Title: Being Your Best: The Impact of Mental Imagery on Performance Enhancement in Amateur Sports Players

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Submitted in partial fulfilment of the requirements of the BA Hons in Psychology at Dublin Business School, School of Arts, Dublin.

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March 2015
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Acknowledgements

I would like to thank members of the following for participating in this research:

Gortnahoe/Glengoole GAA Club
Mary Willies Golf Society
Rathdowney Golf Club
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Abstract

The study examined the effect of a cognitive-specific (CS) imagery intervention on a hurling and a golf task and self-efficacy and mental imagery ability within a training environment in hurling and within a staged environment over three time points. Throughout the subsequent intervention phase, participants in the experimental group completed imagery script practice. This study also investigated whether self-efficacy beliefs would be higher in those involved in a team or individual sport. This study also investigated if those with superior self-efficacy beliefs and imagery ability would produce a superior performance than those with lower self-efficacy beliefs and imagery ability. Results revealed that the imagery intervention had no positive effect on performance in the two groups although scores for hurling showed a significant difference between Time1, Time2 and Time3. Analysis found partial supports for links between self-efficacy, imagery ability and high scores with a positive relationship between self-efficacy at Time1 and imagery ability at Time3 showing a moderate relationship. No difference was in the self-efficacy beliefs of the two groups.
Introduction

Sport psychology researchers are concerned with how athletes’ psychological and characteristics influence performance. Sport psychology has emerged as a field with a research tradition that provides a foundation for direct application with athletes. As the role played by psychological factors in the performance of athletes has become better understood, interventions have been designed to favourably affect athlete’s behaviour throughout their participation in sports and other social contexts. The ability to mentally prepare is considered a key component of such differences. Increasing performance to the optimal level is contingent upon mental preparation and this is largely influenced by psychology factors. Major topics of study include the relationship between exercise and mental health such as self- efficacy, interventions that promote physical activity, theories of behaviour change, and problems associated with exercise such as injury. Applied sport and exercise psychology consists of instructing athletes, coaches, teams, exercisers, parents, fitness professionals, groups, and other performers on the psychological aspects of their sport. The goal of applied practice is to optimize performance and enjoyment through the use of psychological skills and the use of psychometrics and psychological assessment. One common area of study within sport psychology is the relationship between performance and imagery ability.
Applied Models of Imagery

Based on Martin et al. (1999) imagery has cognitive and motivational functions that operate on either a specific or a general level according to Pavio. The cognitive general (CG) function entails imaging strategies, game plans, or routines, while the cognitive specific (CS) function involves imaging specific sport skills. The motivational general (MG) function of imagery involves imaging physiological arousal levels and emotions, and the motivational specific (MS) function of imagery includes imaging individual goals. Hall, Mack, Paivio & Hausenblas (1998) furthered this research in dividing the motivational general function into a motivational general arousal (MG-A) function, combining imagery associated with arousal and stress, and a motivational general-mastery (MG-M) function, representing imagery associated with being mentally tough, in control, and self-confident. An abundance of theory and research indicates that CS imagery can have both cognitive (performance enhancing) and motivational (self-efficacy) functions.

CS intervention studies set within training environments are scarce, and moreover have revealed mixed findings. Short et al. (2002) reported post-intervention self-efficacy increases in beginner golfers within a laboratory putting task. Other studies report no post-intervention changes at all (Martin & Hall, 1995; Woolfolk et al., 1985). This discrepancy may reflect the precise nature of the intervention and/or nomothetic group designs employed. Regarding the latter possibility, collective analysis of group self-efficacy data according to a single pre- and post-intervention measurement could potentially mask individual post-intervention improvements over time (Shambrook & Bull, 1996). In sum, a collection of theory and research indicates that CS imagery can have both cognitive (i.e. performance enhancing) and motivational (i.e. self-efficacy raising) functions. Little research to date in
this area has been concentrated in the training ground therefore the relationship of CS imagery with training quality and self-efficacy warrants further exploration. First, the high percentage of time that athletes typically spend in training (McCann, 1995); secondly, the potential for CS imagery to improve training quality and self-efficacy (e.g. Short et al., 2002); and thirdly, the potential for training quality and self-efficacy in turn to influence competitive performance (Cote et al., 2007).

**Imagery Uses**

**Arousal, motivation, and confidence**

Self-efficacy a motivational function was defined by Bandura, 1997, as ‘belief in one’s capabilities to organise and execute the courses of action required to produce given attainments’ and is inextricably linked to CS imagery. Specifically, Bandura’s (1986) social cognitive theory considers imagining oneself performing a task perfectly, termed ‘cognitive self-modelling’. Athletes who construct a CS image of successfully performing a sport skill can build their self-efficacy through self-observation. This is supported by various other researchers including (Feltz & Lirrgg, 2001) and (Maddux, 1995). In addition, Bandura (1986) considered mastery of a task to be a further source of self-efficacy. Research by (Nordin and Cumming 2005) advanced this notion that CS imagery might evoke past performance mastery information. The CS imagery/self-efficacy link is pertinent to the current study’s focus on the training environment as self-efficacy has proven to be both a reliable indicator of quality training, (Orlick & Partington, 1988) and a reliable predictor of sport performance (Morritz et al, 2000). A number of correlational studies have validated a
self-efficacy enhancing function of CS imagery however the majority have been set within competitive environments, (Beauchamp et al, 2002), or have failed to distinguish the experimental setting either by competition or training, (Short & Short, 2005). Further research is required in comparing CS/Self-efficacy in terms of performance in training versus competitive environment. This would benefit individual athletes as well as coaches and sports psychologist in performance enhancement. The first comparison of training and competition imagery use was conducted by Hall et al. (2009) across 345 recreational and varsity level athletes within 32 sports. CS imagery was found to be a significant and positive predictor of both training and competition self-efficacy. These results are beneficial however experimental research is needed to establish the causal effects of CS imagery on self-efficacy.

Beattie, Lief, Adamoulas & Oliver (2011) conducted experiments to explore the reciprocal relationship between self-efficacy and performance. Novice golfers participated in two putting conditions, with the task difficulty varying in each. At the between-person level self-efficacy and performance were positively related however there was only a weak non-significant, negative relationship between self-efficacy and sport performance at the within-person. These findings suggest that self-efficacy is not always a strong predicator of subsequent performance. Therefore the evidence surrounding a positive self-efficacy and performance relationship is questionable at the within-person level on skill based tasks. Vancouver & Kendall (2006) suggest that individuals with high self-efficacy may become optimistic to the extent that they apply fewer resources when meeting goals, decreasing their performance. Further research at the between and within-participant level is required in order to determine a valid conclusion as to whether self-efficacy is a consistent predicator of performance in sport and exercise. This is pertinent to the current study as a quantitative, mixed between within quasi experiment was employed exploring the relationship between self-efficacy and performance.
Skill Learning and Performance

Imagery has been defined as “the cornerstone of sport psychology interventions” (Cornelius, 2002, p. 206) combining the senses to design or even recreate, a sporting skill, (White & Hardy, 1998). Imagery is useful in improving learning, performance, and self-efficacy. Imagery is used widespread by athletes at all levels and imagery is promoted by coached and athlete’s and is in widespread use within many athletic fields according to (Munroe-Chandler & Hall, 2007).

Strategies

In addition to using imagery to learn and rehearse individual motor skills, athletes also use imagery to learn and rehearse game plans, tactics and strategies (Feltz & Landers, 1983; Hecker & Kaczor, 1988; Paivio, 1985). It is suggested that CG and CS imagery may be beneficial when used to rehearse tactical skills and strategies and for solving unexpected problems that may arise during a competitive event (Guillot & Collet, 2008). Furthermore, both players and coaches may develop game plans and strategies to employ against specific opponents before the competition (Martens, 2004). Athletes can use imagery to deal with timing, technical or tactical challenges that may arise during an event or against a specific opponent. Imagery can also be integrated into an athlete’s pre-performance routine as a means to refine a specific strategy before engaging in the competitive event (Guillot & Collet, 2008). Moran defines a pre-performance routine as a ‘sequence of task relevant thoughts and actions which an athlete engages in systematically prior to his or her performance of a specific sport skill.’ (Moran, 1997, p177). This definition highlights that a routine needs to be task specific, systematic and engaged with. Frequently, these will incorporate other commonly used techniques, such as imagery or self-talk. Volumes of research support the approach that performers who use routines in closed skill sports have
enhanced performance. In basketball free throw shooting (Lonsdale & Tam, 2008), golf putting (Bell et al., 2010), diving (Bell et al., 2008), water polo penalty (Marlow et al., 2001), rugby goal kicking (Jackson & Baker, 2001) and volleyball serving (Lidor & Mayan, 2005). Pertaining to the current study with two closed skills, a free taking task in hurling and a putting task in golf, the use of the imagery scripts were specifically tailored to suit the skill that was being measured.

**Imagery and Physical Practice**

The combination of mental and physical practice has been suggested to be more efficient than physical practice alone in the case where there is no significant decrease in physical training (Feltz & Landers, 1983). Guillot et al. (2009) examined the effects of motor imagery on learning and executing tactical offensive movements in 10 national level female basketball players. Athletes performed a total of 108 motor imagery (9 trials per session during 12 physical practice sessions) trials in combination with physical practice. The amalgamation of motor imagery and physical practice significantly improved motor performance whereas motor imagery was not found to be significant than physical practice alone. This study advocates the combination of imagery practice and physical practice. The present study measured hurlers on a free taking task in conjunction with their normal training session.

**Pre-competition Imagery**

Research suggests that imagery immediately prior to performance may improve performance (Malouff, McGee, Halford, & Rook, 2008; Mamassis, & Doganis, 2004; Martin

Factors Affecting Imagery

Imagery Perspective

When engaged in mental imagery, athletes experience this through an internal or external perspective. Internal imagery involves the person imagining being inside their body and experiencing those sensations that might occur while performing in the real situation (Mahoney & Avener, 1977) while external imagery is seen as a third person view, where the participant assumes the position of an observer. Specific aspects of motor skill performance have shown to be enhanced by varying types of imagery (Guillot et al., 2009; Hardy & Callow, 1999). For example, Hardy & Callow (1999) suggests that external visual imagery may be more beneficial than an internal perspective to enhance the performance of a motor skill task where form and technique are most important. Conversely, it is suggested that an internal visual imagery perspective may be most beneficial for open/reactive skills that depend heavily on perception (White & Hardy, 1995). However mixed finding exist in relation to this and further research is required to verify the inconsistencies in the research and the ambiguity surrounding specific imagery types (Guillot & Collet, 2008).
Imagery Ability

To fully benefit from mental imagery practice, participants must be able to engage in mental imagery effectively. While a vast amount of literature has examined the effects of imagery interventions on performance enhancement (Feltz & Landers, 1983; Martin et al., 1999; Weinberg & Gould, 2006), they have often excluded participants with low imagery ability (Short et al., 2004). In order for athletes to fully benefit it is necessary to assess athlete’s imagery ability as individual differences can influence the frequency of use and effectiveness of imagery by athlete’s. The present study measured individual’s imagery ability however participants were not selected on the basis of their imagery ability.

Frequently practicing mental imagery is not synonymous with this imagery effectiveness. To counteract this Smith & Collins (2004) advocate the use of functional equivalent in the practice of mental imagery techniques. Mental imagery practice should be administered in a systematic fashion according to Bull, Albinson, & Shambrook (1996); have a match for the intended outcome according to Martin, Moritz, & Hall (1999); taking place before, during, and after training and competitions according to Hall (2001); and be carried out during off and on season training according to Cumming & Hall (2002). The current study assessed athlete’s imagery ability. This is important from an applied perspective as imagery is most effective for athletes who score higher on imagery ability measures. Individual differences can influence the learning and the performance of motor and cognitive skills (Vealey & Greenleaf, 2006) leading to varying results for imagery use. Researchers cannot control for imagery ability, controllability, and past experiences (Vealey & Greenleaf, 2006).
To date, CS imagery intervention studies have almost exclusively utilised competition or laboratory settings. Experimental research used in training would further existing literature. Such research has important clinical relevance to athletes, coaches, and practitioners providing a centre of excellent integrating CS imagery into a real-life sport training environment and the effects of improved performance. Researchers have previously advocated CS imagery use within training (e.g. Frey et al., 2003; Hall, 2001), their recommendations have focussed on practising mental skills in preparation for competition, rather than on using mental skills to improve training quality. Firstly, improving imagery in training has clinical significance for athletes and practitioners alike, given that athletes spend a high percentage of their sporting time within training (McCann, 1995), and that research has consistently linked training quality to competitive performance attainment (Cote et al., 2003). Secondly, this builds on previous CS imagery intervention studies, which have commonly explored training quality and self-efficacy variables within beginner samples and laboratory settings. Thirdly, this is the first study to incorporate the game of hurling with over two thousand clubs in the country. The current study explored the effects of mental imagery intervention in a free taking task in hurling and a putting task in golf. The free taking exercise was completed in a training environment hurling while the putting task took place in a contrived setting. The study also investigated if there was relationship between high self-efficacy, high imagery ability and high scores in the free taking and putting tasks. A secondary aim of the study was to examine if self-efficacy would differ between those who participate in a team sport (the hurlers) and an individual sport (golfers).
METHOD

Participants

A total of 25 participants from two sports hurling ($n = 12$) and golf ($n = 13$) volunteered to participate in the study. More males (60.4% of the sample) than females volunteered to participate. Access to the sample was gained in a purposeful fashion, on a voluntary basis seeking permission from both Gortnahoe Glengoole GAA club and access to the local Golf Society, Mary Willies Golf Society. Their ages ranged from 18–66 years ($M = 19.88$, $SD = 4.28$) and most had participated in their sport for quite some time ($M = 8.55$ years, $SD = 4.34$). The frequency of participation in their given sport varied ranging from weekly ($n = 141$) or monthly ($n = 168$) level. Participation was over a three week period.

The group of hurlers participated in a free taking exercise consisting of twelve frees at a distance of 45 meters, four left, four right and four center. Participants were released from training four at a time randomly chosen by the manager to complete free taking task. Two taking turns to puck the ball and two behind the goal to indicate a wide or a score. The manager also selected the six participants to partake in the imagery intervention. This took place after the free taking exercise in the club dressing room.

The golfing task consisted of twelve shots at a distance of 3 meters on a flat surface, four left, four right, four back, four front. Numbers were picked from a hat. Participants in this group were randomly assigned to the control or the experimental group to
complete the putting task. Both groups practiced as normal for one week, three sessions in total. Immediately after the experimental group partook in imagery intervention in a private meeting room in the club house. Putts and free taking task at Time 1 and Time 2, under same conditions similar weather conditions.

All 25 participants from both the hurling and golf clubs signed consent form to partake in the study and took the Self-Efficacy Questionnaire and the Sports Imagery Ability Questionnaire (SIAQ).
**Design:**

The current study was a quantitative, mixed between within subjects quasi experimental design. Random assignment was used to place participants in the experimental or control groups.

Hypothesis 1: It is hypothesised that the individuals undergoing mental imagery intervention for free taking ability will display significantly higher performance accuracy compared to the individuals who do not receive the intervention.

Hypothesis 2: It is hypothesised that the individuals undergoing mental imagery intervention for putting ability will display significantly higher performance accuracy compared to the individuals who do not receive the intervention.

Hypothesis 3: It is hypothesised that there will be a relationship between self-efficacy and imagery ability.

Hypothesis 4: It is hypothesised that those who score higher on imagery ability will score higher in the free-taking and putting tasks.

Hypothesis 5: It is hypothesised that self-efficacy will differ between those who participate in a team sport (the hurlers) and an individual sport (golfers).

Hypotheses 1 & 2: Independent variable: Mental Imagery Intervention, imagery scripts, see appendix E (i) & E (ii).

Dependent variables: Overall performance, 45 meters free pucks scored, 3 meter putts in the hole, imagery ability.
Baseline scores established for the dependent variables.

Hypothesis 3:

Independent variables: 12 Hurlers, 13 Golfers

Dependent variables: Self-Efficacy, Imagery Ability (mean of subscales: Skill images, strategy images, goal images, affect images, mastery images).

Hypothesis 4:

Independent variables: 12 Hurlers, 13 Golfers

Dependent variables: Self-efficacy (single measure), imagery ability (means of sub-scales)

Hypothesis 5:

Independent variables: 12 Hurlers, 13 Golfers

Dependent variables: Overall performance, 45 meters free pucks scored, 3 meter putts in the hole, imagery ability.
Materials:

Both groups, hurlers and golfers used pens, paper, scoring sheets, mental imagery scripts, SIAQ and self-efficacy scale.

Hurling equipment: The equipment consisted of hurlers, 24 size 5 O’Neills Sliotars, GGA pitch, GAA goals posts, plastic cones. Plastic cones were to measure 3 meter putts on each four points, two left, two right, two back, two front of the practice green.

Golf equipment: Standard Proline golf putters, 26 Top Flite golf balls, plastic cones. Plastic cones were used to measure each three 45 meter pucks, 4 left, four right, four center.
Measures:

Demographics

Both sets of players supplied relevant demographic data including age, gender, and competitive level.

Mental Imagery Script for Athletes and Coach

Mental imagery training took place after the completion of the baseline phase. Generic imagery scripts were sourced from a website by two reputable psychologists Burton & Raedeke (2008). The script included visual, auditory, kinaesthetic, mood and control images. The researcher read through the coaches imagery script. Participants were asked to read the general descriptions of four general sport situations. After they read each general situation, they were asked to think of the specific skill task they were undertaking (free-taking in hurling & putting task in golf) the people involved, the place, and the time. They were then requested to take a few deep breaths, become as relaxed as possible, put aside all other thoughts, keep their eyes closed for about one minute as you tried to imagine the situation. They were instructed to redirect their thoughts to the situation being imaging should any distracting thoughts emerge. The intervention was administered to the participants in the group format, taking place in the club dressing room in hurling and a private room in the golf club. Participant were given the imagery scripts and asked to practice the scripts twice per week during the intervention.
Self-Efficacy Scale

The physical Self-Efficacy Scale is a 10-item psychometric scale designed to assess optimistic self-beliefs physical abilities. Each response was rated on a 4 points scale from not at all true (1) to Exactly True (2). All the scores were added together. The higher the total the higher the persons sense of self-efficacy.

Sport Imagery Ability Questionnaire (SIAQ)

To measure the use of various sport specific images athletes often use, the Sport Imagery Questionnaire (SIAQ; Williams & Cummings 2011) was employed. It is a 16-item questionnaire consisting of 5 subscales assessing the assessing imagery ability of various sport specific images. Subscales included skill images, strategy images, goal images, affect images and mastery images. For each of the five subscales athletes rate their frequency of use of that function of imagery on a 7-point Likert-type scale with anchors of 1 (not at all) and 7 (very easy to image).
**Procedure:**

Prior to the start of the research study, an email was sent both Gortnahoe/Glengoole GAA and Mary Willies Golf Society informing them of the nature of the study, the extent to which their participation was requested and informed consent was also obtained at this time. Researcher attended both AGM’s in January to verbally describe the study and to provide clarification and answer questions as necessary. All of the participants were informed of the voluntary nature of the study and were assured confidentiality. The research was approved by the institutional review boards. The research was conducted over three consecutive weekends beginning Saturday the 24th of January at 12:00pm in Gortnahoe hurling field. The golfing exercise began the following day Sunday the 25th of January at 2:30 in Rathdowney golf course. Both exercises continued to take place in the same venues and the same times for the following two weeks. All participants were handed a pack explaining the nature of the study (see Appendix E & F). All participants were thanked for taking part in the study.

**Time1: Baseline**

**Hurling Group**

During a scheduled training session 12 players were released from their normal training to participate in the study. The study began by first providing the players with a definition of mental imagery, and describing the potential value and benefit of using imagery on performance. All twelve players completed the three questionnaires (demographic information, SIAQ and self-efficacy) in the dressing room before a training session taking
approximately 25 minutes. The researcher was available to provide clarification and answer questions as necessary. All 12 participants then converged on the field to complete the free taking exercise. Players were paired up where one completed the task and one marked the scorecard. Each participant took a total of 12 frees, 45 meter pucks from left (4), right (4) and centre (4) field taking approximately 30 minutes. Weather conditions included temperature: 5 degrees; no rainfall, pressure: 1030.0 miles per hour; wind speed 9 miles per hour; west wind direction 260 degrees. Hurlers pucking the ball with the mild breeze behind them. The control group (n=6) then returned to normal training while the experimental group (n=6) returned to the dressing room to receive the imagery intervention. The experimental group were randomly chosen by the manager to participate in the imagery intervention. This took approximately 25-30 minutes. The intervention was divided into two parts. The first part consisted of a review of the three types of imagery goals and how to build self-confidence.

The second part involved evaluating player’s imagery ability. In the first section the players were taught that imagery could be used to help them stay motivated by imaging their short and long term goals (motivational specific imagery), to help regulate their energy and anxiety levels by imaging the energy and excitement of performing in practice and game situations (motivational general-arousal imagery), and to help them become more confident, focused, and mentally tough by imaging themselves successfully dealing with difficult situations (motivational general-mastery). In the second section, the players were encouraged to individualize the content of their imagery use by imaging weak aspects of their playing (e.g., technical skills, psychological weaknesses), as well as reinforcing what they had learned or corrected during a particular practice and/or game. In the “what” section, suggestions were made to the players on how they could make their imagery use more effective. The players were encouraged to incorporate all their senses when imaging,
especially visual and kinesthetic, and to image playing hurling in both practice and game settings. Members of the experimental group were given a copy of the imagery intervention (see appendix E) and asked to practice this twice for 15-20 minutes during intervening week. Participants received no compensation for taking part in the study. All participants were thanked taking part.

**Golf Group**

The Golf participants were Members of Mary Willies golf society. Participants from the Golf society were recruited from Mary Willies Society and the putting exercise took place in Rathdowney golf club. The three questionnaires (demographic information, SIAQ and self-efficacy) were completed in a private room in the club house taking approximately 25 minutes before converging on the practice green to complete the putting task. Golfers were paired up where one completed the task and one marked the scorecard. Weather conditions included temperature: 11.5 degrees; no rainfall, pressure: 1025.0 miles per hour; wind speed 8 miles per hour; wind south southwest direction 150 degrees. Wind factors had no impact to putting task. Each participant took a total of 12 putts, 4 left, 4 right, 4 back, 4 front taking approximately 20 minutes in total. The control group then left the club while the experimental group returned to the club house to receive the imagery intervention which took approximately 25 minutes. Members of the experimental group were chosen by random selection drawing numbers from a hat. The intervention was divided into two parts. The first part consisted of a review of the three types of imagery goals and how to build self-confidence. The second part involved evaluating player’s imagery ability. In the first section the players were taught that imagery could be used to help them stay motivated by imaging
their short and long term goals (motivational specific imagery), to help regulate their energy and anxiety levels by imaging the energy and excitement of performing in practice and game situations (motivational general-arousal imagery), and to help them become more confident, focused, and mentally tough by imaging themselves successfully dealing with difficult situations (motivational general-mastery). In the second section, the players were encouraged to individualize the content of their imagery use by imaging weak aspects of their playing (e.g., technical skills, psychological weaknesses), as well as reinforcing what they had learned or corrected during a particular practice and/or game. In the “what” section, suggestions were made to the players on how they could make their imagery use more effective. The players were encouraged to incorporate all their senses when imaging, especially visual and kinesthetic, and to image playing basketball in both practice and game settings. Members of the experimental group were given a copy of the imagery intervention (see appendix E) and asked to practice this twice for 15-20 minutes during intervening week. Participants received no compensation for taking part in the study. All participants were thanked taking part.
Time 2

Hurling Group

The 12 participants then converged on the field from training to complete the free taking exercise from training. Players were asked to remain in the same pair as the previous week for consistency. One completed the task and one marked the scorecard. Each participant took a total of 12 frees, 45 meter pucks from left (4), right (4) and centre (4) field taking approximately 30 minutes. Weather conditions included temperature: 4.5 degrees; no rainfall, pressure: 998 miles per hour; wind speed 17 miles per hour; north northwest direction 330 degrees. Hurlers pucking the ball against a strong wind. The control group (n=6) then returned to normal training while the experimental group (n=6) returned to the dressing room to receive the imagery intervention as outlined in Time 1 above. This took approximately 25 minutes and the participants again were asked to practice the imagery exercise twice throughout the following week. No questionnaires were completed at time 2. All participants were thanked for completing the study. All participants were thanked for completing the study.

Golf Group

Golfers converged on the practice green in Rathdowney golf course. They were again paired up where one completed the task and one marked the scorecard. Each participant took a total of 12 putts, 4 left, 4 right, 4 back, 4 front taking approximately 20 minutes in total. The control group then left the club while the experimental group returned to the club house to receive the imagery intervention again which took approximately 25 minutes as outlined in
Time 1 above. The participants again were asked to practice the imagery exercise twice throughout the following week. No questionnaires were completed at time 2. All participants were thanked for completing the study. Weather conditions included temperature: 4 degrees; no rainfall, pressure: 1010.0 miles per hour; wind speed 8 miles per hour; wind west northwest direction 300 degrees. Wind factors of no impact to putting task.
**Time 3**

**Hurling Group**

The 12 participants then converged on the field to complete the free taking exercise from training. Players were paired up where one completed the task and one marked the scorecard. Each participant took a total of 12 frees, 45 meter pucks from left (4), right (4) and centre (4) field taking approximately 30 minutes. Weather conditions included temperature: 1.5 degrees; no rainfall, pressure: 1033 miles per hour; wind speed 3 miles per hour; south southeast direction 150 degrees. Hurlers pucking the ball against slight breeze. Both groups then returned to the dressing room and completed the Self-Efficacy and the SIAQ questionnaire taking approximately 20 minutes. No imagery intervention was administered at time 3. All participants were thanked for completing the study.

**Golf Group**

Golfers converged on the practice green in Rathdowney golf course. They were again paired up where one completed the task and one marked the scorecard. Each participant took a total of 12 putts, 4 left, 4 right, 4 back, 4 front taking approximately 20 minutes in total. Both groups then returned to the dressing room and completed the Self-Efficacy and the SIAQ questionnaire taking approximately 20 minutes. No imagery intervention was administered at time 3. All participants were thanked for completing the study. Weather conditions included temperature: 5.2 degrees; no rainfall, pressure: 1021.5 miles per hour; wind speed 4 miles per hour; wind east southeast direction 110 degrees. Wind factors of no impact to putting task.
Results

A mixed measures ANOVA, using the Greenhouse-Geisser correction, showed that the mental imagery for all the groups differed significantly between the three times (F(2,46= 4.167, p<0.001, \( \eta^2_p = .29 \)). As a result, 29% of variation in scores can be explained by the differing time. More specifically, pairwise comparisons highlighted that mental imagery scores was significantly lower at time 2 compared to time 1 (mean difference = 1.30, p = .009, CI (95%) .284 – 2.32) and time 3 (mean difference = 2.20, p = .004, CI (95%) 0.652 – 3.75) but there was no significant difference between time1 and time3. There was no interaction effect for time and group (F(2,46= 1.029, p=.365, \( \eta^2_p = .43 \)).

*Fig1 shows an interaction between time and group.*
Mixed Measures ANOVA comparing scores on time1, time2 and time3 between golf and hurling for control and experimental groups showed that there was an interaction between time and group (control & experiment) in golf (F(2,22= 3.46, p=.49, $\eta^2_p=.239$). However, there was no interaction effect for hurling (F(2,22=.289, p=.752, $\eta^2_p=.28$).

The analyses revealed that mental imagery at time 1, time2 and time3 differed significantly for hurling (F(2,22= 19.46, p<.001, $\eta^2_p=.661$). As a result 66% of the variation in scores for hurling can be explained by the differing time. Pairwise comparison shows that Time 2 was significantly lower than time 1 (mean difference = -1.835, p = .008, CI (95%) .515-3.152) and Time 3 (Mean difference = -4.167, P < .001, -6.338—1.996). Pairwise Comparison also highlighted that Time 1 was significantly lower than Time 3 (Mean difference = -2.33, p = .033, CI (95%) -4.483-.183).

The result highlighted that mental imagery at Time 1, Time 2 and Time 3 does not differ significantly for Golf (F(2,22)=1.391, p = .270).
Table 1: Mixed Measure ANOVA displaying the differences in Performance Scores over Time by Sport Groups.

<table>
<thead>
<tr>
<th>Sport</th>
<th>Source</th>
<th>Type III</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurling</td>
<td>Time</td>
<td>Sphericity Assumed</td>
<td>104.667</td>
<td>2</td>
<td>52.333</td>
<td>19.46</td>
<td>.000</td>
<td>.661</td>
</tr>
<tr>
<td></td>
<td>Time * Group Assumed</td>
<td>1.556</td>
<td>2</td>
<td>.778</td>
<td>.289</td>
<td>.752</td>
<td>.028</td>
<td>.112</td>
</tr>
<tr>
<td>Golf</td>
<td>Time</td>
<td>Sphericity Assumed</td>
<td>4.888</td>
<td>2</td>
<td>2.444</td>
<td>1.391</td>
<td>.270</td>
<td>.112</td>
</tr>
<tr>
<td></td>
<td>Time * Group Assumed</td>
<td>12.170</td>
<td>2</td>
<td>6.085</td>
<td>3.463</td>
<td>.049</td>
<td>.239</td>
<td></td>
</tr>
</tbody>
</table>
Paired Samples T-Test

The mean score for the experimental group in Hurling at Time1 was 5.1 (SD=2.56), however the Hurling at Time3 was scores mean was slightly higher at 7.8 (SD = 3.43). The 95% confidence limits show that the population mean difference of the variables at Time1 lies somewhere between -5.53 and 0.20. Even though these mean scores differed slightly, however, a paired sample t-test showed that there was no significant difference between Hurling scores at Time1 and Hurling Scores at Time 2 (t(5) = -2.39, p = .062).

The mean score for the control group in Hurling at Time1 was 3.3 (SD=1.21), however the Hurling at Time3 was scores mean was slightly higher at 5.3 (SD = 1.86). The 95% confidence limits shows that the population mean difference of the variables at Time1 lies somewhere between -4.57 and 0.57. Even though these mean scores differed slightly, however, a paired sample t-test showed that there was no significant difference between Hurling scores at Time1 and Hurling Scores at Time 2 (t(5) = -2.00, p = .102).

The mean score for the experimental group in Golf at Time1 was 3.0 (SD=1.82), however the Golf at Time3 was scores mean was slightly higher at 3.5 (SD = 1.27). The 95% confidence limits show that the population mean difference of the variables at Time1 lies somewhere between -1.96 and 0.82. Even though these mean scores differed slightly, however, a paired sample t-test showed that there was no significant difference between Golf scores at Time1 and Golf Scores at Time 2 (t(6) = -1.0, p = .356).
The mean score for the control group in Golf at Time1 was 4.6 (SD=1.96), however the Golf at Time3 was scores mean was slightly lower at 3.1 (SD = 1.60). The 95% confidence limits show that the population mean difference of the variables at Time1 lies somewhere between -0.22 and 3.22. Even though these mean scores differed slightly, however, a paired sample t-test showed that there was no significant difference between Golf scores at Time1 and Golf Scores at Time 2 (t(5) = 2.236, p = .076).
Table 2: Paired Sample Test displaying a comparison of Scores between Time1 & Time3.

<table>
<thead>
<tr>
<th>What sport do you participate in?</th>
<th>Control or Experimental</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurling</td>
<td>Experimental Pair 1</td>
<td>5.167</td>
<td>6</td>
<td>2.56255</td>
<td>1.04616</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.833</td>
<td>6</td>
<td>3.43026</td>
<td>1.40040</td>
</tr>
<tr>
<td></td>
<td>Control Pair 1</td>
<td>3.333</td>
<td>6</td>
<td>1.21106</td>
<td>.49441</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.333</td>
<td>6</td>
<td>1.86190</td>
<td>.76012</td>
</tr>
<tr>
<td>Golf</td>
<td>Experimental Pair 1</td>
<td>3.000</td>
<td>7</td>
<td>1.82574</td>
<td>.69007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.571</td>
<td>7</td>
<td>1.27242</td>
<td>.48093</td>
</tr>
<tr>
<td></td>
<td>Control Pair 1</td>
<td>4.667</td>
<td>6</td>
<td>1.96638</td>
<td>.80277</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.166</td>
<td>6</td>
<td>1.60208</td>
<td>.65405</td>
</tr>
</tbody>
</table>
There was a moderate statistically significant positive relationship between Self Efficacy at Time 1 and Sports Imagery Ability at Time 3 ($r(25)= .451, p = .024$) and the result of the pearsons correlation coefficient analysis also shows that there was a moderate statistically significant positive relationship between Self Efficacy at Time 3 and Sports Imagery Ability at Time 3 ($r(25)= .525, p < .05$). Therefore the null hypothesis that there will be no statistically significant relationship between Self-Efficacy and Sports Imagery Ability was rejected.
Table 3: Correlations displaying total Self-Efficacy & Imagery Ability over Time.

<table>
<thead>
<tr>
<th></th>
<th>Self-Efficacy</th>
<th>Imagery Ability</th>
<th>Self-Efficacy</th>
<th>Imagery Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time1</td>
<td>Time1</td>
<td>Time3</td>
<td>Time3</td>
</tr>
<tr>
<td>TotalSEQT1</td>
<td>Pearson</td>
<td>1</td>
<td>.329</td>
<td>.819**</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.108</td>
<td>.000</td>
<td>.024</td>
</tr>
<tr>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>TotalSIAQT1</td>
<td>Pearson</td>
<td>.329</td>
<td>1</td>
<td>.281</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.108</td>
<td>.174</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>TotalSEQT3</td>
<td>Pearson</td>
<td>.819**</td>
<td>.281</td>
<td>1</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
<td>.174</td>
<td>.007</td>
</tr>
<tr>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>TotalSIAQT3</td>
<td>Pearson</td>
<td>.451*</td>
<td>.769**</td>
<td>.525**</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.024</td>
<td>.000</td>
<td>.007</td>
</tr>
<tr>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

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

*. Correlation is significant at the 0.05 level (2-tailed).
A repeated measures ANOVA investigated any differences in ease of imaging across SIAQ subscales. Mauchly's test of Sphericity was examined to investigate the equality of the within-subject factor (SIAQ subscales). The data passed this assumption (p < .05) and the results revealed significant differences in ease of imaging between the imagery content measured by the SIAQ, $F(4, 92) = 8.023, p < .001, \eta^2 = .259$, observed power = 100%. Post hoc analysis revealed that participants found it significantly easier to image affect images ($M = 15.88, SD = 3.31, p = .030$) compared to skill images ($M = 5.16, SD = .96$), strategy images ($M = 13.48, SD = 3.6, p = .04$) and goal images ($M = 12.46, SD = 4.2, p = .002$). However, there was no significant difference in the ease of imaging among Skill Image, Strategy Image, Goal Image and Mastery images.

![Time 3 Imagery Ability & Subscales](image)

Fig 2 shows significant differences in ease of imaging between imagery content. Both groups scoring high on Affect Imaging.
A one-way analysis of variance showed that participants with higher scores across the three time points had significantly higher level of self-efficacy and those who had low scores had lower levels of self-efficacy ($F(1,23)=11.689, p=.002$).

Table 4: ANOVA displaying the Mean of Self-efficacy between Hurling & Golf.

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>123.307</td>
<td>1</td>
<td>123.307</td>
<td>11.689</td>
<td>.002</td>
</tr>
<tr>
<td>Within Groups</td>
<td>242.633</td>
<td>23</td>
<td>10.549</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>365.940</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Main Analyses

The main analyses determined that while there was significant difference across times it cannot be attributed to the mental imagery invention as there was no significant difference between control and experiment groups. No significant difference was revealed between time1 and time3. Firstly, a mixed-design ANOVA, comparing scores on time1, time2 and time3 between golf and hurling for control and experimental groups showed that there was interaction between time and group (control & experiment) in golf (F(2,22) = 3.46, p= 0.49). For these analyses, the experimental group served as the between groups independent variable and time as the within-groups independent variable. The data was collapsed across the three time points to show the overall findings. Means and standard deviations are presented in Table 3 for all three time points according to group. There was an interaction between time and group (control & experiment) in golf (F(2,22) = 3.46, p= 0.49). There was no interaction effect for hurling (F(2,22) =.289, p=.752. There was an interaction between Self Efficacy at Time 1 and Sports Imagery Ability at Time 3 (r(25)= .451, p = .024) and between Self Efficacy at Time 3 and Sports Imagery Ability at Time 3 (r(25)= .525, p < .05. There was no main significant difference among self-efficacy beliefs between the two groups, F(2,22) = 2.21, p = 0.15).
Discussion

Summary of Results

The primary purpose of this study was to examine the effect of a cognitive-specific (CS) imagery intervention on amateur sports, a free taking exercise in hurling in a training environment and a putting task in golf a purpose specific setting. Although scores for hurling showed a significant difference between Time1, Time2 and Time3 this cannot be attributed to the mental imagery intervention on two counts. Firstly both control and experimental group’s scores differed over the three time points. Secondly, hurling is a game in which the weather conditions play a pivotal role. A gale force wind affected the hurler’s free taking ability at Time 2. It further investigated the relationship between self-efficacy and sports imagery ability. A significant relationship was found between those who scored highly on the imagery ability questionnaire and those scored highly on the free-taking and putting tasks. Analysis found partial supports for link between self-efficacy and imagery ability with a positive relationship between self-efficacy at Time1 and imagery ability at Time3. A secondary aim of the research was to identify if there would be a difference in self-efficacy beliefs between those who participated in team sports or individual sport. No significant difference was found to support this claim.

The imagery intervention did not enhance the performance of either experimental groups regardless of being involved in training (hurling) or the contrived environment (golf). One reason for this may be that mental skills take time and effort to learn. None of the participants had used imagery scripts prior to this study. Secondly as mental practice requires considerable concentration it can be tiring. Thirdly most athletes are able to use imagery to some degree but the effectiveness of that imagery could have been enhanced with longer
practice, leading to more enhanced performance as found by Vealey and Greenleaf (2006).

Fourthly for imagery to be most effective, the function of imagery used should match the desired outcome (Martin, Moritz, & Hall, 1999) and a more individualised imagery script would strengthen the current study focusing solely on the specific skill being developed, free-taking in hurling and putting in golf. Fifthly given the time constraints of this study an audio-version of the script could have been more advantageous as it is difficult to read of a piece of paper, memorise it and try to imagine it perfectly. It would also be more encouraging for participants and increase the likelihood that they practice the imagery scripts in between the intervention due to the convenience element.

As identified earlier this study has added to the much needed experimental research in investigating the casual effects CS imagery on self-efficacy in a training environment. Although results revealed no support for the impact of mental imagery on performance they did reveal a correlation between self-efficacy, imagery ability and those who had above average scores adding to current support that self-efficacy is a reliable predictor of sports performance. Furthermore there was no difference between the hurling and golf groups suggesting that being in a training environment or competitive environment has no impact in comparing CS imagery and self-efficacy. This finding also extends Hall et al (2009) results where no significance was found in the scores of recreational and varsity athletes. These results add to the current research on the self-efficacy function of CS imagery. However the small amount of research to date supporting this claim and the limitations of this study warrant further investigation to determine a valid conclusion.

One of the strengths of this study was the use of the SIAQ questionnaire. Little research to date has focused on imagery content and sports specific skills. Imagery ability has
recently become a key factor in the assessment and use of imagery intervention. Designed by Williams & Cummings (2011) it differs from other frequently used questionnaires such as the SIQ and MAIMS as it assesses sport-specific allowing for direct comparisons of different imagery content. Overall, the SIAQ demonstrates good factorial reliability, invariance across gender, and an ability to distinguish among athletes of different competitive levels. Only five published articles to date have used the SIAQ and as Cummings and Williams (2011) pointed out there was a need for further research to be carried out using this questionnaire as it is vital to the study of imagery and in particular imagery context (Williams, & Cumming, 2011).

Imagery ability is not limited to what individuals’ image, but how the imagine. An individual’s ability to image is a key factor in determining the effectiveness of imagery interventions and should not be overlooked. Not only does this point reinforce the need to measure imagery ability as part of screening procedures, but also encourages researchers to be mindful of matching the type of imagery ability measure to what the individual will image (Williams & Cumming, 2011, 2012a) and be more accurate in estimating the time spent imaging (Guillot & Collet, 2005; Guillot, et al., 2008). Findings from the current study reinforce this as results revealed that those who had high imagery ability scored higher on the free-taking and putting tasks suggesting that athletes who image more also find it more effective. This demonstrates partial support for advocating the use of imagery techniques. This has implications for coaches, athlete and sports psychologists in terms of application of imagery techniques and the types employed.

Although it cannot be directly attributes to imagery intervention it is noted that the hurling experiment group averaged higher scores (T1:5, T2:3, T3:7) overall than the control group (T1:3, T2:2, T3:5). Similarly the experimental group in golf remained consistent with scores averaging at T1:3, T2:3.5 & T3:3.5 while the control group deteriorated averaging
T1:5, T2:2, T3:3. Firstly, some of the participants scored relatively high during the baseline phase allowing not much room for improvement. Secondly, the present study was in a natural environment where players were used to performing therefore improvements may not be a quick. As Martin points out interventions with high-level performers may result in small percentage improvements, but such improvements may have significant performance outcome effects (social validity argument) (cf. Hrycaiko & Martin, 1996). Weaker experimental effects may be one of the consequences of conducting research in competitive sport settings with players who are familiar with the task at hand. It is also worthy to note that most imagery interventions are carried out on athletes who possess high imaging ability whereas the current study was completed on random sample regardless of imaging ability. At high levels of competition, relatively small performance improvements may have dramatic outcomes. By tailoring imagery interventions to individual needs, sport psychology consultants may be able to improve performance. The 2014 Hurling All-Ireland final ended in a draw after a missed free, the replay ended in a minimal three point victory. In this respect, increasing a players score by one point has vast implications for the overall outcome.

Along with understanding how athletes can use psychological skills, such as imagery, more effectively, there has also been the acknowledgement in the sport psychology literature for the need to learn and practice these skills (Harris & Harris, 1984; Weinberg & Williams, 2001). Weinberg and Williams (2001) have suggested that psychological skills are developed in a similar manner to physical skills in that positive effects occur after extensive practice and application. Furthermore, Hall (2001) has suggested that imagery for the rehearsal of skills (i.e., cognitive specific) should be treated in a similar fashion to physical practice. The hurling participants in the present study spent the majority of time in training, spending approximately 1.5 hours training and 25 minutes on mental practice equating to a ratio of
1:18. As the players were unaccustomed to mental imagery skills it is not surprising that the mental imagery script did not impact on the overall performance.

Research examining imagery use suggests that many athletes do not approach imagery practice in the same structured (i.e., plan duration and topics to be imaged) and regular (i.e., at a specific time each day) fashion that they approach physical practice (Barr & Hall, 1992; Hall, Rodgers, & Barr, 1990; Rodgers, Hall, & Buckolz, 1991). In a systematic comparison of imagery use across different sports, Hall et al. (1990) found that athletes varied their imagery use throughout the year, and imagery sessions were not always structured, regular or of the same duration. Elite athletes, however, reported more structured imagery sessions than their non-elite counterparts. Similarly, Cumming and Hall (2002a) found that non-elite athletes perceived imagery as being less relevant to their competitive performance and practiced imagery much less than more elite athletes. Rodgers et al. (1991) found that adolescent figure skaters did not structure their imagery practice as they would their physical practice, and failed to practice imagery on a regular basis. Furthermore, the skaters believed that imagery had some value, but they didn’t regard imagery as a skill worthy of practice on its own, or were unaware of how to best develop and use their imagery skills. Finally, Bull (1991) reported that athletes who chose not to participate in a psychological skills training program perceived these skills to be of little benefit to them.

Pertinent to the current study the amateur athletes involved may not regarded imagery practice as important and failed to practice the imagery scripts as instructed. Further studies should test player’s attitudes and beliefs towards imagery and its practice. This has importance implications for future in determining the overall effect of imagery interventions on performance particularly among amateur athletes. In addition, players could be shown how to incorporate imagery more effectively into their training programs, with the ultimate
goal being for them to use imagery in a more structured and regular fashion, maximizing their potential for performance benefits.

Even though the relationship between sporting imagery ability and cognitive imagery use was mediated by efficacy in using imagery, it is possible that the relationship between these variables is not that simple. Bandura (1997) has proposed that efficacy beliefs can be part of temporally recursive chains. Using the variables in the present study, an example of a temporally recursive chain would be where over time efficacy in using imagery leads to more imagery use, which, as time passes, leads to greater improvements in efficacy in using imagery, and so on. Based on what we know about the effect of imagery training programmes on imagery ability (Cumming & Ste-Marie 2001; Rodgers et al., 1991) which has been supported by the finding of the current study, it is likely that using imagery will also increase imagery ability scores. This sets the stage for additional intervention studies designed to examine if building an athlete’s efficacy in using imagery will facilitate the athlete’s imagery use and enhance imagery ability. Future researchers are encouraged to explore the interaction between efficacy in using imagery, imagery ability and imagery use.

Limitations

A limitation of the current study was the relatively short baseline period measured only once at Time 1 in both sports. Kazdin (1992) has suggested that the ABA design requires an assessment of stable baseline performance of the dependent variable or a trend in the opposite direction. I suggest that future studies use an extended baseline period, use a multiple baseline approach or alternatively select multiple performance indicators. In particular multiple performance indicators as frees in hurling and putts in golf are limited in both games and do not incorporate the other skills that contribute to performance. The
findings of this study may have limited application to other golf and hurling skills and situations, such as driver shots, iron shots, and performance on a real course in golf and striking ability, hand passing, catching, shot stopping and blocking in hurling. The fact that the present study only used one particular aspect of the player’s performance as a dependent variable might have contributed to this. Future studies might consider multiple aspects of both games performance as dependent variables. Future research should incorporate additional imagery training sessions into the study design in attempt to elicit more consistent dependent variable scores (e.g. Blair et al., 1993).

The nature of the experimental design did not allow for the development of personalised imagery scripts, which have been associated with improved imagery vividness (Wilson et al., 2010), adherence, enjoyment, and motivation, alongside continued use (Cumming & Ramsey, 2009). Future designing of imagery script creation and execution with PETTLEP principles (Holmes & Collins, 2001), for instance would be beneficial in improving the ecological validity of the study. Furthermore including using functionally equivalent imagery would be advantageous as it is evidenced to have more pronounced effects on subsequent sport performance (Wakefield et al., 2011).

From an applied perspective, imagery ability in sport is “one of the most important factors influencing imagery effectiveness” (Munroe-Chandler & Hall, 2007, p. 194). Given that various imagery abilities and self-efficacy were found to be related to higher scores, it would be prudent for practitioners to develop players self-efficacy which could lead to positive benefits including better regulation of arousal and anxiety to help athletes achieve their ideal performance state, maintaining mental toughness and enhanced feelings of being
in control. Of interest the SIAQ results revealed that Affect imagery was highest among the participants. Further research is warranted in this specific area of imagery as it suggests that emotional factors play a major role in imagery ability of most individuals. Future imagery interventions could be designed based on emotional factors as Affect imaging appears to be the most natural for individuals to imagine of the imagery subscales. Practitioners who use imagery with athletes should emphasize emotional components of imagery scripts as these appear to be salient to all imagery functions.

**Future Research**

Many imagery researchers have been interested in the relationship between efficacy and imagery in sport. It has been shown that there are individual differences in imagery ability and these differences could influence the frequency of use and effectiveness of imagery by athletes. Hall et al. (1992) stated that if low ability imagers are instructed to use an imagery strategy, it is possible that the imagery instructions will have little or no effect. High ability imagers, however, using the same instructions should be able to use imagery very effectively. The implications of this are clear: imagery is not considered to be a very effective performance enhancing strategy for those people who have low imagery abilities. In fact, in many recent imagery intervention studies, participants have been screened according to imagery ability scores: participants with low imagery ability have been excluded from participation (e.g. Short et al., 2004). This is an issue which should be rectified in future research as the positive effect of imagery on performance has been well documented to date (e.g. Driskell et al., 1994; Feltz & Landers, 1983).
In conclusion the present study found that the imagery intervention had no effect on performance. This can in part be explained by the limitations of the study itself, short baseline measurements, external factors and the overall relatively short duration of the study. However the findings demonstrate that imagery ability and self-efficacy have significant effects on sporting performance in comparison to imagery interventions. Specifically the findings suggest in order to be effective in improving psychological skills and performance measures, individual differences in imagery ability and self-efficacy beliefs have implications for designing imagery interventions. This evidence further highlights the importance of maximizing individual’s imagery ability when using imagery interventions to measure skill performance. This is particularly noteworthy for coaches and athletes who design and administer imagery training programmes especially in amateur sports where they tend not to consider imagery ability. Affect imagery could be more widely employed to complement imagery effectiveness. As Martin (1991) stated meaning of an image is paramount to the individual.
References


Wetterstrand (Eds.) Sport Psychology in the New Millennium Conference (pp. 11-18). Centre for Sport Science, Halmstad University, Sweden.


Appendix A (i): Information Sheet & Consent Form

Responsible Researcher: Mary Langton, undertaking a BA in Psychology at Dublin Business School.

1. You are being asked to participate in a research study on the mental aspects of free taking ability in hurling.

2. You are invited to take part in this study. The research will require three sessions and take approximately one hour per session over the course of 3 weeks starting on Saturday the 24th of January 2015. There will be 16 participants in total and you will be divided into two groups, Group A and Group B. Each of the 16 participants will be required to partake in a 10 meter putting exercise, taking a total of 12 frees and completing and returning the attached surveys. Group B will be randomly assigned to take part in a mental imagery exercise. The mental imagery exercise will take place after the free taking exercise and will take an additional 20-25 minutes.

3. One group will also be asked to practice mental imagery at least 2 times during each week.

4. There are no anticipated risks associated with participation in this study.

5. While there are no expected benefits associated with participation in this study, you may improve either free taking performance or imagery use, or both.

6. Although the results of this study may be published, no information that could identify you will be included. You will be referred to only by a code name of your choice.

7. The mental imagery exercise will be offered to group A on completion of the current study.

8. Questions about this research may be addressed to the researcher, Mary Langton marylangton00@hotmail.com or 087 2611563. My supervisor Jonathan Murphy can be contacted at jonathan.murphy@dbs.ie

9. Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. You have the right to not answer questions you do not wish to answer. If you decide to participate in the study, you are free to withdraw at any time without any negative.
10. After you receive and sign two consent forms, you will receive one for your records, signed and dated by the researcher, and the other to return to the researcher.

"I, have read the above statements, and by signing and dating my name above the researcher's name and date, I am giving my consent for the researcher to use my information for the benefit of the study."

Participant's Signature  Date
Researcher's Signature  Date

• The signature of a subject on this document indicates agreement to participate in the study.
• The signature of a researcher on this document indicates agreement to include the above named subject in the research and attestation that the subject has been fully informed of his or her rights.

If you wish to receive a summary of the findings of this research, please contact me after June 2015.

Thank you for taking the time to participate in this research
Appendix A (ii): Information Sheet & Consent Form

Responsible Researcher: Mary Langton, undertaking a BA in Psychology at Dublin Business School.

1. You are being asked to participate in a research study on the mental aspects of putting ability in golf.

2. You are invited to take part in this study. The research will require three sessions and take approximately one hour per session over the course of 3 weeks starting on Sunday the 25th of January 2015. There will be 16 participants in total and you will be divided into two groups, Group A and Group B. Each of the 16 participants will be required to partake in a 3 meter putting exercise, taking a total of 12 putts and completing and returning the attached surveys. Group B will be randomly assigned to take part in a mental imagery exercise. The mental imagery exercise will take place after the putting exercise and will take an additional 20-25 minutes.

3. One group will also be asked to practice mental imagery at least 2 times during each week.

4. There are no anticipated risks associated with participation in this study.

5. While there are no expected benefits associated with participation in this study, you may improve either putting performance or imagery use, or both.

6. Although the results of this study may be published, no information that could identify you will be included. You will be referred to only by a code name of your choice.

7. The mental imagery exercise will be offered to group A on completion of the current study.

8. Questions about this research may be addressed to the researcher, Mary Langton xxxx@hotmail.com or 087xxxxxx. My supervisor Jonathan Murphy can be contacted at xxxxx@dbs.ie

9. Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. You have the right to not answer questions you do not wish to answer. If you decide to participate in the study, you are free to withdraw at any time without any negative.
10. After you receive and sign two consent forms, you will receive one for your records, signed and dated by the researcher, and the other to return to the researcher.

"I, have read the above statements, and by signing and dating my name above the researcher’s name and date, I am giving my consent for the researcher to use my information for the benefit of the study."

Participant's Signature               Date
Researcher's Signature                Date

• The signature of a subject on this document indicates agreement to participate in the study.
• The signature of a researcher on this document indicates agreement to include the above named subject in the research and attestation that the subject has been fully informed of his or her rights.

If you wish to receive a summary of the findings of this research, please contact me after June 2015.

Thank you for taking the time to participate in this research
### Appendix B: Experimental Plan

Establish Baseline Scores | General Questionnaire | SIAQ | Self-Efficacy | Intervention
---|---|---|---|---
**Time 1**
Control Group | Yes | Yes | Yes | Yes | No
Experimental Group | Yes | Yes | Yes | Yes | Yes
**Time 2**
Control Group | No | No | No | No | No
Experimental Group | No | No | No | No | Yes
**Time 3**
Control Group | No | No | Yes | Yes | No
Experimental Group | No | No | Yes | Yes | No
Appendix C: Self-Efficacy Questionnaire

Please read the sentences below and select an answer for each statement which indicates how much the statement applies to yourself.

1 = Not at all true  2 = Hardly true  3 = Moderately true  4 = Exactly true

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I could participate in several types of exercise if I wanted to.</td>
</tr>
<tr>
<td>2</td>
<td>I hold up well under stress.</td>
</tr>
<tr>
<td>3</td>
<td>I feel in control when I take tests involving physical activity.</td>
</tr>
<tr>
<td>4</td>
<td>I take pride in my sporting ability.</td>
</tr>
<tr>
<td>5</td>
<td>I am concerned with the impression my physique makes on others.</td>
</tr>
<tr>
<td>6</td>
<td>I am confident of my athletic ability.</td>
</tr>
<tr>
<td>7</td>
<td>I don’t let things get in the way of my exercise/sport.</td>
</tr>
<tr>
<td>8</td>
<td>I have excellent reflexes.</td>
</tr>
<tr>
<td>9</td>
<td>I would be very irritated if something prevented me from participating in a session of exercise I had planned to.</td>
</tr>
<tr>
<td>10</td>
<td>I feel uncomfortable shaking hands because my hands are clammy.</td>
</tr>
</tbody>
</table>
Scoring

Add the scores together from all 10 items. The higher the total the greater the person’s generalized sense of self-efficacy.

References


Further Reading

http://userpage.fu-berlin.de/~health/selfscal.htm (author’s webpage for GSES)

http://www.ralfschwarzer.de/ (additional self-efficacy scales from author)
Appendix D: Sports Imagery Ability Questionnaire (SIAQ)

Sport Imagery Ability Questionnaire

The purpose of this questionnaire is to obtain information about your ability to generate a number of images athletes use in relation to their sport.

For each item, bring the image to your mind with your eyes CLOSED. Then rate how easy it is for you to form this image (1 = very hard, 4 = not easy or hard to 7 = very easy). Circle the appropriate rating based on the scale provided. For example, some athletes may find imaging themselves kicking a football neither easy nor hard and therefore select 4.

Ease of imaging scale

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not at all</td>
<td>Hard to image</td>
<td>Somewhat hard to image</td>
<td>Neutral (not easy nor hard)</td>
<td>Somewhat easy to image</td>
<td>Easy to image</td>
<td>Very easy to image</td>
</tr>
</tbody>
</table>

Please be as accurate as possible and take as long as you feel necessary to arrive at the proper ratings for each image. There are no right or wrong answers, because we are simply interested in your response. Only move on to the next item when you have completed both ratings.
In relation to your sport, how easy is it for you to image the following…

<table>
<thead>
<tr>
<th></th>
<th>Very hard to image</th>
<th>Hard to image</th>
<th>Somewhat hard to image</th>
<th>Neutral (not easy or hard)</th>
<th>Somewhat easy to image</th>
<th>Easy to image</th>
<th>Very easy to image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Making up new plans/strategies in my head.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2. Giving 100% effort even when things are not going well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3. Refining a particular skill.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4. The positive emotions I feel while doing my sport.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5. Myself winning a medal</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>6. Alternative plans/strategies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7. The anticipation and excitement associated with my sport.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8. Improving a particular skill.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>9. Being interviewed as a champion.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>10. Staying positive after a setback.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>11. The excitement associated with performing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>12. Making corrections to physical skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>13. Creating a new event/game plan.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>14. Myself winning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>15. Remaining confident in a difficult situation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

When experiencing the above images, did you generally see yourself from an **outside view** (i.e., from a 3rd person perspective, as if watching yourself on video tape) or from an **inside view** (i.e., from a 1st person perspective, as if you are actually inside yourself performing and seeing the action through your own eyes)? Please circle the appropriate response between 1 and 7.
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Always inside</strong></td>
<td>Mostly inside, sometimes outside</td>
<td>Half &amp; Half</td>
<td>Mostly outside, sometimes inside</td>
<td>Always outside</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank You!
SIAQ Items

Unlike most imagery ability questionnaires which assess the ability to image various actions and movements, the Sport Imagery Ability Questionnaire aims to assess imagery ability of various sport specific images athletes often use.

*The subscales are:*

**Skill Images: images include performing specific sport skills**
- Refining a particular skill (3)
- Improving a particular skill (8)
- Making corrections to physical skills (12)

**Strategy Images: images include game plans, strategies and routines (often a combination of a number of skills)**
- Making up new plans/strategies in my head (1)
- Alternative plans/strategies (6)
- Creating a new event/game plan (13)

**Goal Images: images include specific goals and outcomes reflecting sporting achievements and success**
- Myself winning a medal (5)
- Being interviewed as a champion (9)
- Myself winning (14)

**Affect Images: images include the feelings and emotions associated with sport**
- The positive emotions I feel while doing my sport (4)
- The anticipation and excitement associated with my sport (7)
- The excitement associated with performing (11)
Mastery Images: images include remaining in the correct frame of mind when in the face of adversity

- Giving 100% effort even when things are not going well (2)
- Staying positive after a setback (10)
- Remaining confidence in a difficult situation (15)

Reference:

Appendix E: Demographic Questions

Please tick the appropriate Boxes √

1. Gender
   Male
   Female

2. Age: ____

3. Nationality:
   Irish
   Other

   Please Specify ______________

4. What Sport That You Primarily Participate In?
   Hurling
   Golf
   Athletics
   Soccer
   Football
   Swimming
   Other
5. What position/event do you primarily participate in? (for example, forward in hurling, 200m in on track, etc)

___________________________________________________________

6. How often do you participate in training in your Primary Sport?

Weekly:

☐ Once ☐ Twice ☐ 2-5 ☐ 5 or more

Monthly:

☐ Once ☐ Twice ☐ 2 ☐

Thank you for taking the time to participate in this study
Appendix F: Imagery Intervention (Handout for Athletes)

**Review:** 3 Types of Goals: Process, Performance, Outcome

- We have control over process and performance goals.
- As you accomplish goals, what will build? Self-Confidence
- Tell me if this is an example of a process, performance or outcome goal:
  - 5 minutes per day working on ball control  Process
  - Being able to sprint back from the 50 when the opposing team is taking a penalty on your defense  Performance
  - Beating an opponent to the ball  Outcome

**Today: Imagery**

- What does imagery involve?
  - Using your sight, feel-how muscles feel as they move, touch, sound, smell and taste-to create or re-create an experience in your mind.
  - Through imagery, you bring to mind a previous experience.
  - You can also create an image of what you’d like to have happen.

- Who uses imagery?
  - S_____________ and highly skilled athletes.

- How does it work?
  - The mind cannot tell the difference between an image and the thing. So, when you image something, you can produce almost the same effect as if you actually experienced it.

- How effective is it? It can improve performance but some athletes benefit more than others based on:
  - Imagery ability: can you see a vivid (vs. blurry) image that you can control?
  - Imagery Perspective: internal vs external. Internal is when you experience the event seeing it through your own eyes and feeling the movements as if actually performing the skill. This is best when you are in the flow of play and events are changing. External imagery is good for when you are seeing the big picture- where teammates and opponents are.

- How can you use imagery effectively? How can it improve your performance?
  - P__________ the skills and strategies faithfully.
  - Work to create a clear, detailed, lifelike image that you can control.
  - R__________ and allow the image to flow.
  - If you lose focus, gently redirect attention back to the image.

- Using Imagery to Improve Mental Skills
  - Develop self-awareness, Improve self-confidence and motivation, Manage Stress, Manage Energy, Plan game strategies, Provide relaxation, Control emotions, Analyze performances, Practice other psychological skills

- What are the key concepts of imagery?
  - Sensory awareness, Vividness, Control

- What personal imagery skills do I already have?

---

**Evaluating Imagery Ability**

Read the descriptions of four general sport situations. After you read each general description, think of a specific example of it—the skill, the people involved, the place, and the time. Close your eyes and take a few deep breaths to become as relaxed as you can. Put aside all other thoughts. Keep your eyes closed for about one minute as you try to imagine the situation. If you have distracting thoughts, gently redirect your attention to the scene you are imagining.

There are no right or wrong images. Your accurate evaluation of your images will help you to determine what skills you need to focus on in the development of your imagery-training program.

After imaging the situation, rate the following imagery dimensions by circling the appropriate number.

- Visual
- Auditory
- Kinesthetic
- Mood and emotion
- Control

**Situation 1:** Select a specific skill or activity in your sport. Imagine yourself performing the activity in the place where you would normally practice, without anyone else present. Now close your eyes for about one minute and try to see yourself at this place, hear the sounds, feel the body movements and be aware of your mood.

<table>
<thead>
<tr>
<th>Very poorly</th>
<th>Very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

a. Rate how well you saw yourself performing the activity
b. Rate how well you heard the sounds of performing the activity
c. Rate how well you were able to feel yourself performing the activity
d. Rate how well you were aware of your mood and emotions.
e. Rate how well you were able to control your image.

**Situation 2:** You are performing the same activity but are now practicing the skill with the coach and your teammates present. This time, however, you make a mistake that everyone notices, but you remain calm, recover quickly, correct your mistake, and perform well. Now close your eyes for about one minute and imagine making the error, correcting it, and performing well as clearly as possible.

<table>
<thead>
<tr>
<th>Very poorly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very well</td>
</tr>
</tbody>
</table>

Very well
a. Rate how well you saw yourself performing the activity | 1 | 2 | 3 | 4 | 5  
b. Rate how well you heard the sounds of performing the activity | 1 | 2 | 3 | 4 | 5  
c. Rate how well you were able to feel yourself performing the activity | 1 | 2 | 3 | 4 | 5  
d. Rate how well you were aware of your mood and emotions. | 1 | 2 | 3 | 4 | 5  
e. Rate how well you were able to control your image. | 1 | 2 | 3 | 4 | 5

**Situation 3:** Think of a teammate performing a specific activity successfully in a contest—for example, making a goal or stopping a goal. Now close your eyes for about one minute to image watching your teammate performing this activity successfully in a critical part of the contest as vividly and realistically as possible.

<table>
<thead>
<tr>
<th>Very poorly</th>
<th>Very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Rate how well you saw your teammate performing the activity</td>
<td>1</td>
</tr>
<tr>
<td>b. Rate how well you heard the sounds of your teammate performing the activity</td>
<td>1</td>
</tr>
<tr>
<td>c. Rate how well you felt your own physical presence in this situation</td>
<td>1</td>
</tr>
<tr>
<td>d. Rate how well you were aware of your mood and emotions.</td>
<td>1</td>
</tr>
<tr>
<td>e. Rate how well you were able to control your image.</td>
<td>1</td>
</tr>
</tbody>
</table>

**Situation 4:** Imagine yourself performing the same or a similar activity in a contest, but imagine yourself performing very skillfully, Spectators and teammates show their appreciation. Now close your eyes for about one minute to imagine the situation as vividly as possible.

<table>
<thead>
<tr>
<th>Very poorly</th>
<th>Very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Rate how well you saw yourself performing the activity</td>
<td>1</td>
</tr>
<tr>
<td>b. Rate how well you heard the sounds of performing the activity</td>
<td>1</td>
</tr>
<tr>
<td>c. Rate how well you were able to feel yourself performing the activity</td>
<td>1</td>
</tr>
<tr>
<td>d. Rate how well you were aware of your mood and emotions.</td>
<td>1</td>
</tr>
<tr>
<td>e. Rate how well you were able to control your image.</td>
<td>1</td>
</tr>
</tbody>
</table>
Now add up your responses to each question and write your scores in the spaces that follow:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual (all “a” items)</td>
<td></td>
</tr>
<tr>
<td>Auditory (all “b” items)</td>
<td></td>
</tr>
<tr>
<td>Kinesthetic (all “c” items)</td>
<td></td>
</tr>
<tr>
<td>Mood (all “d” items)</td>
<td></td>
</tr>
<tr>
<td>Control (all “e” items)</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

Compare your scores for each dimension to the following skill categories:

<table>
<thead>
<tr>
<th>Score</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20</td>
<td>Good skills. Periodically do an exercise to keep yourself sharp.</td>
</tr>
<tr>
<td>13-17</td>
<td>Average development of skills. Spend time each week improving these skills</td>
</tr>
<tr>
<td>0-12</td>
<td>These dimensions need daily attention to bring your imagery skills to a useful level.</td>
</tr>
</tbody>
</table>

A calm place for me is: __________________________________________.

Imagery scenario: Pick one.

- **Forward**: Drive ball to goal, keeper deflects it, you are following your shot, pick up the deflection on your stick and put ball in cage.
- **Mid-Fielder**: Cut into a space and collect a pass from a teammate. You lift the ball over your defender’s stick and pass the ball through into a space where your teammate is cutting into.
- **Defender**: Running back on defense. Get ball side and stick side of player you’re marking. Pass comes but you cut onto it (intercept it) and take it wide where you pass it into a space where the mid-fielder is cutting into.
- **Goalie**: Forward is dribbling toward you on a breakaway. Forward shoots. You stop the ball and clear it into a space where your teammate is cutting into. You check and adjust your position according to where the cage is and where the ball is.
Appendix G: Imagery Intervention (Handout for Coach/Researcher)

Coach’s Script for: Psychological Skills Training: Imagery

*Bring to practice:* coach’s script, a copy of the athlete’s practice plan for each athlete (follows the coach’s script), pencils or pens, chalk or dry erase markers

**Review:**

Three Types of Goals:

- **Process Goals:** focus on improving form, technique, and strategy.
- **Performance Goals:** address overall personal performance such as running without tiring and so not needing to come out of a game, getting by an opponent more consistently or shooting or clearing the ball more accurately.
- **Outcome Goals:** emphasize outperforming other competitors, as well as the objective outcome - that is winning.

We have control over process and performance goals.

As you accomplish goals, what will build? **Self-Confidence**.

Tell me if this is an example of a process, performance or outcome goal (*coach- replace with your sport*):

a. 5 minutes per day working on ball control **process**

b. being able to sprint back from the 50 when the opposing team is taking a penalty corner on your defense **performance**

c. beating an opponent to the ball **outcome**

**Today:** We are going to work on Imagery (Education, Acquisition, Implementation Phases)
Imagery isn’t new to you. As a young child probably all of you “pretended”. Ex. Pirate, flying in the air, having a tea party, fighting a dragon (ask athletes for examples). You could see it in your mind, hear what was going on, smell and taste and feel what you were imaging.

In sport imagery is used to learn new skills, practice known skills, correct skills, play through strategies, with relaxation and energization, in self-talk, in stress management and in goal setting. Imagery involves all five senses. When you image something, you can produce almost the same effect as if you’d actually experienced it.

Education Phase: Introduce imagery and evaluate athletes’ strengths and weaknesses in creating vivid and controlled images that incorporate all the senses.

- What does imagery involve?
  - Using your senses (sight, feel- how muscles feel as they move, touch, sound, smell and taste) to create or re-create an experience in your mind.
  - Imaging a sport skill is similar to performing the skill, except you experience the action only in your mind.
  - Though you don’t actually see a (coach- replace with your sport) ball, feel the stick in your hand or the sensation of your muscles moving or hear the sound of the stick hitting the ball, you do experience all these sensory cues in your mind.
  - Imagery is a product of what is already stored in your brain.
  - Through imagery, you bring to mind a previous experience. What did it feel like to score a goal….. stop a goal from scoring….. dodge past an opponent…..
  - You can also create an image of what you’d like to have happen.
  - You can imagine (coach- replace with your sport) taking the ball down the field past opponents based on what you already know about dodging and passing and cutting.

- Who uses imagery?
  - Successful and highly skilled athletes.
  - More than 9 out of 10 Olympic athletes use imagery an average of 4 days a week for 10-15 minutes a day.

- How does it work?
  - The mind creates a blueprint for performing a skill.
  - The mind cannot tell the difference between an image and the real thing. So, when you image something, you can produce almost the same effect as if you actually experienced it.
  - For example (coach- replace with your sport), if you image cutting, receiving a pass or cutting off a pass or a shot on goal, the mind now has the sequence of events ready for you to do. The more you image what might occur during a game and how you would respond, the more you can react during a game without hesitation, without thinking, because you have already seen it happen in your mind.
  - So, when you get on the field to do the physical skill, the mental blueprint is already there to help make the skill automatic…. You don’t have to think about it.

- How effective is it? It can improve performance but some athletes benefit more than others based on:
- Imagery ability: can you see a vivid (vs. blurry) image that you can control? Otherwise you may just repeat mistakes as you try to image.
- Imagery Perspective: internal vs. external. Internal is when you experience the event seeing it through your own eyes and feeling the movements as if actually performing the skill. This is best for (coach-replace with your sport) field hockey players when you are in the flow of play and events are changing. External imagery is good for when you are seeing the big picture- where teammates are on the field and where the opponent is.
  - How can I use imagery effectively? How can it improve my performance?
    - Practice the skills and strategies faithfully.
    - Work to create a clear, detailed, lifelike image that can control be controlled.
    - Relax and allow the image to flow.
    - If you lose focus, gently redirect attention back to the image.
  - Using Imagery to Improve Mental Skills
    - Develop self-awareness: recall a time when you played very well, when concentration was automatic and events flowed easily, when self-doubt was nonexistent. Think about these feelings and use the images you had then to create the feeling you want as you enter competition. For example, were you calm, cool even when made a mistake. Also recall a time when you got anxious or angry. Was it an official’s call or a being pushed by an opponent? You can imagine that occurring and then imagine remaining focused and performing well by using self-talk to focus on the task at hand.
    - Improve self-confidence and motivation: imagine playing in front of cheering fans or replay outstanding performances or reaching a goal.
    - Manage Stress: image things that could go wrong and what you will then do.
    - Manage Energy: to manage getting too psyched up to the proper level, see self in a place you associate with calmness and tranquility. To manage being flat or fatigued, get an image that is energizing like starting up your energy shoes or seeing yourself running effortlessly on the field.
    - Improve focus and concentration:
      - Plan game strategies
      - Provide relaxation
      - Control emotions
      - Analyze performances
      - Practice other psychological skills
  - What are the key concepts of imagery?
    - Sensory awareness, Vividness, Control
  - What personal imagery skills do I already have?
Appendix H (i): Weather Station Data - From 24/01/15 – Hurling Time1
Appendix H (ii): Weather Station Data - 25/01/15 – Golf Time1
Appendix H (iii): Weather Station Data – 31/01/15 – Hurling Time2

HOURLY VALUES (UTC) 31 Jan 2015 Oak Park

Temperatures (deg C)

Rainfall (mm)

MSL Pressure (hPa)

10-min Wind Speeds (kt)

Wind Directions (deg)
Appendix H (iv): Weather Station Data – 01/02/15 – Golf Time2
Appendix H (v): Weather Station Data – 10/02/15 – Hurling Time3

HOURLY VALUES (UTC) 10Feb2015 Oak Park

Temperatures (deg C)

Rainfall (mm)

MSL Pressure (hpa)

10-min Wind Speeds (kt)

Wind Directions (deg)
Appendix H (vi): Weather Station Data – 11/02/14 – Golf Time3

HOURLY VALUES (UTC) 11Feb2015 Oak Park

- Temperatures (deg C)
- Rainfall (mm)
- MSL Pressure (hPa)
- 10-min Wind Speeds (kt)
- Wind Directions (deg)