changes in performance scientifically through visual graph analysis and practically by social validity. Both athletes and coaches agreed that the changes in performance were important and that using the mental skills was useful. Although the positive changes in S% were relatively small, the coaches felt that the changes in performance were considerable and important in the sport of hockey. Furthermore, the coaches' felt that the consistent performance displayed by participants 1, 2, and 4 were more important than any improvements in S%.

Another characteristic of single-subject designs is the repeated measurement of the main dependant variable throughout the duration of the study (Hrycaiko & Martin, 1996). In the present study, this allowed for S% to be monitored for every game within the regular season. Any declines in performance following intervention could be assessed in relation to other uncontrolled variables. The ongoing assessment also helped to verify the effectiveness of the mental skills being currently used in the sport of hockey by sport psychologists (Martin, 1993; Halliwell, 1990; Botterill, 1990). However, the lack of research literature on the sport of ice hockey

and mental skills training makes it difficult to compare the present study with others.

The results of this study raise a number of issues with regard to applied (field) research. In the competitive environment there are many variables that can not be controlled, such as opponents, coaches, travel time, officials, equipment, etc. These variables likely provide the variability found in the data of all four participants in the current study. Kendall et al's (1990) research in competitive basketball also experienced variability in the data. Kendall et al. (1990) noted that they expected some post intervention variability as the participants were developing their ability to perform the desired mental skill. This may also be the case in the present study. All participants showed considerable post intervention variability, but the performance of some participants began to level off and display consistency in game S% during the latter part of the study. Regardless of the variability, all four participants showed improved S% after the intervention providing confidence that the change in performance was due to the mental skills training.

With data producing small but consistent improvements it may be practical to look at other statistical methods to determine if there was a significant improvement (Hrycaiko & Martin, 1996). Two such techniques are the split middle analysis or the time series analysis. Unfortunately, the split middle technique cannot be used with data displaying a ceiling effect as is the case with this study (Kazdin, 1982). However, the time series analysis may be performed on data consisting of eight or more data points (Tryon,

1982). In this study, participants one and four display enough data points to perform the analysis.

A further difficulty in the game of hockey, as mentioned above, is the statistic of S%. This statistic has a ceiling limit beyond which improvement is not possible. This is termed a 'shutout'. A 'shutout' would comprise a perfect game; therefore, S% would be 100% with a GAA of zero. With even one shutout during baseline data collection, all other data points would automatically overlap (as seen in figure 1). Knowing this in advance made it prudent to also consider a nontargeted performance measure (GAA).

Finally, an interesting finding in the present study was that there was no training effect throughout the season. This finding is not unique to hockey and supports similar observations by Patrick and Hrycaiko (in press) and Wanlin et al. (1997). Participant 5's performance actually decreased in the latter half of the season when assessing the season in two equal halves. This is a particularly important observation for coaches and athletes as most assume that performance improves as the competitive season progresses. This finding suggests that mere physical practice is not sufficient to provide a training effect.

Further research is required to investigate the effectiveness of additional mental skills in the sport of hockey. Research should also concentrate on using applied settings and actual competition to assess these mental skills. Assessing the effects of mental training in a natural sport setting with numerous uncontrolled variables is difficult. As a result, nontargeted variables should also be assessed for changes coinciding with mental skills training. Future research

should consider assessing players at a much younger age as intuitively it makes sense that effective routines might be more easily developed before less effective routines are adopted. Finally, athletes should be consulted on the specific mental skills needed to enhance their performance. Who more than the athlete has a sense of the specific skills they do not practice, or the skills that they feel would help them reach their potential?

In conclusion, the overall results of this study indicate that the mental skills training package, consisting of centering and self-talk, enhanced goaltenders' performance in actual competitive game situations. In addition, the mental skills used and the results obtained received favorable validation from both the goaltenders and the coaches. This study effectively adds to the literature by investigating a unique area within sport psychology, contributing to the literature on ice hockey and demonstrating the efficacy of single-subject designs in an applied setting.

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Appendices

(Appendix A)

Tally Sheets

Date _____
Home Team _____ Away Team _____
Goaltender _____ _____

Legend:

GP * Games Played RB * Rebounds given up
SH * Shots on goal MP * Minutes played
SV * Saves made GA * Goals against
S% * Save percentage GAA * Goals against average
W * Wins L * Loss T * Tie

GP	MP	SH	SV	RB	GA	GAA	SP	W	T	L	Comments

(Appendix B)

Social Validation for Participants

1	2	3	4	5
not important		somewhat important		very important

1. How important is it for you to improve your save percentage? 1 2 3 4 5

2. How important is it for you to improve your goals against average? 1 2 3 4 5

3. How important is it for you to perform consistently in games? 1 2 3 4 5

4. Do you feel that you had consistent improvment between:
   A. September - December? Yes No
   B. January - March? Yes No

1	2	3	4	5
not useful		somewhat useful		very useful

5. How useful did you find the mental skills used in this study? 1 2 3 4 5

6. How useful was the breathing component? 1 2 3 4 5

7. How useful were the self-talk statements? 1 2 3 4 5

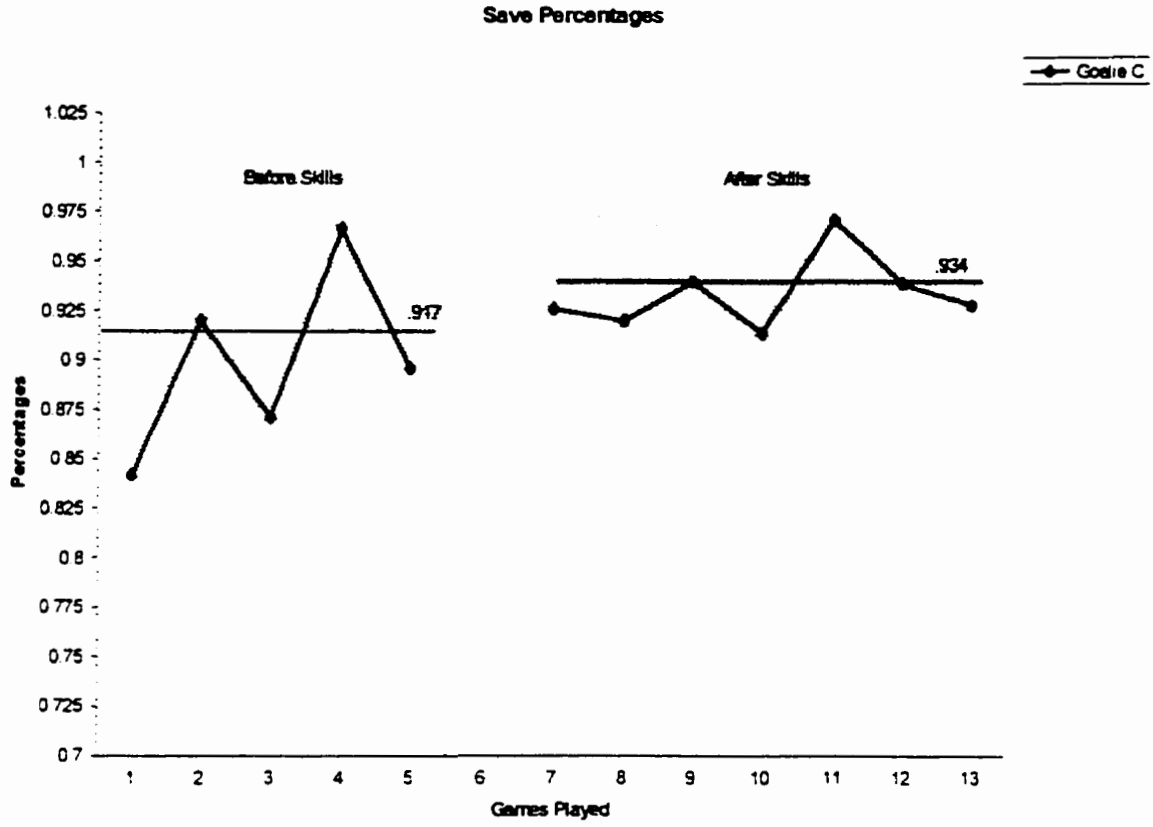
8. Did you enjoy using the mental skills in this study?

1	2	3	4	5
not at all enjoyable		somewhat enjoyable		very enjoyable

9. Refering to the graph on the following page; are you satisfied with the results produced by utilizing the mental skills?

1	2	3	4	5
not at all satisfied		somewhat satisfied		very satisfied

Please provide any general comments pertaining to your participation in the study or of the mental training skills used (worksheets, instructor, etc.) in the space provided on the following page.



Comments:

Figure: an illustration of the graphs provided to the participants showing S% for the regular season.

(Appendix C)

Social Validation for Coaches

1	2	3	4	5
not important		somewhat important		very important

1. How important is it for your goaltender to improve his save percentage? 1 2 3 4 5

2. How important it is for your goaltender to improve his goals against average? 1 2 3 4 5

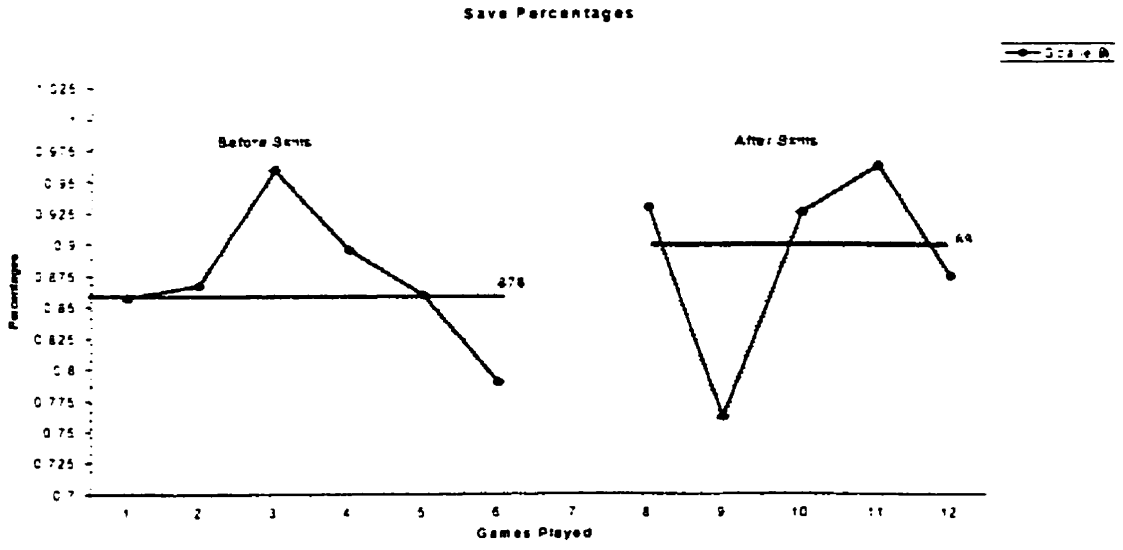
3. How important is it for your goaltender to improve consistently throughout the regular season? 1 2 3 4 5

4 Do you feel that your goaltender improved consistently:

	Goalie 1
A. September - December?	Yes No
B. January - March?	Yes No

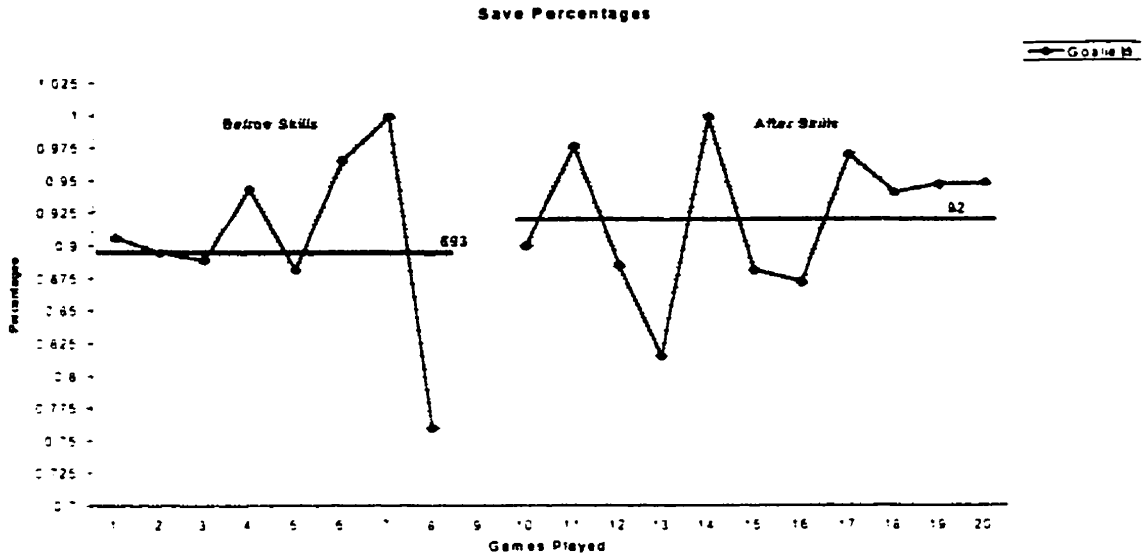
5. Considering each goaltenders' results separately below, would you consider the improvements over a two month period to be an important change in performance?

Goalie A:



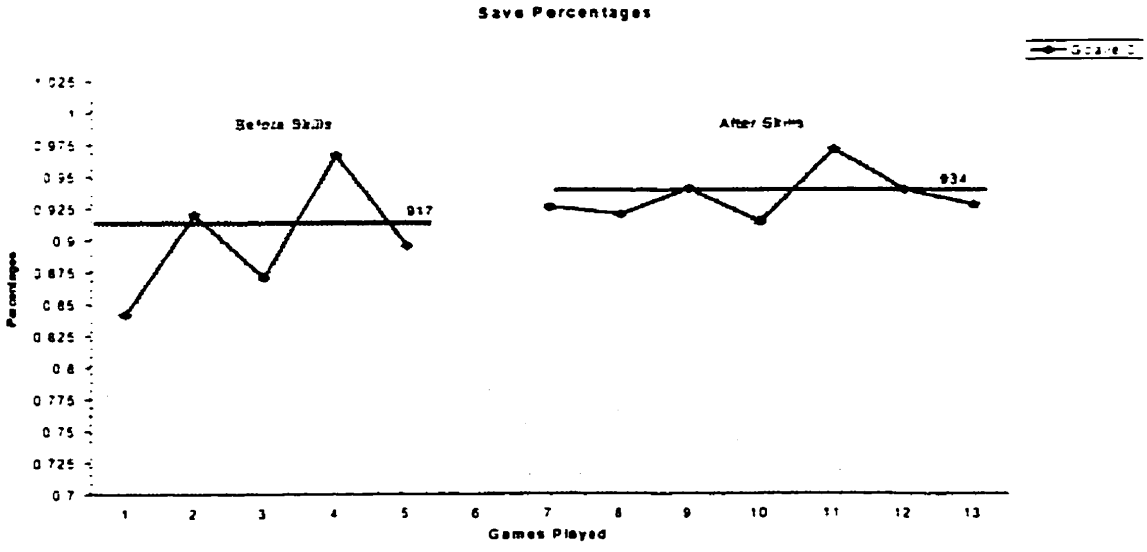
Is there an important change in performance? Yes_____ No_____

Goalie B:



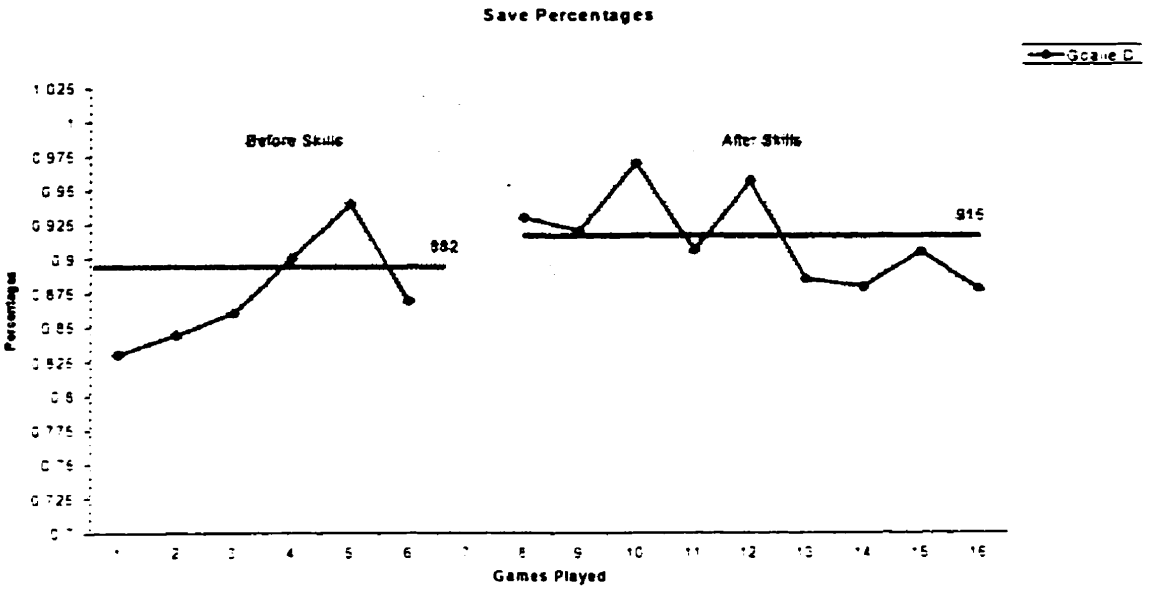
Is there an important change in performance? Yes _____ No_____

Goalie C:



Is there an important change in performance? Yes _____ No_____

Goalie D:



Is there an important change in performance? Yes_____ No _____

Please provide any general comments in the space provided below.

(Appendix D)

Evaluation of the Goaltender

Player Name _____ # years with the team _____
Level of competition _____ # years in the league _____

Rating Scale:

Needs Improvement				Consistent Play		
Poor	Weak	Fair	Satisfactory	Good	Very good	Excellent
(1)	(2)	(3)	(4)	(5)	(6)	(7)

A. Physical Characteristics

1. Balance
 - maintained good ready position during game 1 2 3 4 5 6 7
 - recovery (regains stance after leaving his feet) 1 2 3 4 5 6 7
 - holds stance in movement 1 2 3 4 5 6 7

2. Mobility
 - remains on feet as much as possible 1 2 3 4 5 6 7
 - moves with control in ready position in all directions 1 2 3 4 5 6 7
 - reacts well to puck movement in zone 1 2 3 4 5 6 7

3. Stamina
 - ability to play entire game 1 2 3 4 5 6 7
 - ability to play back to back games 1 2 3 4 5 6 7
 - ability to resist fatigue 1 2 3 4 5 6 7

B. Technical/Tactical Characteristics

1. Rebound Control
 - deflects puck out of prime scoring areas 1 2 3 4 5 6 7
 - passes puck to team-mates effectively 1 2 3 4 5 6 7
 - smothers puck well when appropriate 1 2 3 4 5 6 7

2. Shots
 - ability to stop low shots 1 2 3 4 5 6 7
 - ability to stop high shots 1 2 3 4 5 6 7
 - use of stick during saves 1 2 3 4 5 6 7
 - use of blocker during saves 1 2 3 4 5 6 7

3. Angles
 - positions self properly prior to shot 1 2 3 4 5 6 7
 - lines up properly to puck 1 2 3 4 5 6 7
 - ability to orient self instantly 1 2 3 4 5 6 7
 - challenges the shooter 1 2 3 4 5 6 7

4. Team Play

- ability to read oppositions' play well	1 2 3 4 5 6 7
- knowledge of his own teams defensive systems	1 2 3 4 5 6 7
- understands breakout concepts	1 2 3 4 5 6 7
- communication with team-mates	1 2 3 4 5 6 7
- play of puck outside the net	1 2 3 4 5 6 7

C. Mental Characteristics

1. Concentration

- alert at all times	1 2 3 4 5 6 7
- keeps sharp when not regularly tested	1 2 3 4 5 6 7
- ability to shake off a bad play	1 2 3 4 5 6 7
- able to relax at appropriate times	1 2 3 4 5 6 7
- maintains focus despite bad or early goals	1 2 3 4 5 6 7

2. Consistency

- able to make key saves	1 2 3 4 5 6 7
- shows consistent mental state regardless of score or opposition	1 2 3 4 5 6 7
- plays well both at home and away	1 2 3 4 5 6 7
- does not allow 'bad' goals	1 2 3 4 5 6 7

3. Confidence

- capable of raising level of team play	1 2 3 4 5 6 7
- able to play under pressure	1 2 3 4 5 6 7
- positive mental attitude at all times	1 2 3 4 5 6 7
- eager to play and practice	1 2 3 4 5 6 7
- able to control reactions when scored upon	1 2 3 4 5 6 7
- ability to win the 'big' game or make the 'big' save	1 2 3 4 5 6 7

Comments:

Evaluator _____

(Appendix E)

Participants

Dear Goaltender and Parent:

I would like to request your consent to act as a participant in a study to investigate the effects of psychological skills training program on goaltender performance. This study is a partial requirement for a Masters of Science Degree specializing in Sport Psychology from the University of Manitoba.

You will be free to withdraw at any time throughout the study without any prejudice or penalty. Part of the study will be conducted in two separate training sessions lasting approximately one hour each. These sessions will be arranged to fit your schedule so as to not interfere with school or practices. The sessions will consist of instructions in the use of mental skills and worksheets to individualize the skills to your routine. There will be no cost incurred to you as a result of your participation. Your anonymity as a participant in this study will be strictly protected.

For the purposes of the study you will be asked to fill out a daily log after practices and games, complete a questionnaire at the end of the study, and attend both of the instructional sessions. The content of the instructional sessions is to remain confidential until the completion of the study. If there are any questions or problems I will be available for assistance.

Following the conclusion of the study, upon request, you will be provided with a summary of the findings. Thank you in advance for your co-operation.

Lisa Rogerson
477 - 5650

Dennis Hrycaiko
Student Advisor
474 - 8764

I, _____, give my consent to act as a participant in the study as described above.

I, _____, give my consent for my son's participation in the study as described above. (needed for participants under 18 years)

I would like to receive a summary of the studies findings. YES NO

Coach :

Dear Coach,

I would like to request your consent to allow the goaltender of your team to participate in a study to investigate the effects of a psychological skills program on goaltenders performance. This study is a partial requirement for a Masters of Science Degree specializing in Sport Psychology from the University of Manitoba.

You and your goaltender will be free to withdraw from the study at any time without prejudice or penalty. The goaltender will attend two separate sessions lasting approximately an hour each. These sessions will be arranged to fit the participants' schedule so as not to interfere with school or practices. The sessions will consist of instructions in the use of mental skills and worksheets to individualize the skills to the goaltender. There will be no cost incurred to you or your team as a result of your participation. Your anonymity as a participant in this study will be strictly protected.

For the purposes of the study your goaltender will be asked to fill out a daily log after practices and games, complete a questionnaire at the end of the study, and attend the training sessions. As the coach you will be asked to complete a player evaluation both before and after the study, and share goaltender statistics on the games observed. These will consist primarily of shots on goal, save percentages, goals against average and number of rebounds given (if statistic is taken). If there are any questions or problems I will be available for assistance.

Following the conclusion of the study, upon request, you will be provided with a summary of the findings. Thank you in advance for your co-operation.

Lisa Rogerson
477 - 5650

Dennis Hrycaiko
Student Advisor
474 - 8764

I, _____, give my consent for my goaltenders participation in the study as described above.

I would like to receive a summary of the findings YES NO

(Appendix F)

A MENTAL PREPARATION PROGRAM FOR HOCKEY GOALTENDERS

Lisa Rogerson

University of Manitoba

A MENTAL PREPARATION PROGRAM FOR HOCKEY GOALTENDERS

World-class athletes are all highly skilled. But physical skills alone do not guarantee success. To be the best that you can possibly be, and to perform to the best of your ability on a consistent basis, you must combine your physical talent with effective mental preparation. The mental skills presented here can help you to accomplished those goals.

Guidelines for this workbook are based on discussions and materials by the following people:

Dr. G. Martin
Mr. Rick St. Croix
Mr. Mike Sirant

Some General Findings From Sport Psychology

1. Your potential for any given game depends on your:

   physical preparation (being in good shape, eating nutritious foods, getting lots of rest)
   technical preparation (having a high level of skills)
   tactical preparation (the game plan for the opponents).

   Whether or not you will play up to your potential depends on your *mental preparation.*

2. In any given game, **what you say to yourself, what you focus on, and how you feel determines how you will perform**. Worrying, thinking negatively, or doubting yourself, can cause you to play below your potential. On the other hand, thinking positively, feeling confident, and staying focused will improve your play.

3. **You can use your thoughts and emotions to improve your performance,** or you can let negative thoughts and emotions interfere with your skills - the choice is up to you.

4. Studies of world class athletes indicate that everyone (even those for whom mental toughness comes naturally) can improve their performance by improving their mental preparation.

5. Consistent practicing of mental skills will help an athlete play closer to his potential in every game. With practice, performance will increase at a steady rate and the skills will become more automatic.

*

The best athletes in the world use positive self-talk to improve confidence and concentration.

*

Self-Talk

Your self statements or thoughts directly affect feelings and actions. Inappropriate and negative thoughts usually lead to negative feelings and poor performance, just as appropriate or positive thoughts lead to good performance. Our thoughts can serve as cues to prompt desirable behaviors and used for emotional control. Negative thoughts will still occur but it is important to have a plan to control them.

Types of Self-talk:

1. **Positioning/Focus** - these are key phrases which include task specific content, instructional words and thoughts on personal skills.

   Examples:
   A. Positioning
      1. "Stand up well"
      2. "I'll play the angles and cut off the shooter"
      3. "Control rebounds"
      4. "Have good balance"

   B. Focus - attending to things on the ice
      1. "My man the one with the puck"
      2. "I'll focus on my strengths"
      3. "One shot at a time"
      4. "Challenge the shooter"

2. **Self affirming** - ego boosting/complimentary thoughts, confidence building and thoughts to keep perspective/focus.

   Examples:
      1. "I've played well against this team before and I can do it again"
      2. "I know I can be one of the best"
      3. "Good saves still count"
      4. "I've worked hard, I am ready"
      5. "I deserve to win"

3. **Mood words** - key words to keep a desired feeling/image, keep a proper mind set for performance, control activation levels.

   Examples:
      1. "Cool and alert"
      2. "Be patient"
      3. "Be calm"
      4. "Compete"

Worksheet 1

Part A:

List some examples of positioning/focusing key words that would help you to play well:

List some examples of self-affirming statements that would make you feel confident:

List some examples of mood words to give you feelings of being ready to play well:

*

Recognizing your negative self-talk is an important step to improving your mental preparation

*

Worksheet 2

PART B: Negative Thought Checklist

Fill in your own examples at the bottom and/or check off any of the given examples that apply to you (both negative and positive).

Negative Thoughts	Positive Thoughts
On the day of the game against a team that's physically big and crashes the net	
__ "I hope I don't get hurt"	__ "I'll keep my head up and play hard"
__ "I hope I don't embarrass myself"	__ "I'll win the battles for the puck"
__ "I hope I don't lose my cool"	__ "I'll stay in control"
__ _____	__ _____
You're playing a team that has beaten you the last several times that you played	
__ "We'll never beat these guys"	__ "I'll out-work them on every shift"
__ "They're much better than we are"	__ "I'll be aggressive"
__ "I hope I can keep the score close"	__ "I'll work hard to the last second"
__ _____	__ _____
You're playing a team that you've beaten the last several times that you played	
__ "This will be an easy win"	__ "I'll stop every shot"
__ "I can get a shutout against this team"	__ "I'll play shift by shift"
__ "We better not let them beat us"	__ "I'll be alert and ready for anything"
__ _____	__ _____
Your team has scored two early goals	
__ "Play cautious, don't let them back in it"	__ "Play aggressive right until the end"
__ "I hope I don't give up a bad goal"	__ "Keep the rebounds tight"
__ "I can relax, nothing will go in"	__ "I'll play smart"
__ _____	__ _____
You feel tired between the second and third periods	
__ "I can't wait to get this over with"	__ "We'll win minute by minute"
__ "My legs feel like lead"	__ "Stand tall, Fast feet"
__ "I hope I can stay alert"	__ "Watch each play as it occurs"
__ _____	__ _____

You make a bad play that costs a goal

__ "I'm such an idiot, Why did I do that?"
__ "I'll probably get pulled"
__ "I shouldn't go out of the net"
__ _____

__ "I can't change the past but I can change the future"
__ "The rest of my game starts now"
__ "Think smart, play tough"
__ _____

The game is tied going into the final few minutes

__ "If we lose this one, I'm in big trouble"
__ "I hope I don't cost us the game"
__ "Let's not screw it up"
__ _____

__ "Be cool and alert"
__ "I'm ready & confident to stop everything"
__ "Stick to the game plan and we'll win"
__ _____

You're heading into overtime in an important game

__ "I hope I can keep the puck out"
__ "I hope we win"
__ "I doubt I can stop their best shooter"
__ _____

__ "I see everything"
__ "We're the better team"
__ "I see him coming and I'm ready"
__ _____

You're playing against a team with a 'hot' goalie

__ "I'll look bad in goal tonight"
__ "I hope I can keep the score close"
__ "I'll never be that good"
__ _____

__ "I can match him play by play"
__ "I've set my goals and I'll reach them"
__ "I'll be that good tonight"
__ _____

You let in a short-handed goal

__ "I hope I can recover quickly"
__ "Why did I do that"
__ "I'm going to get pulled next bad play"
__ _____

__ "Refocus, that won't happen again"
__ "Cover the angles, watch the puck"
__ "I'm going to finish this game and win"
__ _____

Other situations and the thoughts you may experience during them

1. _____

Negative thoughts Positive thoughts

2. _____

Negative thoughts Positive thoughts

3. _____

Negative thoughts Positive thoughts

4. _____

Negative Thoughts Positive Thoughts

*

For physical skills

and

mental skills,

practice makes perfect

*

CENTERING

Being able to relax the body gives you control over muscles important for keeping loose in competition. The feeling of 'flow' is often associated with being loose and effortless. Centering involves directing thoughts internally for a moment to mentally check focus and to adjust breathing or muscle tension. This momentary clearing and readjustment maximizes the likelihood that you will be able to zero in on task-relevant cues. This technique includes a deep breath, an awareness of muscle tension and a strong exhalation to relax the muscles. Instead of breathing up in the chest, the breath is down in the stomach; the stomach should bulge out when inhaling and collapse when exhaling.

Breathing Exercise

1. Stand up with the knees slightly bent, one hand on your stomach.
2. Take a deep breath. As you inhale you should feel your hand move out. Your chest should **not** rise.
3. Exhale slowly. Feel the muscles relaxing as the air leaves your body. You should feel your stomach collapse.

** Try to use this breathing technique in the ready position.

Centering Procedure

Many goaltenders don't take advantage of the time in between whistles. Their thoughts and emotions are controlled by what they see happening on the ice. That can be good if your team is playing well but not so good if you're not. Other goaltenders let their minds wander and lose concentration, or get down on themselves if they make an error or let in a goal. To control your thoughts and emotions and play the best game you are capable of, you should practice the **centering procedure**.

A. Take a deep centering breath.

B. Rehearse your positive self-talk statement and get ready for the next play.
   - e.g. "That one's gone forever"
     "The rest of my game starts now"

C. Refocus on the face off and get ready for the next play.

Mental Preparation Strategies
(an example)

1. Before each Game

a) In the dressing room before the warm-up, mentally rehearse the self-talk statements.

b) In between periods, during the last three minutes or so, mentally rehearse the self-talk statements.

2. During the Game

a) Between whistles
- stay loose (deep centering breathing)
- mask off, down on one knee, take a skate, etc.
- use mood words
"Be quick"
"Be patient"
"Be cool"

b) Regroup after a goal is scored on you
- early in the game: "No big deal, we've got a good team", etc.

c) If they're up several goals: "Play tough to the end"
"Play for your own goals against"
"Good saves still count"

d) Talk to yourself constantly throughout.

3. After the Game

a) Complete the self-evaluation form

b) Don't hesitate to call for help at any time.

*

Self-improvement

Begins with

Self-assessment

*

Self-Assessment Forms

(to be recorded after each game)

Date						
Opposition						
Home/away						
Before the Game:						
Y= Yes N= No						
Did you review:						
Your positive self-talk statements?						
The mood words you used for the game?						
The positioning statements for the game?						
Your focusing words for the game?						
During the Game:						
Y= Yes N= No						
Did you use the centering technique:						
In period one?						
In period two?						
In period three?						
Rate the following:						
1=Extremely Poor 2=Poor						
3=Average 4=Good 5=Extremely Good						
Ability to stay confident during the game						
Level of energy (being ready to play)						
Mental alertness and concentration						
Ability to relax/stay loose						
Ability to refocus after a distraction						
Ability to control negative thoughts						
** Rate the following in percentages:						
1=less than 20% 2=20-49% 3=50%						
4=51-75% 5=76-89% 6=90-100%						
Use of centering						
Use of mood words						
Use of positional statements						
Use of self-affirming statements						
Use of focus statements						

Comments:

** Percentages are based on the opportunity to use the skills. If you had 60 opportunities, and used 30 of them, that is 50%.

(Appendix G)

Intervention Checklist

Session One

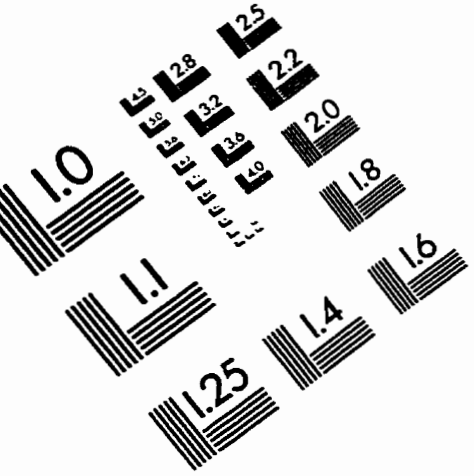
__ Explain self-talk
__ Present examples of three types of self-talk
__ Discuss self-talk as it applies to the goaltending position
__ Present the goaltenders workbook
__ Complete worksheet 1 on self-talk with goaltender
__ Begin worksheet 2 (first three examples)

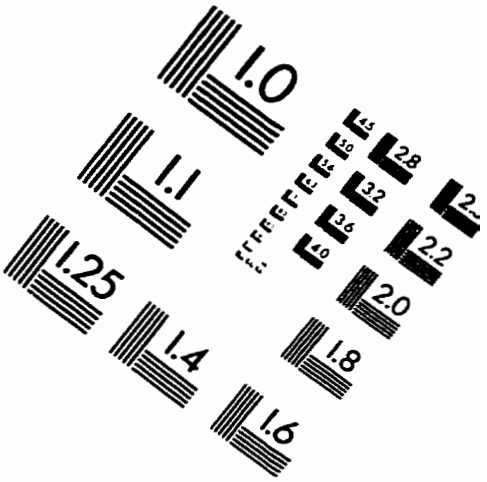
__ Explain relaxation
__ Completed tensing - relaxation exercise
__ Attempt breathing without instruction
__ Explain centering and how to breath properly
__ Attempt breathing with instruction
__ Asked questions to ensure participants can tell the difference betweeen the two
__ Present examples of when centering can be used i.e. stretching, in goal, b/w periods

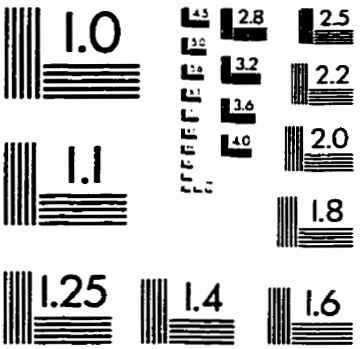
Session Two

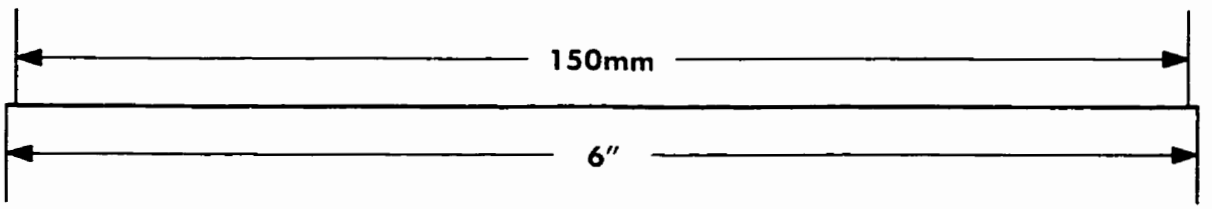
__ Asked if there are any questions from the worksheets
__ Can they see themselves using the technique in goal?
__ Explain how to put self-talk and centering together
__ Attempt examples of tight situations from the worksheet using centering
__ Discuss using the technique in practice and in games
    __: after every whistle
    __: said outloud at first until more comfortable
    __: incorporate into the usual physical routine
__ Explain how the checklist works and it's importance to the study
__ Remind them that there will be periodic checks to ensure everything is working out okay

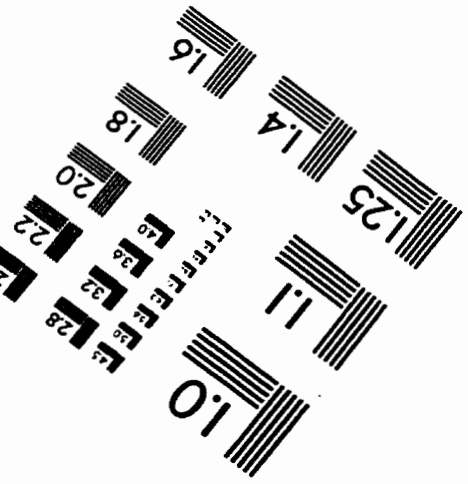
IMAGE EVALUATION
TEST TARGET (QA-3)

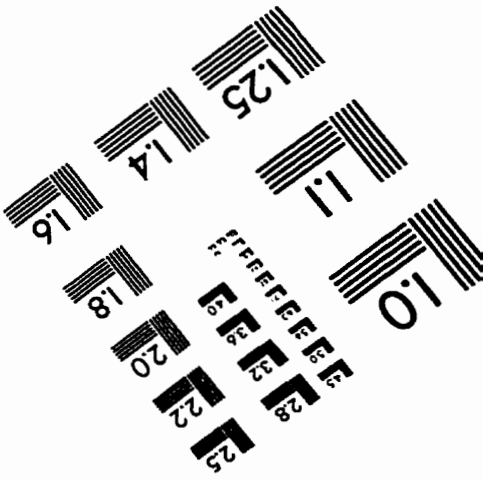












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