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Influence of sex and sport skill type on imagery use among division III athletes 2015

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Influence of Sex and Sport Skill Type on Imagery Use among Division III Athletes

by

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ABSTRACT

There is limited research revealing the underlying trends and influences of imagery use in sports. The purpose of this study was to investigate the frequency of imagery use among National Collegiate Athletic Association (NCAA) Division III collegiate athletes. Additionally, the influence of athlete sex and sport skill type was examined. A sample of 337 athletes from 15 different sports participated in the study. The Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblaus, 1998) was administered to assess the frequency of imagery use between males and females as well as between open-skill sport (e.g., basketball, hockey, etc) and closed-skill sport athletes (e.g., golf, track, etc). Multiple regression analyses indicated that male athletes as well as open-skill sport athletes use imagery more frequently than female athletes and closed-skill sport athletes, respectively. However, the low amount of variation explained by the data makes it hard to produce definitive predictions. It is likely that individual differences, such as efficacy and ability, play a larger role in predicting imagery use in sport.

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Introduction

Background

Athletes are persistently looking for ways to gain a competitive edge over their competitors. As coaches and athletes seem more receptive to incorporating mental training techniques, the field of sport psychology needs to make a push in applied research for more professional development (Williams & Krane, 2015). Theories, methods, and techniques applied from cognitive psychology have been shown to improve performance in sport (Whelan, Mahoney, & Meyers, 1991). In particular, mental imagery is one of the most popular techniques used in sport because of its ability to improve attention, aid in motor skill learning, help control arousal levels, direct motivation, and increase confidence (see reviews: Cumming & Ramsey, 2008; Martin, Moritz, & Hall, 1999; Weinberg, 2008).

A relationship between an athlete's competitive level and their imagery use is apparent. While there are consistent findings that athletes at higher competitive levels use imagery more often (Cumming & Hall, 2002; Hall, Rogers, & Barr, 1990; Jones & Stuth, 1997), research also supports the notion that athletes who practice imagery more often find it more beneficial and easier to use (Nordin & Cumming, 2008; Vadocz, Hall, & Moritz, 1997). Moreover, imagery use has applications in a variety of situations; it is reported frequently in both training and competitive situations (Hall, Rogers, & Barr, 1990; Munroe, Giacobbi, Hall, & Weinberg, 2000) as well as in rehabilitation from injury (Jones & Stuth, 1997), during the off-season (Cumming & Hall, 2002) and in non-sport situations such as at home or in school (Salmon, Hall, & Haslam, 1994). However, even with such an extensive background of research, there is a greater need for investigations that will improve imagery interventions practiced today.

The development of the Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblaus, 1998) has been a pivotal instrument in creating a general understanding of how and why athletes use imagery (see reviews: Cumming & Ramsey, 2008; Hall, Stevens, & Paivio, 2005; Munroe et al., 2000; Short, Steward, & Monsma, 2006). The SIQ categorizes sport imagery use based on the two main functions of imagery presented by Paivio (1985): (a) motivational and (b) cognitive. Hall et al., (1998) further operationalized these functions into five types of imagery: (1) Motivational-Specific (MS), (2) Motivational General-Mastery (MGM), (3) Motivational General-Arousal (MGA), (4) Cognitive Specific (CS), and (5) Cognitive General (CG). Using the SIQ provides researchers with a measure of the extent that each type of imagery is used within a specific population. Kizildag and Tiryaki (2012) acknowledged that there are patterns of imagery use and that further investigation is required in order to reveal these relationships. By improving our understanding of the underlying effects of imagery on athletic performance, sport psychologists can better provide athletes with more effective imagery interventions.

Statement of the Problem

There is limited agreement amongst researchers pertaining to how athletes functionally use imagery. While there are trends of imagery use among athletes, individual differences make it difficult to identify underlying patterns across sports (Kizildag & Tiryaki, 2012). Since the early 1990s a great deal of research on imagery use in sport has been focused around Paivio's (1985) model of the cognitive and motivational functions of imagery. Specifically, the development of the Sport Imagery Questionnaire (Hall et al., 1998) has led to numerous studies of the frequency of imagery use in sport (for a review see: Cumming & Ramsey, 2008; Short et al., 2006).

Nevertheless, this extensive research background still requires investigation into the core functions of imagery. Varying results reported in studies examining imagery use by skill level (Cumming & Hall, 2002; Hall et al., 1990), sport (Kizildag & Tiryaki, 2012; Weinberg, Butt, Knight, Burke, & Jackson, 2003), sex (Cumming & Hall, 2002; Isaac & Marks, 1994; Weinberg et al., 2003) and skill type (Kizildag & Tiryaki, 2012) reveal that a better understanding of the roles that imagery plays in performance is needed. Exploring athlete's imagery use in specific situations would help sport psychologists develop more effective imagery interventions (Short, Monsma, & Short, 2004).

Purpose of the Study

The purpose of this study was to investigate the frequency of imagery use among NCAA Division III collegiate athletes. Specifically, the research was aimed to discover whether differences existed in the use of imagery between open-skill sport athletes and closed-skill sport athletes, as well as between male and female athletes. The results of this study may reveal tendencies of imagery use within a specific competitive level.

Hypotheses

1. Differences of imagery use will exist between open-skill sport and closed-skill sport athletes.
2. Open-skill sport athletes will use more MG-A imagery than closed-skill sport athletes.
3. Closed-skill sport athletes will use more MG-M and CS imagery than open-skill sport athletes.
4. Overall, male athletes will use imagery more frequently than their female counterparts.

Delimitations

The following study was delimited by:

1. Only Division III varsity athletes from the same college were used as participants.
2. Only one questionnaire, the Sport Imagery Questionnaire, was administered to the participants.
3. All questionnaires were administered in April, meaning teams were in varying stages of their respective seasons.

Limitations

The following study was limited by:

1. The survey was administered directly before a team practice or workout and within a large group of their peers, possibly causing participants to feel rushed or be distracted.
2. Participants may not have answered the questions honestly.
3. Challenges with recruiting athletes varied depending on the team and the standing of their athletic season. Only about 2/3 of the total athlete population (337 athletes) participated in the study.
4. The population sizes between sport skill types and between sexes were not equal.

Assumptions

The following study assumed:

1. Participants followed directions with respect to the SIQ and answered each item accurately.
2. The SIQ was an effective measure of imagery use.

3. Differences in stages of team athletic season did not have an influence of reported imagery use.
4. Classifications of sport skill types accurately represent the skill requirements of each respective sport.

Significance of the Study

This study hopes to provide a better understanding of how NCAA Division III collegiate athletes use imagery. Studying imagery use by sport skill type could provide insight into the trends of imagery use based on the skill requirements of a specific sport. Revealing trends within a specific competitive level can lead to more informed applied sport psychology practice. Likewise, understanding differences in imagery use across male and female athletes may help tailor more appropriate mental training techniques. By identifying the role that imagery plays in sport performance, practitioners could optimize the effectiveness of imagery as an intervention tool.

Definition of Terms

Closed-Skill	A skill performed in an environment that does not change and is predictable (Kizildag & Tiryaki, 2012).
Imagery	Process of being aware of "quasi-sensory or quasi-perceptual experiences" in the absence of those stimulus conditions (Richardson, 1969).
Imagery Content	The specific image(s) used during imagery (Short et al., 2004).
Imagery Function	The purpose or reason for employing an image (Cumming & Ramsey, 2008).
Imagery Outcome	The result of the imagery (Cumming & Ramsey, 2008).

Imagery Type	Describes both the content and function or purpose of an athlete's imagery (Martin et al., 1999)
Intervention	Implemented program by someone other than the athlete in order to influence performance (Greenspan & Feltz, 1989).
Mental Practice	The practice of mental processes including but not limited to: imagery, self-talk, thought-reframing, and modeling (Cumming & Ramsey, 2008).
Open-Skill	A skill performed in an environment that is changing, unstable and unpredictable (Kizildag & Tiryaki, 2012).
Sport Imagery Questionnaire (SIQ)	A questionnaire developed to measures athletes' ability to experience different senses, emotions, and perspectives during imagery (Hall et al., 1998).
Visualization	Process of mentally picturing images, using only vision as a sense (Cumming & Ramsey, 2008).

Chapter 2

Review of Literature

Introduction

Mental imagery is considered to be the most important psychological techniques applied to sport (Cornelius, 2002). The purpose of this study was to reveal current trends of imagery use among a specific population of NCAA Division III athletes. Furthermore, the study investigated the potential influence of athlete sex and sport skill types on imagery use. This literature review begins with an overview of applied sport psychology and the current status of interventions in the field. The second section discusses imagery and its role in sport situations. The Sport Imagery Questionnaire is then introduced, with a focus on the impact the instrument has had on imagery research. In the penultimate section, elements influencing sport imagery use are examined, revealing known trends and areas of further investigation. The final section provides a summary as well as validation for further research in the field.

Applied Sport Psychology

Though the field of sport psychology has a strong empirical background, further developments in applied consulting practices are needed. Williams and Krane (2015) recognize that even though sport psychology is a growing academic field with a bright future, being able to apply cognitive techniques in athletic situations is necessary to develop the applied field of sport psychology. In a review of sport psychology consulting, Luiselli (2012) expressed concern that sport psychology consultants too often generalize outcomes of previous research in order to validate their practice. Specifically, Luiselli addresses the need for implementing cognitive behavior techniques that are more evidence-based rather than anecdotal (2012). Interventions that are socially validated and targeted toward relevant audiences should be the objective of future applied sport psychology research.

As athletes continue to strive toward gaining a competitive edge over their peers, mental training is becoming more popular. Cognitive techniques such as mental imagery, self-talk, meditation, goal setting and thought reframing are frequently used by sport psychologists to help athletes in competitive situations (Greenspan & Feltz, 1989; LeUnes, 2008; Luiselli & Reed, 2011; Williams & Krane, 2015; Whelan, Mahoney & Meyers, 1991). Psychological interventions in sport as defined by Greenspan and Feltz (1989), are "Actions initiated by someone other than the athlete that focus on psychological skills in an attempt to improve the athlete's performance during competition" (p. 221). These psychological techniques are applied in sport situations not only to enhance performance but also to help improve consistency through better control of emotions and thought processes.

Imagery in Sport

Of the cognitive techniques applied to sports, mental imagery is one of the most commonly utilized and researched (LeUnes, 2008). Short, Ross-Stewart, and Monsma (2006) report that there are over 200 published studies investigating the role of imagery in sport settings alone. The definition of imagery provided by Richardson (1969) states that imagery is "those quasi-sensory and quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions" (p. 2). This definition is one of the most commonly used in imagery research (see reviews: Cumming & Ramsey, 2008; Jones & Stuth, 1997; Martin et al., 1999); it differs from the term visualization, which only assumes imagery as a visual stimuli, or mental practice which can refer to the practice of many different mental processes (Cumming & Ramsey, 2008). Each of these terms can be used in applied settings; however, in the academic field imagery is the most appropriate term and will be used throughout the remainder of this study.

In sport situations, basic imagery research involves examining the frequency of imagery use through self-reported measures. By revealing current trends, researchers can investigate the underlying influences of imagery use including what, why, where and when (Munroe et al, 2000; Short et al, 2006). When comparing imagery use among a 381 participant sample of athletes in six different sports, Hall, Rogers, and Barr (1990) found that the higher the competitive level, the more often athletes reported using imagery. Consistent with those results, findings in past studies from Ungerleider, Golding, Porter, and Foster (1989) as well as Orlick and Partington (1988) showed imagery use among elite athletes to be as high as 70-99% (Jones & Stuth, 1997). Imagery use is consistently reported in training and competitive situations, with use in competitive situations being more common (Hall et al., 1990; Munroe et al., 2000). Moreover, imagery use is reported in the off-season as a preparation method for the upcoming season (Cumming & Hall, 2002) as well as away from sport environments such as at home or school (Salmon et al., 1994).

The Sport Imagery Questionnaire

Since the early 1990s a great deal of research on imagery use in sport has been focused around Paivio's (1985) conceptualized model of imagery functions. The SIQ (Hall et al., 1998) further operationalized Paivio's functions into five types of imagery: (1) Motivational Specific (MS), (2) Motivational General-Arousal (MG-A), (3) Motivational General-Mastery (MG-M), (4) Cognitive Specific (CS), and (5) Cognitive General (CG). Each motivational or cognitive classification corresponds to a function in sport: MS for goal-oriented behaviors, MG-A for arousal control, MG-M for coping and confidence, CG for strategy execution, and CS for skill learning and performance (Hall et al., 1998).

While reviewing the current state of imagery research, Short et al. (2006) recognized that the development of the SIQ revolutionized imagery research. The applied model of imagery use (Martin et al., 1999) evolved out of the development of the SIQ and together they serve as a guide for research on imagery in sport situations (Nordin & Cumming, 2008). Hall, Stevens, and Paivio (2005) reported that the SIQ is a general instrument that can be administered to athletes of any competitive level, in any sport, and is not situational specific (i.e., training or competition) or time specific (i.e., immediately before or after imagery use). The SIQ is generally the most commonly used tool for sport psychologists and researchers looking to quantify the use of mental imagery in sport.

Numerous studies have illustrated that athletes of all sports and skill levels image all five types of imagery; and that there is a great deal of variation between the frequency each type is used (see reviews: Cumming & Ramsey, 2008; Hall et al., 2005; Martin et al., 1999; Munroe et al., 2000; Short et al., 2006). Martin et al. (1999) believes these imagery types to be functionally independent but suggest that athletes may use them alone or in combination with each other. Highlighting trends and relationships of imagery use is a major goal of imagery research using the SIQ. Kizildag and Tiryaki (2012) recognized that there are definitely patterns of imagery use, but that the large amount of individual variability makes them hard to identify.

Elements Influencing Imagery Use

When considering the functions of imagery, it is clear that patterns of its use exist. Differences in imagery use between sports, competitive levels, and athlete's sex show how much variability is present (Kizildag & Tiryaki, 2012). There are many complex interactions such as imagery perspective, imagery type, and imagery ability that all play a role in an

athlete's imagery experience (Callow & Roberts, 2010). The applied model of imagery use (Martin et al., 1999) attempted to guide future research and application by limiting the amount of variables that should be considered. However by not considering individual differences, the applied model of imagery is limited as a guiding framework for designing future studies and interventions (Martin et al., 1999; Murphy, Nordin, & Cumming, 2008). Munroe et al. (2000) noted how important it is to understand all the elements of imagery use in order to optimize imagery interventions.

Variables such as competitive level and efficacy have already been thoroughly studied and consistently show their effect on imagery use among athletes. The relationship between competitive level and imagery use is evident; athletes participating at higher competitive levels use imagery more frequently (see reviews: Cumming & Ramsey, 2008; Munroe et al., 2000; Short et al., 2006). In addition to competitive level, imagery use can also be predicted by the athletes' perceived effectiveness of the technique. The more an athlete believes imagery is an effective process, the more likely they are to use the technique (Martin et al., 1999; Short, Tenute, & Feltz, 2005; Weinberg, 2008; Weinberg et al. 2003). However there are many factors that influence imagery use in sport.

Perhaps the most distinguishable element of sport participation is an athlete's sex. Differences between male and female athletes are often accounted for in sport research; however, in sport imagery research specifically, sex differences are often not a variable under investigation (Hall et al., 1990; Short et al., 2004; Short et al., 2005a). This may be due to the fact that early research of imagery showed only minor differences in imagery use between male and female athletes (Munroe, Hall, Simms, & Weinberg, 1998). Even though normative SIQ data presented by Hall et al. (2005) show male athletes use imagery more frequently

across all five imagery functions, inconclusive findings of sex effects on imagery use have been reported in recent studies (Gregg & Hall, 2006; Gregg, Hall, McGowan, & Hall, 2011; Kizildag & Tiryaki, 2012). After predicting a difference in male and female imagery use that was not found, Kizildag and Tiryaki (2012) contributed the inconsistent results to the evolution of women challenging gender stereotypes in sport. In all, previous imagery research has demonstrated athletes' sex to have little influence on imagery use compared to other variables such as the level of competition and imagery ability.

Another major element that influences imagery use is sport type. Several studies have examined the effect of sport type by comparing differences across a variety of sports (Weinberg et al., 2003; Weinberg et al., 2011), while other studies differentiate by team or individual sports (Gregg & Hall, 2006; Munroe et al., 1998). However, Kizildag and Tiryaki (2012) recognized that the environment in which a performer executes a skill (i.e. open or closed) is a worthy topic of imagery use by sport. Research by sport skill type is based around Hardy and Callow (1999) when they began studying imagery based on task requirements and found that different visual perspectives (internal or external) had varying effects based on the type of skills being performed. Hallman and Munroe-Chandler (2009) further supported the effect of task requirements on imagery use in their examination of ice hockey players' imagery use. They found that differences in imagery use exist even within a single sport, mainly because of the different task requirements of various playing positions (Hallman & Munroe-Chandler, 2009).

Specific research on imagery use between open-skill and closed-skill sports has been limited to the extent that reviews by Kizildag and Tiryaki (2012) and Arvinen-Barrow, Weigand, Thomas, Hemmings, and Walley (2007) have had to extrapolate findings from previous studies comparing specific sport populations. Kizildag and Tiryaki (2012) reported that open-skill

athletes use imagery for more motivational purposes, using Motivational General-Mastery significantly more than closed-skill athletes. Moreover, Arvinen-Barrow et al. (2007) reported closed-skill athletes using significantly more cognitive imagery functions. Both studies exhibited inconclusive and conflicting results, highlighting the need for further research on the influence of sport type on imagery abilities

Summary and Rationale

The development of the SIQ (Hall et al., 1998) was instrumental in the advancement of imagery research. Questions such as where do athletes use imagery, when do athletes use imagery, what do athletes image, and why do athletes use imagery (Munroe et al., 2000); have now been examined in many different contexts (Hall et al., 2005). On the basis of the initial development and subsequent research of the SIQ, most general conclusions have been established. Efforts are now turned to more underlying influences on imagery use such as task movement requirements and skill environments (Hallman & Munroe-Chandler, 2009; Kizildag & Tiryaki, 2012). Though the SIQ has limitations, it has been significant in standardizing the evaluation of imagery use among athletes.

With imagery often being thought of as, "the cornerstone of sport psychology interventions" (Cornelius, 2002, p. 206) it is vital to implement techniques that are evidence-based rather than anecdotal (Luiselli, 2012). Applied sport psychologists need to rely on empirical research to base their practice around. This evidenced in the study by Short, Tenute, and Feltz (2005), which demonstrated how much of an athlete's imagery use depends on their perceived effectiveness of it. More research done in the field will only provide stronger support and validity for performance enhancing mental skill techniques. Altogether, there are many factors that influence imagery use in sport. It is important to reveal as many

relationships as possible in order to further our knowledge and increase the effectiveness of imagery applications.

Chapter 3

Methodology

Introduction

The study was designed to measure athlete's imagery use within a National Collegiate Athletic Association (NCAA) Division III institution. In addition, the influence of an athlete's sex and sport skill type was examined. This chapter describes the participants and instruments used in the study; as well as outlines the design, procedures and data analysis used in the study.

Participants

The 337 participants were male (n=152) and female (n=185) varsity athletes at a NCAA Division III college in New York State. Each participant was at least 18 years of age at the time of the study. The participating teams were baseball, basketball, field hockey, ice hockey, lacrosse, soccer, tennis, volleyball, wresting, cross country, golf, gymnastics, swimming, and track & field. Table 1 presents a breakdown of the participation by sport as well as by skill type classification. Each team was either in season or taking part in an off-season training schedule.

Table 1.

Participation by Sport and Sex

Sport Type	Open Skill Sports		Closed Skill Sports	
Sex	Male	Female	Male	Female
Baseball	28			
Basketball	10	6		
Field hockey		11		
Ice hockey	14	20		
Lacrosse	26	25		
Soccer	16	9		
Softball		23		
Tennis		7		
Volleyball		10		
Wrestling	12			
Cross country			7	21
Golf				6
Gymnastics				11
Swimming			5	10
Track & field			34	26
Total	106	111	46	74

Instruments

A slightly modified version of the Sport Imagery Questionnaire (SIQ; Hall et al., 1998) was administered in paper form to all participants (see Appendix A). The SIQ is a 30-item measurement tool where participants self-report the frequency of their imagery use. Each item corresponds to one of the five subscales (CS, CG, MS, MG-M, MG-A) assessing the athlete's use of the five different functions of imagery. As discussed by Short et al. (2004), a zero point in the Likert scale would provide an option of not using imagery for that function at all. All items are measured on a 7-point Likert scale with 0 = *never*, 3 = *sometimes,* and 7 = *always*. The SIQ is commonly used to measure the frequency of imagery use in both research and applied sport psychology (Hallman & Munroe-Chandler, 2009). Previous literature has constantly demonstrated both predictive and content validity (Hall et al., 1998). Additionally, each subscale has demonstrated acceptable internal consistencies with alpha coefficients greater than .70 (Hall et al., 1998).

Procedures

After receiving approval from the IRB, coaches were contacted to request access to their athletes. Each team was approached before or after an organized team practice or workout. Potential participants were provided information regarding informed consent and the purpose of the study. After giving consent, each participant was supplied a writing utensil and a hard copy of the research survey. The SIQ included an added demographic section (see Appendix B), which included sex, age, sport and playing position. Following the demographics the subjects were required to read the instructions pertaining to the SIQ and then were asked to complete the SIQ, which was slightly modified to include a non-use response. Participants then returned the completed surveys, which were subsequently organized into folders by team and securely stored. After all data collecting sessions were completed, the questionnaires were tallied and scored using Microsoft Excel.

Data Analysis

Data analysis was conducted using SPSS software version 17. Multiple linear regression analyses were performed at each SIQ subscale level to investigate the role of athlete sex and sport skill type on predicting SIQ scores. A linear regression approach was used instead of analysis of variance because of the need to reveal relationships rather than differences. Furthermore, a multiple linear regression analysis allowed for an analysis of each independent variable, athlete sex for example, while taking into account the influence of the other variable, sport skill type.

Chapter 4

Results and Discussion

Results

Data analyses support that a variation in SIQ scores can be explained by athlete sex and sport skill type. Table 2 shows the mean SIQ subscale scores and standard deviation for male and female athletes participating in either open-skill or closed-skill sports. Tests of see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (Sex and Skill Type at all SIQ subscale levels; Tolerance = .99, VIF = 1.01). The data also met the assumption of independent errors (Durbin-Watson values: CS = 1.85; CG = 1.82; MS = 1.9; MG-A = 1.87; MG-M = 1.76). Furthermore, visual examination of a histogram of standardized residuals indicated that the data contained approximately normally distributed errors, as did the normal P-P plot of standardized residuals.

Table 2.

Means and Standard Deviations by SIQ Subscale

	Open-Skill Sports				Closed-Skill Sports			
	Male		Female		Male		Female	
	M	SD	M	SD	M	SD	M	SD
Cognitive Specific	6.06	0.77	5.42	0.81	5.52	0.83	5.00	0.92
Cognitive General	5.46	0.83	5.35	0.82	5.07	1.07	4.94	0.92
Motivational Specific	5.56	0.95	5.48	1.16	5.11	1.29	4.36	1.28
Motivational General-Arousal	5.47	0.85	5.39	0.90	5.51	0.78	5.16	0.97
Motivational General-Mastery	5.63	0.76	5.92	0.78	5.79	0.87	5.39	0.77

Multiple regression analysis results indicated that athlete sex and sport skill type were associated with the frequency of imagery use; CS ($F(2,334) = 12.03$, $p < .001$, $R^2 = .07$, $R^2_{Adjusted} = .06$), CG ($F(2,334) = 9.36$, $p < .001$, $R^2 = .05$, $R^2_{Adjusted} = .05$), MS ($F(2,334) = 25.12$, $p < .001$, $R^2 = .13$, $R^2_{Adjusted} = .13$), and MG-M ($F(2,334) = 15.37$, $p < .001$, $R^2 = .08$, $R^2_{Adjusted} = .08$) subscale levels. However, athlete sex and sport skill type did not significantly

explain the amount of variance in the frequency of imagery use at the MG-A level (F(2,334) = 2.28, p = .104, R^2 = .01, $R^2_{Adjusted}$ = .01). Table 3 displays multiple regression analysis results at each subscale level. Athlete sex significantly predicted that male athletes had higher values for CS (ß= .32, t(326) = 3.52, p < .001), MS (ß= .31, t(326) = 2.46, p = .015), and MG-M (ß= .22, t(326) = 2.57, p = .011) while accounting for athlete's sport skill type; however no significance was found for CG (ß= .12, t(326) = 1.24, p = .214) or MG-A (ß= .16, t(326) = 1.67, p = .096). Sport skill type significantly predicted that open-skill sport athletes had higher values for CS (ß= .29, t(326) = 3.05, p = .003), CG (ß= .40, t(326) = 4.0, p < .001), MS (ß= .84, t(326) = 6.37, p < .001), and MG-M (ß= .42, t(326) = 4.63, p < .001) while accounting for differences of athlete's sex; however no significance was found for MG-A (ß = .12, t(326) = 1.15, p = .251).

Table 3.

Multiple Regressions Results by SIQ Subscale

	Cognitive Specific				Cognitive General				Motivational Specific				Motivational General-Arousal				Motivational General-Mastery			
Variable	ß		95% CI		ß		95% CI		ß		95% CI		ß		95% CI		ß		95% CI	
Sex	.32	**	.14	.50	.12		-.07	.31	.31	*	.06	.56	.16		-.03	.35	.22	*	.05	.39
Skill	.29	**	.10	.48	.40	**	.20	.60	.84	**	.58	1.10	.12		-.08	.32	.42	**	.24	.60
F value	12.03				9.36				25.12				2.28				15.37			
R^2	0.07				0.05				0.13				0.01				0.08			

*p<.05 **p<.01

Discussion

The results of the study confirmed findings from previous research that showed differences between open-skill and closed-skill sport athletes exist (Arvinen-Barrow et al., 2007; Kizildag & Tiryaki, 2012). However, it was thought that trends would be present

favoring specific functions of imagery, not of the overall frequency of imagery use. The two previous studies investigating the influence of skill environments reported that open-skill sport athletes use more MG-M imagery (Kizildag & Tiryaki, 2012) and more MG-A imagery (Arvienen-Barrow et al., 2007). The results of the current study did not support the results found by Arvienen-Barrow et al. (2007) but did suggest that open-skill sport athletes use imagery more frequently overall, especially the CS, CG, MS and MG-M types of imagery.

Even the previous research between team and individual sports has shown that sport types favor specific functions of imagery (Weinberg et al., 2003; Munroe et al, 1998). The differences in sample sizes, presented in Table 1, may have contributed to the discrepancy in reported imagery use. However, a multiple regression analysis was specifically used because it does not require equal sample sizes and because it makes predictions while taking into account both variables. Further research is warranted on other influences affecting imagery use. The efficacy of imagery use by players (Short et al., 2005a) and coaches (Short et al., 2005b) likely play a large role in the variability of SIQ scores.

While gender differences are not generally considered to be a major element influencing imagery use, this research suggests that it is a topic worthy of further investigation. Many studies have shown unconvincing evidence that differences of imagery use exist between male and female athletes (Cumming, Vincent, Hall, Hardwood, & Gammage, 2002; Gregg & Hall, 2006; Nordin Cumming, Vincent, & McGrory, 2006). However, the SIQ normative data suggests that males use imagery more frequently across all imagery functions (Hall et al., 2005). As Kizildag and Tiryaki (2012) suggest, differences between male and female athletes may depend on the sport and the gender stereotypes associated with that sport.

Consistent with previous literature using the SIQ, differences in the frequency of imagery use existed between each of the five subscales. However, when compared with the SIQ normative information presented by Hall et al. (2005), the reported use of imagery in this particular sample was surprisingly high. The mean normative scores for 888 collegiate athletes at each SIQ subscale are: CS-4.96, CG-4.80, MS-4.50, MG-A-4.94, and MG-M-5.44. Whereas the current study of 337 collegiate athletes found imagery use to be much more frequent with reported use of: CS-5.41, CG-5.26 MS-5.21, MG-A-5.38, and MG-M-5.83.

This sample's high level of reported imagery use can be attributed to several different factors. One possible influence is the overall athletic performance of the school, which has placed among the top 25 out of over 270 Division III schools in national colligate athletic rankings each year since the award was recognized in 1996 (NACDA Directors' Cup). This accomplishment is one of only six other Division III colleges nationwide and certainly influences the overall competitive level of the athletes at this particular institution. Both the coaches and the athletes may strive for athletic excellence through the use of added training programs such as imagery. Exploring the differences between competitive levels and performance levels may reveal new influences on the use of imagery.

Another factor that may explain the difference between SIQ normative data and the current findings is the nearly ten years between reports. Williams and Krane (2015) noted how cognitive techniques applied to sports are growing in popularity. Imagery models such as the applied model of imagery use (Martin et al., 1999) and the PETTLEP model of motor imagery (Holmes & Collins, 2001) have greatly contributed to the field of research and, more importantly, to the efficacy of imagery intervention use by athletes and coaches. Short,

Smiley, and Ross-Stewart (2005b) showed that there was a relationship between coach's imagery use and their efficacy, suggesting that coaches would apply imagery techniques more in their teachings. With imagery use becoming more popular and understood, updated normative values may be necessary.

It should be considered that the modified version of the SIQ might have had an effect on the subscale scores. However, past studies such as done by Short et al., (2005b) showed that by adding a non-use response ('zero') to the SIQ frequency measurement scale, responses may have actually been lower. In order to explore other variables, many previous studies have utilized modified versions of the SIQ (Murphy et al., 2008; Short et al, 2004; Weinberg et al., 2003). All things considered, the modified version of the responses used in this study maintained a 7-point Likert scale most commonly employed in research using the SIQ and likely had little effect.

Chapter 5

Summary, Conclusions, and Recommendations

Summary

The aim of this study was to investigate the frequency of imagery use among NCAA division III collegiate athletes and examine the influence of athlete sex and sport skill type. The reported imagery use in this particular collegiate institution revealed that male athletes use imagery more frequently than female athletes. Likewise, open-skill sport athletes report using imagery more often than closed-skill sport athletes. However, the low amount of variation explained by the data makes it difficult to make predictions based on specific types of imagery use. It is likely that individual differences, such as efficacy and ability, play a larger role in predicting imagery use in sport.

Conclusions

The first hypothesis of the study stated that differences of imagery use would exist between athletes participating in open-skill sports and those playing closed-skill sports. This hypothesis was shown to be true, as data analysis suggests that sport skill type influences imagery use across four of the five SIQ subscales (CS, CG, MS and MG-M), while accounting for sex differences. Additionally, it was hypothesized that open-skill sport athletes would report more MG-A imagery use, while closed-skill sport athletes would report more MG-M and CS imagery use. Neither of these hypotheses was supported by the results as MG-A imagery was the only function not influenced by sport skill type, while MG-M and CS imagery were both used more by open-skill sport athletes.

With regards to sex differences and imagery use, it was hypothesized that male athletes would use imagery more frequently than their female counterparts. The results

supported the hypothesis, showing that imagery use was influenced by athlete sex for CS, MS, and MG-M types of imagery, while accounting for skill type differences. This hypothesis was based on overall trends of imagery use and by the SIQ normative scores (Hall et al., 2005). No hypotheses were made predicting differences by imagery type because gender was generally not found to have much of an effect on imagery use.

Recommendations for Future Research

Based on the findings from the current research, future research in sport imagery use could benefit from the following recommendations. First, although the study aimed to sample athletes from a specific population (NCAA Division III athletes), it is recommended that future research use participants from multiple institutions within the same competitive level. Expanding this research to more than one college or university would allow for a greater sample of a competitive level. Furthermore, future research should compare differences between colleges and universities of varying divisions: NCAA Division I, NCAA Division II, or National Junior College Athletic Association (NJCAA) affiliations.

In the current study there was a great deal of individual variability shown by the SIQ scores of imagery use. Future research should focus on what influences these differences by looking at other factors such as team rankings and individual performance or playing time. If one assumes that elite athletes use imagery more often than non-elites (Cumming & Ramsey, 2008) then differences are likely to exist within a competitive level based on performance. A relationship between imagery use and team ranking or individual performance, would further demonstrate the role of imagery in sports.

One major goal of this study was to investigate the influence of skill environments on imagery use. This was done by classifying each sport as either an open-skilled or closed-skilled sport. However, as Kizildag and Tiryaki (2012) recognized, more specific data could be obtained if the classifications of sport skills were more explicit. The skill requirements of each sport vary greatly, but even playing positions within each sport involve specific movement or skill requirements (Hallman & Munroe-Chandler, 2009). As investigated by Hardy and Callow (1999), an athlete's imagery use is largely affected by the task requirements of their sport.

The current study exclusively used the SIQ as a measurement of imagery use. Future research should investigate other elements of imagery such as ability, efficacy and perspective. Ability, efficacy, and perspective are all considered to play a major role in the effectiveness of an imagery intervention (Hall et al., 1998; Short et al., 2005; Hardy & Callow, 1999). It is only the beginning of imagery research by investigating the frequency of imagery use through the use of the SIQ. Other questionnaires such as the Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011) or the Vividness of Movement Imagery Questionnaire (VMIQ; Isaac et al., 1986) could be used to enhance future research.

References

Arvinen-Barrow, M., Weigand, D. A., Thomas, S., Hemmings, B., & Walley, M. (2007). Elite and novice athletes' imagery use in open and closed sports. *Journal of Applied Sport Psychology 19*, 93-104. doi:10.1080/10413200601102912

Callow, N., & Roberts, R. (2010). Imagery research: An investigation of three issues. *Psychology of Sport and Exercise*, *11*, 325-329. doi:10.1016/j.psychsport.2010.03.002

Cumming, J. & Ramsey, R. (2008). Imagery interventions in sport. In S. D. Mellalieu & S. Hanton, *Advances in applied sport psychology* (5-36). New York, NY: Routledge.

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

Greenspan, M. J., & Feltz, D. L. (1989). Psychological interventions with athletes in competitive situations: A review. *The Sport Psychologist, 3*, 219-236.

Gregg, M. & Hall, C. (2006). Measurement of motivational imagery abilities in sport. *Journal of Sport Sciences 24*(9), 961-971. doi:10.1080/02640410500386167

Hall, C. R., Rogers, W. M., & Barr, K. A. (1990). The use of imagery by athletes in selected sports. *The Sport Psychologist, 4*, 1-10.

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

Hall, C. R., Stevens, D. E., & Paivio, A. (2005). *The sport imagery questionnaire: Test manual.* Morgantown, WV: Fitness Information Technology.

Hallman, T. A. D., & Munroe-Chandler, K. J. (2009). An examination of ice hockey players' imagery use and movement imagery ability. *Journal of Imagery Research in Sport and Physical Activity 4*, 1-19. doi: 10.2202/1932-0191.1040

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

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

Isaac, A., Marks, D., & Russel, E. (1986). An instrument for assessing imagery of movements: the Vividness of Movement Imagery Questionnaire (VMIQ). *Journal of Mental Imagery, 10*, 23-30.

Jones, L., & Stuth, G. (1997). The uses of mental imagery in athletics: An overview. *Applied & Preventive Psychology*, *6*, 101-115.

Kizildag, E., & Tiryaki, S. M. (2012). Imagery use of athletes in individual and team sports that require open and closed skill. *Perceptual and Motor Skills, 114*(3), 748-756. doi:10.2466/05.20.22.PMS.114.3.748-756

Luiselli, J. K. (2012). Behavioral sport psychology consulting: A review of some practice concerns and recommendations. *Journal of Sport Psychology in Action*, *3*, 41-50. doi:10.1080/21520704.2011.653048

LeUnes, A. (2008). *Sport Psychology*. New York, NY: Psychology Press.

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

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

Murphy, S., Nordin, S. M., & Cumming, J. (2008) Imagery in sport, exercise and dance. In S. D. Mellalieu & S. Hanton, *Advances in applied sport psychology* (297-324). New York, NY: Routledge.

Nordin, S. M., & Cumming, J. (2008). Types and functions of athletes' imagery: Testing predictions from the applied model of imagery use by examining effectiveness. *International Journal of Sport and Exercise Psychology*, *6*(2), 189-206.

Orlick, T., & Partington, J. (1988). Mental links to excellence. *Sport Psychologist, 2*, 105-130.

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

Richardson, A. (1969). *Mental imagery.* New York, NY: Springer.

Salmon, J., Hall, C. R., & Haslam, I. (1994). The use of imagery by soccer players. *Journal of Applied Sport Psychology, 6*, 116-133.

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

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

Short, S. E., Tenute, A., & Feltz, D. L. (2005a). Imagery use in sport: Mediational effects for efficacy. *Journal of Sport Sciences*, *23*(9), 951-960. doi:10.1080/02640410400023373

Short, S. E., Smiley, M., & Ross-Stewart, L. (2005b). Relationship between efficacy beliefs and imagery use in coaches. *The Sport Psychologist, 19*, 380-394.

Short, S. E., Ross-Stewart, L., & Monams, E. V. (2006). Onwards with the evolution of imagery research in sport psychology. *The Journal of Sport Psychology, 8*(3) 47-63.

Ungerleider, S., Golding, J. M., Porter, K., & Foster, J. (1989). An exploratory examination of cognitive strategies used by masters track and field athletes. *Sport Psychologist, 3,* 245-253.

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

Weinberg, R. (2008). Does imagery work? Effects on performance and mental skills. *Journal of Imagery Research in Sport and Physical Activity 3*, 1-21. doi:10.2202/1932-0192.1025

Weinberg, R., Butt, J., Knight, B., Burke, K. L., & Jackson, A. (2003). The relationship between the use and effectiveness of imagery: an exploratory investigation. *Journal of Applied Sport Psychology, 15*, 26-40. doi:10.1080/10413200390180044

Whelan, J. P., Mahoney, M. J., & Meyers, A. W. (1991). Performance enhancement in sport: A cognitive behavioral domain. *Behavior Therapy*, *22*, 307-327.

Williams, S. E. & Cumming J. (2011) Measuring athlete imagery ability: The sport imagery ability questionnaire. *Journal of Sport & Exercise Psychology, 33*, 416-440.

Williams, J. M. & Krane V. (2015) *Applied sport psychology: Personal growth to peak performance.* New York, NY: McGraw Hill.

Appendix A – IRB Approval

SUNY Cortland
Institutional Review Board

MEMORANDUM

To:	Daniel Jones Katherine Polasek
From:	Thomas Koesterer, Reviewer *on behalf of* Institutional Review Board
Date:	4-6-2015
RE:	Institutional Review Board Approval

In accordance with SUNY Cortland's procedures for human research participant protections, the protocol referenced below has been approved for a period of one year:

Title of the study:	Differences in Imagery Use by Sport Skill Type and Sex among Division III Athletes		
Level of review:	**Exempt**	**Protocol number:**	141528
Project start date:	Upon IRB approval	**Approval expiration date*:**	Note: Exempt research

* **Note: exempt research does not require continuation requests;** the SUNY Cortland IRB only requests annual email notification (to irb@cortland.edu) indicating that the research continues. The purpose of the continuation notification is to alert the IRB Administrator that the records of the original IRB approval must remain available. Unlimited continuations can be registered for exempt research under federal and SUNY Cortland IRB guidelines.

The federal Office for Research Protections (OHRP) emphasizes that investigators play a crucial role in protecting the rights and welfare of human subjects and are responsible for carrying out sound ethical research consistent with research plans approved by an IRB. Along with meeting the specific requirements of a particular research study, investigators are responsible for ongoing requirements in the conduct of approved research that include, in summary:

- obtaining and documenting informed consent from the participants and/or from a legally authorized representative prior to the individuals' participation in the research, unless these requirements have been waived by the IRB;
- obtaining prior approval from the IRB for any modifications of (or additions to) the previously approved research; this includes modifications to advertisements and other recruitment materials, changes to the informed consent or child assent, the study design and procedures, addition of research staff or student assistants, etc. (except those alterations necessary to eliminate apparent immediate hazards to subjects, which are then to be reported by email to irb@cortland.edu within three days);
- providing to the IRB prompt reports of any unanticipated problems involving risks to subjects or others;
- following the principles outlined in the Belmont Report, OHRP Policies and Procedures (Title 45, Part 46, Protection of Human Subjects), the SUNY Cortland College Handbook, and SUNY Cortland's IRB Policies and Procedures Manual;
- notifying the IRB of continued research under the approved protocol to keep the records active; and,
- maintaining records as required by the HHS regulations and NYS State law, for at least three years after completion of the study.

Miller Building, Room 402 • P.O. Box 2000 • Cortland, NY 13045-0900
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In the event that questions or concerns arise about research at SUNY Cortland, please contact the IRB by email irb@cortland.edu or by telephone at (607)753-2511. You may also contact a member of the IRB who possesses expertise in your discipline or methodology, visit http://www.cortland.edu/irb/members.html to obtain a current list of IRB members.

Sincerely,

Thomas Koesterer, Reviewer *on behalf of*
Institutional Review Board
SUNY Cortland

Appendix B – Sport Imagery Questionnaire

Please fill in the blank or circle appropriate answer:

Age:___

Sex: M / F

Sport(s):_____

Playing Position(s):_____

This questionnaire was designed to assess the extent to which you incorporate imagery into your sport. Any statement depicting a function of imagery you *rarely* use should be given a **low rating**. In contrast, any statement describing a function of imagery you use *frequently* should be given a **high rating.**

Your rating will be made on a seven-point scale referring to the frequency you engage in that kind of imagery ranging from: 0 = **never**, 3 = **sometimes**, and 6 = **always** engage in that kind of imagery.

Read each statement below and circle the appropriate response which indicates the degree to which the statement applies to you when you are practicing or competing in your sport. Don't be concerned about using the same responses repeatedly if you fell they represent your true feelings. Remember, there are no right or wrong answers, so please answer as accurately as possible.

		Never			Sometimes			Always
1.	I make up new plans/strategies in my head.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2.	I image the atmosphere of winning a championship (e.g., the excitement that follows winning a championship).	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3.	I image giving 100%.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4.	I can consistently control the image of a physical skill.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5.	I image the emotions I feel while doing my sport.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
6.	I image my skills improving.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
7.	I image alternative strategies in case my event/game plan fails.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8.	I image myself handling the arousal and excitement associated with my sport.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9.	I imagine myself appearing self-confident in front of my opponents.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10.	I imagine other athletes congratulating me on a good performance.	**0**	**1**	**2**	**3**	**4**	**5**	**6**

	Never		Sometimes				Always
11. I image each section of an event/game (e.g. offense vs. defense, fast vs. slow).	**0**	**1**	**2**	**3**	**4**	**5**	**6**
12. I imagine myself being in control in difficult situations.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
13. I can easily change an image of a skill.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
14. I image others applauding my performance.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
15. When imaging a particular skill, I consistently perform it perfectly in my mind.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
16. I image myself winning a medal/trophy.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
17. I imagine the stress and anxiety associated with my sport.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
18. I image myself continuing with my game/event plan, even when performing poorly.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
19. When I image myself performing, I feel myself getting psyched up.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
20. I can mentally make corrections to physical skills.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
21. I imagine executing entire plays/programs/sections just the way I want them to happen in an event/game.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
22. Before attempting a particular skill, I imagine myself performing it perfectly.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
23. I imagine myself being mentally tough.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
24. When I image myself participating in my sport, I feel anxious.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
25. I imagine the excitement associated with performing.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
26. I imagine myself being interviewed as a champion.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
27. I image myself to be focused during a challenging situation.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
28. When learning a new skill, I imagine myself performing it perfectly.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
29. I image myself successfully following my game/event plan.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
30. I image myself working successfully through tough situations (e.g., hurt, loosing, etc.).	**0**	**1**	**2**	**3**	**4**	**5**	**6**