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A study assessing cyclists' experiences using imagery to enhance self-efficacy.

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A STUDY ASSESSING CYCLISTS' EXPERIENCES USING IMAGERY TO ENHANCE SELF-EFFICACY

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By

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CERTIFICATE OF APPROVAL

MASTER OF SCIENCE THESIS

This is to certify that the Thesis of
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submitted in partial fulfillment of the requirements for the degree of
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ABSTRACT

Being a competitive athlete requires the use of both physical and mental skills to enhance performance. One mental skill many athletes have found useful is mental imagery (Hall, Rodgers, & Barr, 1990; Mills, Munroe, & Hall, 2001). Imagery is an experience involving the use of one or more senses to create, or recreate, a particular sporting skill or situation (White & Hardy, 1998). There are many ways imagery improves performance. One way imagery can be effective at improving performance is by enhancing athlete's self-efficacy (Beauchamp, Bray & Albinson, 2002; Mills et al., 2001; Short, Bruggeman, Engel, Marback, Wang, Willadsen & Short, 2002; Short, Tenute & Feltz, 2005). Bandura (1977) defined self-efficacy as the belief one has in being able to execute a specific task successfully in order to obtain a certain outcome.

While the topics of imagery and self-efficacy have received considerable attention in the world of sport, research assessing cyclists' use of imagery and how it relates to self-efficacy has yet to be completed. This relationship is especially important so that cyclists, coaches, and sport psychology consultants can better understand how imagery might enhance cyclists' self-efficacy and overall performances. The purpose of this study was to assess the relationship between self-efficacy and the use of imagery by cyclists who completed at least four 65-mile bike rides during the 2009 cycling season.

Twenty male and female cyclists, at least 18 years of age, participated in the current study. Participants were from various backgrounds with varying levels of cycling and competition experiences. A descriptive research design was followed, whereby the participants were asked to fill out a Demographic Form, The Sport Imagery Questionnaire (SIQ), and a Cycling Self-Efficacy Questionnaire (CSEQ). The demographic form, the SIQ, and the CSEQ, were given to the participants via-email, or in person, along with instructions on how to complete each questionnaire. A one-sample t-test was used to determine if participants used imagery during a 65-mile bike ride by comparing their imagery subscale scores to a value of four on the SIQ 1-7 Likert scale. Results showed that cyclists do use imagery during a 65-mile bike ride and results from a one-way ANOVA indicated that motivational general-mastery (MG-M) imagery was used more than the four other types of imagery. Unfortunately, participants CSEQ scores were all very high (M = 90.47 SD = 9.09) creating a ceiling effect making it impossible to determine if a relationship existed between imagery and self-efficacy.

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DEDICATION

This thesis is dedicated to my brother, David Sager. The completion of this thesis is proof that no matter what challenges you face, or how long it takes, if you put your mind to it, anything is possible.

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CHAPTER 1

INTRODUCTION

Cycling is a complex sport that can be physically and mentally demanding. Although some cyclists are competitive, many people use cycling as a form of transportation or as a form of exercise. According to the *Bicycle Retailer and Industry News* (Townly, 2012), bicycle sales were on the rise until 2001 when the economy began to change. In 1997, 15.2 million bicycles were sold. In 2000, the number of bikes sold rose to 20.9 million. After several years of declining bike sales, the number of bikes sold, again rose to 19.8 million by 2010 (Townly, 2012). The number of competitive riders has also increased in the past decade (Staff, 2008). In 2009, USA Cycling sold an all-time high 66,600 race licenses (Frattini, 2009). With this increased popularity comes an increased demand for ways to enhance performance of both competitive and recreational cyclists.

Cycling performance depends on many factors such as physical strength, endurance, motivation, confidence, and weather conditions. One important factor that likely influences cyclists' performance is self-efficacy. Bandura (1977) defined self-efficacy as the belief one has in being able to execute a specific task successfully in order to obtain a certain outcome. Self-efficacy can be enhanced by reviewing past successful performances, using social comparisons, self-modeling, as well as various persuasive techniques used by coaches and parents of athletes (Feltz & Reissinger, 1990). Maddux (1995) also suggested imagined experiences to be another source used by athletes to increase self-efficacy. In other words, athletes can generate positive self-efficacy beliefs by simply imagining themselves performing successfully in an upcoming event.

Research has shown that athletes use imagery primarily to enhance performance at either the cognitive or motivational level (Beauchamp et al., 2002; Callow & Hardy, 2001; Denis, 1985; Hall, 2001; Hall, Mack, Paivio, & Hausenblaus, 1998). The type of imagery athletes use (cognitive, motivational, specific, or general) may depend on the competitive level of the athlete. One particular difference in imagery use between elite and sub-elite athletes is that elite athletes focus on internal and kinesthetic imagery, and they use imagery more while training than during their event (Mahoney, Gabriel and Perkins, 1987). While self-efficacy and imagery have received considerable attention in the world of sport, research assessing cyclists' uses of imagery and the relationship to self-efficacy is lacking. Understanding cyclists' use of imagery is important for cyclists, coaches, and sport psychology consultants to better understand the relationship between imagery, self-efficacy, and performance.

Statement of Purpose

The purpose of this study was to examine the relationship between self-efficacy and the use of imagery by cyclists who completed at least four 65-mile bike rides during the 2009 cycling season (February 14^{th} - September 14^{th}).

Hypotheses

The hypotheses of this study were:

1. Cyclists use imagery more than "sometimes", as defined by the Sport Imagery Questionnaire, during a 65-mile bike ride.
2. Cyclists use Motivational General-Mastery imagery more than the other four types of imagery.
3. Imagery has a positive relationship to self-efficacy.

Definition of Terms

The following terms were defined for the purpose of this study:

1. Self-efficacy - the belief one has in being able to execute a specific task successfully in order to obtain a certain outcome (Bandura, 1977).
2. Imagery - an experience involving the use of one or more of the senses to create, or recreate, a particular sporting skill or situation (White & Hardy, 1998).
3. Cognitive Specific Imagery (CS) - imagery of specific sport skills, such as a penalty shot in hockey or a double-axel in figure skating (Martin, Moritz & Hall, 1999).
4. Cognitive General Imagery (CG) - imagery of the strategies related to a competitive event, such as imagining the use of full-court pressure in basketball or a baseline game in tennis (Martin, Moritz & Hall, 1999).
5. Motivational Specific Imagery (MS) - imagery that represents specific goals and goal-oriented behaviors, such as imaging oneself winning an event, standing on a podium receiving a medal, or being congratulated by other athletes for a good performance (Martin, Moritz & Hall, 1999).
6. Motivational General-Arousal Imagery (MG-A) - imagery that represents feelings of relaxation, stress, arousal, or anxiety in conjunction with a sport competition (Martin, Moritz & Hall, 1999).
7. Motivational General-Mastery Imagery (MG-M) - imagery that represents effective coping and mastery of challenging situations, such as imagining being mentally tough, confident, and focused during a sport competition (Martin, Moritz & Hall, 1999).

8. Category 5-4 cyclists - cyclists who start in at least 10 USA Cycling Sanctioned races by the USA Cycling Road Categorization Guideline.
9. Category 4-3 cyclists - cyclists who earn 20 points in any 12-month period; or experience 25 races with a minimum of 10 top ten finishes in a field of at least 30 riders; or a 20 pack finish with 50 or more riders; 20 points in 12-months is an automatic upgrade by the USA Cycling Road Categorization Guideline.
10. Category 3-2 cyclists - cyclists who earn 25 points in any 12-month period; 40 points in 12-months is an automatic upgrade by the USA Cycling Road Categorization Guideline.
11. Category 2-1 cyclists - cyclists who earn 30 points in any 12-month period; 50 points in a 12-month period is an automatic upgrade by the USA Cycling Road Categorization Guideline.

Delimitations

This study was delimited to cyclists who have completed at least four 65-mile bike rides during the 2009 cycling season (February 14th – September 14th).

Limitations

The limitations of this study were as follows:

1. The results may not be generalized to cyclists riding more, or less than, 65-miles.
2. The results are limited to the participant's abilities to recall the use and specifics of their images surrounding a 65-mile bike ride.
3. The results are limited to the validity of the CSEQ. The CSEQ was developed in accordance with Bandura's (1996) suggestions, using Moritz, Feltz, Fahrback, and Mack (2000) as a guide.

Assumptions

1. It was assumed cyclists would answer questions on both the SIQ and the CSEQ honestly and to the best of their ability.
2. It was assumed the CSEQ is a reliable and valid questionnaire.

CHAPTER 2

REVIEW OF LITERATURE

Many athletes use imagery as a mental training tool to increase performance (Hall et al., 1998; Hall, 2001; Munroe, Giacobbi, Hall, & Weinberg, 2000). In addition to increasing performance, imagery has also been found to enhance athletes' self-efficacy (Feltz & Reissinger, 1990; Feltz, Short, & Sullivan, 2008). While an extensive amount of research supporting the use of imagery to enhance athlete self-efficacy exists (Beauchamp et al., 2002; Feltz & Reissinger, 1990; Feltz et al., 2008; Maddux, 1995; Mills et al., 2001; Short et al., 2002), there is a gap in the research supporting cyclists' use of imagery and how it impacts self-efficacy. The following is a review of imagery, self-efficacy, and the relationship between self-efficacy and imagery.

Imagery

Paivio (1985) purposed four primary functions of imagery. Each function serves either a cognitive or motivational purpose and operates at either the general or specific level. The four functions are: 1) Cognitive Specific (CS), which consists of mental practice of specific skills; 2) Cognitive General (CG), which consists of mental practice of strategies, routines, or game plans; 3) Motivational Specific (MS), which includes mental practice of specific performance goals being achieved; and 4) Motivational General (MG) which includes mental practice of a general physiological arousal effect. Research by Hall et al. (1998) identified two separate functions for motivational imagery, Motivational General-Arousal and Motivational General-Mastery. Motivational General-Arousal (MG-A) is used for affect regulation, such as anxiety reduction; Motivational General-Mastery (MG-M) is used to build confidence and retain focus.

It has been well established in the sport and exercise literature that athletes use mental training techniques, such as imagery, as a tool to enhance performance (Hall, 2001). Munroe et al. (2000) investigated the use of imagery by 14 varsity athletes from a variety of sports. Researchers used a conceptual framework to determine where, when, why, and what athletes were imaging during and outside of practice, as well as pre-competition, during competition, and post-competition. The most frequently reported time and place athletes used imagery was during practice. Athletes believed imagery use to be most effective during practice and pre-competition. As a result, it may be that imagery use is a source of performance enhancement through motivation. Athletes' images ranged in length and frequency, effectiveness, nature, and controllability. Positive images were most frequently reported during practice and pre-competition. Negative images were most often reported during competition. In fact, some athletes reported occasionally imagining performing a skill incorrectly or the negative outcomes associated with competition. Athletes also reported images to be detailed and accurate. As to why and what athletes are imaging, the findings of Munroe et al. (2000) support Paivio's (1985) findings that imagery is used by athletes for both cognitive and motivational purposes.

To date, there are only case-study reports depicting the effects of CG imagery on athletic performance. For example, there are case-study reports documenting the benefits of CG imagery for football players rehearsing plays (Fenker & Lambiotte, 1987), wrestlers practicing specific strategies (Rushall, 1988), gymnasts rehearsing pommel-horse routines (Mace, Eastman, & Carroll, 1987) and floor routines (White & Hardy, 1998), and canoeists imaging entire slalom races (MacIntyre & Moran, 1996). According to these reports, CG imagery can positively influence athletes' performances.

Like CG imagery, CS imagery can enhance both learning and performance of motor skills (Abma, Fry, Li, Relyea, 2002; Lee, 1990; Martin et al., 1999). CS imagery has been shown to improve performance in a variety of sport skills including dart throwing, basketball free throws, and strength tests (Munroe et al., 2000). Lee (1990) assessed sit-up performance by comparing the use of CS imagery (imagining doing sit-ups) to an irrelevant image. Fifty-two male students participated and were asked to perform two sets of sit-ups with a 30-second time limit for each set. Each participant was told to try as hard as he could to finish as many sit-ups as possible in that time frame. Between sets participants were given 5 minutes to rest, during which time the researcher selected, at random, which type of imagery the participant would use during the following set. The options were: relevant image (cognitive specific imagery), "I want you to spend 30-seconds imagining yourself performing your best at sit-ups. Try to see, feel, and experience yourself with as many senses as possible. Imagine yourself doing really well and feeling that you are succeeding" (Lee, 1990, p. 68); irrelevant image (motivational general-arousal), "I want you to spend 30 seconds imagining a situation, any situation, in which you felt really happy and confident. Try to see, feel, and experience yourself in that situation with as many senses as possible. Remember how good you felt and how confident and successful you felt" (Lee, 1990, p. 68); and distraction control, " I want you to spend 30 seconds counting backward by 7's from 500. Count out loud and concentrate on the numbers" (Lee, 1990, p. 69). Results indicated those who were given the relevant imagery (cognitive specific imagery) were able to complete more sit-ups in the 30 second time frame than those in the irrelevant or control group. The authors concluded that their experiment supports the argument that cognitive specific imagery can prepare the athlete for a specific task.

In an effort to see how athletes with varying levels of confidence use imagery, Abma et al. (2002) examined performance improvements in track and field athletes across a wide range of experiences. Researchers asked 111 Division I track and field athletes to complete the Trait Sport Confidence Inventory (TSCI), which assesses specific aspects of sport confidence, such as comparing the confidence an athlete feels while competing against the most confident athlete they know. In addition, these athletes were asked to complete the Sport Imagery Questionnaire (SIQ) and the Movement Imagery Questionnaire-Revised (MIQ-R). The MIQ-R was developed to assess individual differences in visual and kinesthetic imagery. Participants filled out each questionnaire during a regular season practice at least two days prior to or following a competition. Results showed that runners who used CS imagery (imaging perfect performance movements associated with running) performed better than runners who used MS imagery (imaging crossing the finish line ahead of all other competitors). Results also revealed, despite the many benefits of CS imagery, that athletes used MG-M imagery more than any other type of imagery.

On the other hand, MG-A imagery does not appear to be as successful as MG-M at improving performance. In a study using a strength-training task, Murphy, Woolfolk, and Budney (1988) found no improvement by those participants who used MG-A imagery. These authors suggested arousal might not improve performance unless it is accompanied with CS imagery. The findings imply, compared with other types of imagery, that CS imagery may be the most effective imagery strategy for promoting athletes' acquisition and performance of individual motor skills, while MG-M imagery may be used to enhance athletes' self-confidence (Munroe et al., 2000). Moreover, Hall et al. (1998) suggested athletes who report using CS imagery most frequently may also use MG-M imagery to increase confidence.

Self-Efficacy

Self-efficacy and self-confidence are two important sport related cognitions that may be highly influenced by imagery use (Short & Short, 2005). Bandura's theory of self-efficacy was developed within the framework of the social cognitive theory (Feltz & Reissinger, 1990). The social cognitive theory states that people have control over and can regulate their thoughts related to motivation, actions, and emotions, rather than the environment having control over such processes. Within the social cognitive theory, self-efficacy addresses the role of people's thoughts relating to themselves and their beliefs, and self-efficacy is the main factor influencing their goal-directed behaviors (Feltz & Reissinger, 1990). Self-efficacy is the thought process involved in mediating a person's self-appraisal, thought patterns, emotional reactions, motivations, and behaviors. Such motivated behaviors and thought patterns are important in sport performance (Feltz et al., 2008). Athletes who have a high self-efficacy are not afraid to pursue challenging goals, cope with pain, and persist through setbacks. Athletes who have low self-efficacy avoid difficult goals, worry about the possibility of injury, expend less effort, and often give up at the first sign of failure (Shaw, Dzwealotwski, & McElroy, 1992).

While the self-efficacy theory was originally developed in a clinical realm, it has been applied to other domains of psychological functioning, including health and exercise behavior (McAuley, 1992b; McAuley & Mihalko, 1998; O'Leary, 1985) and sport and motor performance (Feltz, 1988b, 1994). Moritz et al. (2000) reported, in a meta-analysis, that in the field of sport and motor performance, there are over 200 published papers on self-efficacy.

Efficacy beliefs are not judgments about possessing a set of skills to produce an action, instead they are beliefs of what one can accomplish with those skills (Bandura, 1996). In other words, self-efficacy judgments are about what a person thinks they can do with their skills (e.g., I think I can return the majority of the tennis serves from my opponent) rather than the talent one has (e.g., I have excellent reflexes in tennis). Self-efficacy beliefs can be influenced by multiple sources, such as past performance accomplishments, vicarious experiences, verbal persuasion, and physiological states (Bandura, 1996). Maddux (1995) added mental imagery as another important source of efficacy enhancement. He suggested people can generate efficacy beliefs by imagining themselves or others performing successfully or unsuccessfully.

Past performances have been shown to be the most influential source of efficacy enhancement because they are based on one's own mastery experiences through self-appraisal (Feltz et al., 2008). If the person views these performances as successes, his/her self-efficacy will increase; if the experiences are viewed as failures, there will be a decrease in self-efficacy. Performance accomplishments on difficult tasks, tasks performed without external help, or tasks accomplished with only occasional failures carry greater positive efficacy value than tasks which result in repeated failures without any sign of improvement (Feltz et al., 2008). An athlete's perception of his or her ability as an acquirable skill also has great influence on self-efficacy (Bandura, 1996). For example, athletes who see past performance failures as learning opportunities and believe their performances will improve with practice have a stronger sense of efficacy than those who see mistakes as physical limitations.

Efficacy information can also be derived from observing and comparing oneself with others. This modeling process comes from watching one or more individuals performing and then using that performance to compare and judge oneself (Bandura, 1996; Maddux, 1995). Modeling and social comparison is an effective way to enhance self-efficacy. By watching demonstrations of what the task should look like when done correctly, the observer is receiving instructional information about the task, while also feeling more confident that the task can be done correctly (Lirgg & Feltz, 1991).

Feltz, Short, and Singleton (2008) assessed 22 Division I male hockey players using self-modeling as a tool to increase shooting percentage and self-efficacy. The hockey team was divided evenly into two groups, one experimental and one control group. Each participant was asked to fill out a self-efficacy questionnaire in order to measure confidence in his ability to perform certain shooting skills correctly 100% of the time. The self-efficacy questionnaire and shooting test performance were administered to all participants at the start of the study, which took place three weeks into the hockey season, and then again at two five-week intervals. The experimental group spent one day a week, for 10 weeks, watching a 90-second video of themselves successfully shooting a hockey puck backhand at a target. The 90-second video consisted of multiple successful backhand shots, at the target, from two different camera angles. The control group received no treatment. Results indicated a significant effect between the two groups.

The experimental group showed greater shooting accuracy and higher scores on the shooting self-efficacy questionnaire than the control group.

In order to test the influence of mastery experiences on self-efficacy, sport psychology researchers have sometimes experimentally induced failure or success on participants by manipulating feedback. For example, Weinberg, Gould, Yukelson, and Jackson (1981) manipulated participants' self-efficacy during a leg endurance task in which participants had to hold their leg out in front of them for as long as possible while sitting on a chair. Participants were 96 male and female college students who were randomly assigned to either a high or low self-efficacy condition. Self-efficacy was manipulated by having subjects compete against another participant in the muscular leg endurance task. Unknown to the participants, the person whom they would be competing against was part of the research team. If the participant had been placed in the high-manipulated self-efficacy group, they were told their competition was suffering from a knee injury and had performed poorly on a related task. The participants in the low-manipulated self-efficacy group were told their competition was a member of the varsity track team. Results supported self-efficacy theory with the high-manipulated self-efficacy group extending their leg longer than participants in the low-manipulated self-efficacy group.

Self-Efficacy and Imagery in Sport

Bandura (1996) suggested that positive visualizations enhance self-efficacy by way of preventing negative visualizations in situations where athletes start to question their own abilities. However, Martin et al. (1999) suggested that there is no consistent relationship between imagery use and self-efficacy because participants may not be using the type of imagery that is conducive to enhancing self-efficacy. In order for athletes to use imagery successfully, Denis (1985) recommended that imagery content match the intended outcome. In the case of self-efficacy, imagery will only enhance self-efficacy when the image is associated with success and competence, for example when MG-M is used (Moritz et al., 1996). Results from Feltz and Reissinger (1990) support Denis' (1985) findings. Participants who used MG-M imagery (i.e., imagined themselves feeling competent and being successful) on a muscular endurance task had higher and stronger efficacy expectations for their performance than participants who did not use MG-M imagery.

Feltz and Riessinger (1990) further investigated the effectiveness of imagery and self-efficacy during a competitive muscular endurance task. Participants were placed into one of three groups: mastery imagery plus feedback, feedback alone, or a control group. As students signed up to participate in the study, they were told they would be performing two tasks: the Cybex task and the wall-sit task. The Cybex is an accommodating-muscular-resistance device that provides constant resistance despite the amount of force applied by the user. The wall sit requires the participant to press their back against a wall and slide their body down the wall as if sitting in a chair. The legs of the participant should be at a 90-degree angle and their back completely flat against the wall to perform the task correctly. Participants were also told they would have a partner during the study to encourage competition. Unknown to the participants, the partner assigned to them was part of the research team. Researchers rigged the study so the partner, (researcher) would win every competition against the participant. Each task was performed with the participant and their partner (researcher) on opposite sides of a wall to ensure the participant wouldn't see their partner's performance. The Cybex task was used to manipulate the participants' self-efficacy prior to treatment by having the participants compare their performance on the Cybex machine to their partner's (researcher) better performance. The wall-sit task was used to determine how imagery affected performance. After the Cybex and prior to starting the wall-sit task, participants in the imagery-plus-performance feedback condition listened to a 5-minute audiotape recording of mastery-producing images and then mentally practiced the technique. All participants were given final instructions for the wall-sit task and performed two trials (back-to-back competitions) with their partner (researcher) on opposite sides of a wall partition. After each trial, the participants were told their partner (researcher) had performed better than they had. Despite losing the competition and receiving negative feedback, results showed those participants who were in the imagery plus feedback group increased their self-efficacy after each trial (Feltz & Riessinger, 1990).

More recently, Beauchamp et al. (2002) administered an eight item golf self-efficacy questionnaire and the sport imagery questionnaire to 36 championship varsity golfers. Results indicated a positive relationship between self-efficacy and all types of imagery except MG-A. It was found that MG-M predicted self-efficacy, and self-efficacy predicted performance (Beauchamp et al., 2002). In another golf study, researchers examined the interaction between two imagery functions, CS and MG-M, and two imagery directions, positive and negative, on self-efficacy and golf performance (Short et al., 2002). Participants were placed into one of seven groups: CS and positive imagery, CS and negative imagery, MG-M and positive imagery, MG-M and negative imagery, CS imagery only, MG-M imagery only, no imagery, or a control group.

Overall, golf performance increased with positive imagery use; researchers suggested that imagery function and direction can affect both self-efficacy and performance. Mills et al. (2001) also investigated the relationship between self-efficacy and imagery use by athletes in other individual sports (i.e., rowing, wrestling, and track and field). After administering the Sport Imagery Questionnaire (SIQ) and a self-efficacy questionnaire, researchers found that high efficacious athletes used motivational imagery during competition more than athletes who had low self-efficacy. There was no difference between high-and-low self-efficacy athletes' use of imagery during practice (Mills et al., 2001).

Many additional authors have utilized the Sport Imagery Questionnaire (Hall et al.,1998) in an attempt to answer imagery related research questions, such as the relationship between imagery use and confidence (Abma et al., 2002; Beauchamp, Halliwell, Fournier, & Koestner, 1996; Callow & Hardy, 2001; Mills et al., 2001; Moritz, Hall, Martin, Vadocz, 1996; Short & Short, 2005) and imagery use and self-efficacy (Beauchamp et al., 2002; Cumming, Nordin, Horton, & Reynolds, 2006; Mills et al., 2001; Milne, Hall, & Forwell, 2005; Short et al., 2002; Short et al., 2005). While exploring the relationship between imagery and self-confidence, Callow and Hardy (2001) found that netballers of different skill levels used different types of imagery. Specifically, netballers with the most experience had higher confidence and used more goal achievement imagery, such as MS imagery, than netballers who were less skilled. The lower skilled netballers were less confident and used more imagery dealing with challenging situations (MG-M) and strategies of the game (CG). It was suggested by the authors that lower skilled netballers used MG-M because it gave them the confidence to see themselves mastering challenging situations.

Mills et al. (2001) investigated the relationship between imagery and self-efficacy by assessing the self-efficacy of athletes in both training and competition settings. The Sport Imagery Questionnaire and a Self-Efficacy Questionnaire were administered to 50 male and female athletes. The authors found that athletes who were high in competition self-efficacy used all functions of motivational imagery (i.e., MS, MG-A and MG-M) more than athletes who were low in competition self-efficacy. When it comes to developing, maintaining, or regaining self-efficacy in competition, the imaging of mastery experiences, arousal, stress related to competition, and staying focused on competition goals are likely more important than imaging specific sport related skills or strategies (Mills et al., 2001). In short, it appears that athletes who use imagery, particularly MG-M, perform better and have higher self-efficacy.

Cycling

Cyclists, like other athletes, demand peak performance, require many hours of training on and off the bike, and need motivation and confidence to meet their goals to be competitive in a sport that is very mentally challenging. Cyclists thus might engage in cognitive imagery to aid in learning and performing skills (i.e., CS imagery) and race day plans (i.e., CG imagery). In addition to the cognitive functions, cyclists may engage in motivational imagery to build or maintain confidence (i.e., MG-M imagery), regulate anxiety and arousal levels (i.e., MG-A imagery), and image the achievement of goals (i.e., MS imagery). Since research has shown a relationship between imagery use and self-efficacy, cyclists who use imagery may have high self-efficacy. Since self-efficacy has also been linked to performance, it is possible that cyclists' who use imagery will also have better performance. Because of the importance of this relationship, there is an obvious need to understand the mental processes that cyclists' use to build self-efficacy and future success.

Conclusions

There is an extensive body of research supporting the use of mental imagery as a performance enhancing technique for athletes. Using Paivio's (1985) framework as a guide, Hall et al. (1998) developed the SIQ, which assesses athletes' use of five functions of imagery (CS, CG, MS, MG-A, MG-M). Athletes who display high self-efficacy perform better than their low self-efficacy counterparts (Mills et al., 2001), and athletes who possess higher self-efficacy often initiate and persist in performance situations. Lastly, self-efficacy and imagery use, specifically MG-M imagery, has been highly correlated with athletic performance.

CHAPTER 3

METHODS

The purpose of this study was to examine the relationship between self-efficacy and the use of imagery by cyclists who completed at least four, 65-mile bike rides during the 2009 cycling season. This chapter includes a discussion about the participants, design and protocol, instrumentation, and statistical analysis.

Participants

Subjects ($N = 20$) were male ($n = 15$) and female ($n = 5$) cyclists who voluntarily participated in this study with an average age of 28.6 years. Ten subjects resided in Santa Fe, NM, six subjects lived in Ithaca, NY, and one each from Baldwinsville, NY, Hampton Bays, NY, Rochester, NY, and Las Cruces, NM. It was required that all subjects completed at least four, 65-mile bike rides during the 2009 cycling season (February 14th- September 14th). Five participants completed between four and six, 65-mile rides and 15 participants completed more than ten 65-mile rides. Twelve of the cyclists were competitive cyclists. Of the 12 participants with a USA Cycling license, two raced as a category two, two as a category three, six as a category four, and one participant raced at the masters (age specific) level. The other nine cyclists rode for exercise and the pleasure of riding.

The 10 participants from Santa Fe, NM, were all part of the same bicycle racing team and were recruited through the team. The lead researcher attended a team meeting and was given permission to explain the study to team members and ask for volunteers. Other participants who were known by the researcher were recruited via e-mail sent by the researcher asking for volunteers to participate in the study. Four participants responded to the e-mail willing to participate. The final six participants were recruited during a local sanctioned ride for a large group of cyclists in Ithaca, NY.

Design and Protocol

A descriptive correlation research design was followed. After participants were briefed about the study and agreed to participate, they were asked to fill out a research packet which included: the Informed Consent Form (Appendix A), a Demographic Form (Appendix B), the Sport Imagery Questionnaire (SIQ) (Appendix C), and the Cycling Self-Efficacy Questionnaire (CSEQ) (Appendix D).

Cyclists who agreed to participate in the study (in person) were given a packet containing the Informed Consent Form, Demographic Form, SIQ, and CSEQ along with instructions on how to fill out each questionnaire and return it to the researcher. Participants contacted via the Internet were sent an e-mail packet and attachment containing the informed consent form, demographic form, SIQ, and CSEQ. These participants were instructed to print out the packet, fill it out, and mail it back to the researcher; or scan it and e-mail it back to the researcher.

Because the study was conducted after the 2009 cycling season, participants had to retrospectively think back to their 65-mile bike rides when filling out the Sport Imagery and Cycling Self-Efficacy Questionnaire. Research by Cumming and Hall (2002a) supports the use of retrospective assessments of imagery use among competitive athletes. In addition, researchers in other areas of sport psychology have successfully used retrospective recall while examining cognitions and emotions such as anxiety experienced before and during competition (Friedman, 1993; Shiffman, 1997).

Instrumentation

Sport Imagery Questionnaire

The Sport Imagery Questionnaire (SIQ: Hall et al., 1998) was developed to assess the extent to which athletes use imagery in their training. The questionnaire contains 30-items that ask participants to rate, on a Likert scale ranging from 1 (never) to 7 (often), how often they engage in five different functions of imagery: Cognitive General (CG; e.g., imagining routines and strategies), Cognitive Specific (CS; e.g., imagining perfectly executed skills), Motivational General-Mastery (MG-M; e.g., imagining staying focused and working through problems), Motivational General-Arousal (MG-A; e.g., imagining the arousal, stress, and anxiety that may accompany performance), and Motivational Specific (MS; e.g., imagining specific goals and outcomes). The SIQ has been shown to be a valid and reliable instrument with acceptable internal consistency, alpha coefficients for the five subscales ranging from .70 to .88 (Hall et al., 1998). The SIQ is scored by calculating mean values of six items in each of the five sub-scales. A low score indicates infrequent use of the imagery type being questioned.

Self-Efficacy Questionnaire

Currently, there are no existing instruments that assess cyclists' self-efficacy. Therefore, for the purpose of this study, a Cycling Self-Efficacy Questionnaire was developed in accordance with Bandura's (1996) suggestions and using Moritz et al. (2000) as a guide. Moritz et al. (2000) recommended that perceptions of self-efficacy be directed at specific skills required for completing a performance. Self-efficacy questionnaires are designed specific to a population and purpose of testing. Content validity and wording of the CSEQ were evaluated by three cycling experts in accordance with Bandura (1996) and Moritz et al. (2000) and modifications were made until the experts were satisfied with the questionnaire. The final 18-item questionnaire asks participants to rate, on a scale from 0 (cannot do at all) to 100 (highly certain I can do), how certain they are that they can complete a 65-mile bike ride under a variety of realistic cycling situations. The CSEQ was scored by averaging the responses to each item; a low score indicates low self-efficacy and a high score indicates high self-efficacy.

Statistical Analysis

Descriptive statistics were calculated for each of the five SIQ subscales. Means and standard deviations for the entire sample, including CSEQ means and standard deviations, were calculated. To determine if cyclists used imagery, the SIQ scores were compared to a value of four on the 1-7 Likert Scale with one-sample t-test for each sub-scale. On the SIQ, the value of four on the Likert Scale is defined as using imagery "sometimes." A one-way repeated measures ANOVA was used to determine if MG-M imagery was used more than the four other types of imagery. Alpha level was set at 0.05 for all tests. Significant effects were further evaluated post-hoc using a multiple pair wise comparison with a Bonferonni adjusted alpha level of 0.01. Finally, a multiple linear regression analysis was used to assess if the five types of imagery were predictors of cyclist's self-efficacy.

CHAPTER 4

RESULTS

The purpose of this study was to examine the relationship between self-efficacy and the use of imagery by cyclists who completed at least four 65-mile bike rides during the 2009 cycling season. Results collected from statistical analysis are provided. Specific subsections include: imagery, motivational general-mastery imagery use by cyclists, and the relationship between imagery and self-efficacy.

Imagery

Imagery use for the five subscales ranged from a mean value of 5.92 (MG-M) to 3.74 (MS) (Table 1). Five one-sample t-tests were used to determine if participants used imagery more than "sometimes" during 65-mile bike rides by comparing their imagery subscale scores to a value of four on the SIQ 1-7 Likert Scale. Results of the one-sample t-tests showed that cyclists used CS, CG, MG-M, and MG-A imagery more than sometimes during 65-mile bike rides. MS with a mean score of 3.74 (SD = 1.15) was not statistically significant (p = .43), indicating that it was not used more than sometimes.

Motivational General-Mastery Imagery Use by Cyclists

The use of motivational general-mastery imagery by cyclists, in comparison with the other four types of imagery, was analyzed using a one-way repeated measures ANOVA. Due to a violation of sphericity, a Greenhouse-Geisser correction was used to adjust the F-statistic and the degrees of freedom, $F(2.219, 42.155) = 22.032$, $p < .001$ (Table 2). Post-hoc analysis revealed that cyclists use MG-M imagery more than the four other types of imagery on 65-mile bike rides (Table 3).

Table 1

Means and Standard Deviations for SIQ and CSEQ Scores

Variable	Mean	SD	Alpha	t	*p*-Value
SIQ 7 Point Scale					
Cognitive Specific (CS)	5.13	.95	.743	5.33	<.001
Cognitive General (CG)	5.17	1.15	.790	4.54	<.001
Motivational Specific (MS)	3.74	1.43	.870	-.806	.43
Motivational General-Mastery (MG-M)	5.92	.65	.664	13.72	<.001
Motivational General-Arousal (MG-A)	5.07	.93	.696	5.14	<.001

Table 2

One-Way ANOVA

	SS	df	MS	F	*p*
SIQ Subscales	47.62	4	11.9	22.03	0.001
Error	41.05	42.155	0.974		

Table 3

Pairwise Comparisons Between MG-M and the Four Other Types of Imagery

		Mean Difference	SE	*p*
MGM	CS	.702	.125	.001
	CG	2.081	.288	.001
	MS	.501	.101	.037
	MG-A	.759	.144	.001

Self-Efficacy

A Cycling Self-Efficacy Questionnaire (CSEQ) was developed for the purpose of the current study in accordance with Bandura's (1996) suggestions and using Moritz et al. (2000) as a guide. Participants CSEQ scores were very high: two scored 100, 11 scored between 90 and 99, four scored between 80 and 90, and three scored between 70 and 80 the mean score was 90.47 (SD = 9.09).

Relationship Between Imagery and Self-Efficacy

In order to determine if cyclists' self-efficacy was influenced by their use of imagery, a backward regression analysis was used with self-efficacy as the dependent variable and the 5 sub-scales of imagery as the independent variable. All five subscales were entered into the regression and removed one-by-one to find the best combination of imagery and self-efficacy. No combination of any imagery dependent variable successfully predicted self-efficacy.

CHAPTER 5

DISCUSSION

Imagery research within sport psychology has focused primarily on the use of imagery for learning a skill and enhancing performance. While there is evidence suggesting that imagery enhances self-confidence and self-efficacy, and that imagery is popular among athletes, imagery use by cyclists has yet to be researched. The purpose of this study was to examine the relationship between self-efficacy and the use of imagery by cyclists who completed at least four, 65-mile bike rides during the 2009 season.

Imagery

Results from the current study indicate that, like many athletes, cyclists do use imagery for a variety of reasons during 65-mile bike rides. Research suggests factors such as competitive level, type of sport, time of season, and gender differences influence athletes' imagery use (Arvinen-Barrow, Weigand, Thomas, Hemmings, & Walley, 2007; Beauchamp et al., 2002; Callow & Hardy, 2001). For example, the type of imagery used during a training phase depends on the focus of the training program and the athlete's level of skill acquisition (Martin & Hall, 1995; Murphy, 1994). For example, novice athletes tend to use imagery which primarily focuses on learning new sport skills and strategies, as well as acknowledging and correcting performance errors (Martin et al., 1999). For the novice athlete, cognitive imagery seems appropriate. Once an athlete has obtained the required sport skills and knowledge, training will likely transition into performing the skills in competitive situations. This is the phase in which athletes tend to use more motivational imagery (Martin et al., 1999). In the current study, MG-M imagery was used more than the four other types of imagery. Subjects in the current study were all seasoned cyclists with experience riding 65-miles or more. While all the participants were familiar with riding 65-miles on a regular basis, eight of the participants were recreational the other 12 were competitive cyclist. Having both competitive and recreational cyclists could be a confounding variable in the current study due to the nature of recreational and competitive athletes using imagery for different reasons. However, despite the two types of athletes, motivational imagery was used more than cognitive imagery across all cyclists. Hall, Rodgers, and Bar (1990) suggested that competitive athletes make more of a commitment to their sport than a recreational athlete would, and because of their commitment they set winning as a goal where the recreational athlete is more likely to play for fun and fitness and does not set winning as a priority. While both groups of cyclists in the current study used MG-M imagery, they may have had different reasons for using motivational imagery.

In the current study cyclists use MG-M imagery more than the other types of imagery; additionally, results showed that MG-A was the second most used type of imagery by the cyclists. Munroe, Hall, Simms, and Weinberg (1998) suggested frequent use of MG-M and MG-A imagery types, both early and late in athletic seasons due to the nature of these imagery types (e.g., being mentally tough and coping with stress). These same authors found that CS imagery was used throughout the season to help athletes stay focused on the current task, both in training and competition. In addition, CG imagery use likely increases later in a season as sport strategies further develop. Most athletes increase their use of MS imagery once their competitive season begins. This may be due to the fact that MS imagery primarily involves seeing oneself winning, finishing first, or standing on a podium (Munroe et al., 1998). The cyclists in the current study completed the questionnaire packets early in their cycling season, which might have also contributed to the high MG-A and MG-M imagery use.

Self-Efficacy

For the purpose of the current study, cyclists from a variety of backgrounds with varying skill levels were asked to rate how confident they were at completing a 65-mile bike ride under many different circumstances. Similar to other studies assessing athletes' self-efficacy, the cyclists in the current study scored very high on the Cycling Self-Efficacy Questionnaire (M = 90.47). Feltz et al. (2008) suggest interviews and open-ended surveys with athletes about the sport before constructing the questionnaire in order to identify the appropriate gradations of challenge which efficacy judgments are made to avoid ceiling effects in the questionnaire. In the current study, content validity and wording of the CSEQ was evaluated by three expert cyclists and modifications were made until the experts were satisfied in accordance with Bandura's (1996) suggestions and using Moritz et al. (2000) as a guide. The questions were deemed appropriate and relevant to successfully finishing a 65-mile bike ride. The high scores for all cyclists created a ceiling effect.

While self-efficacy was not measured effectively in this study, all cyclists had high levels of self-efficacy. The research on athletes' self-efficacy beliefs has shown self-efficacy to be a reliable predictor of sport performance and useful in combination with other cognitive and training variables in accounting for performance variance (Feltz & Lirgg, 2001). For example, Garza and Feltz (1998) used mental practice techniques in an effort to enhance self-efficacy beliefs, competition confidence, and performance ratings of competitive figure skaters. Junior figure skaters, who were all members of the

United States Figure Skating Association, were randomly assigned to one of two mental training interventions: drawing one's freestyle routine on paper or walking through the routine. A third stretching control group also existed. Self-efficacy was measured by constructing individualized figure-skating self-efficacy scales to emphasize the skaters' current skating ability concerning jumps, spins, and steps/connecting moves. Results showed both mental training groups significantly improved their performance ratings and their competition confidence compared to the control group.

Imagery and Self-Efficacy

Results from the current study indicate no relationship between imagery use and self-efficacy by cyclists, which could be the result of a diverse population of competitive and recreational cyclists, the small sample size of participants or the small range (29.44) of self-efficacy scores which created a ceiling effect. Perhaps if one group (recreational or competitive) were chosen for the purpose of this study, the results would be different because the two groups of cyclists may be using imagery for a variety of purposes. In short, the small sample size likely impacted the findings and the relationship between imagery and self-efficacy.

Despite the lack of a significant correlation in this study, there is however, a plethora of research using athletes from other sports that shows a relationship between imagery and self-efficacy, specifically MG-M imagery (Beauchamp et al., 2002; Feltz & Ressinger, 1990; Jones, Bray, Mace, MacRae, & Stockbridge, 2002; Munroe-Chandler et al., 2008; Vealey, 2001). Feltz and Ressinger (1990) first found motivational imagery (specifically motivational-general mastery imagery) to have a positive relationship with self-efficacy in their muscular endurance study. Beauchamp et al. (2002) also found that self-efficacy was significantly related to motivational general-mastery imagery, which was consistent with the notion that athletes who are highly efficacious make more frequent use of MG-M imagery than do those who are less efficacious. Bandura (1996) stated that a person with a high sense of personal efficacy fosters imagery use, which in turn enhances subsequent performance. Beauchamp and colleagues also pointed out that MG-M imagery was the mediating variable between imagery and self-efficacy. Motivational general-mastery imagery is imaging oneself being mentally tough, confident, and focused. While athletes may use many different types of imagery, either before or during performance, the impact self-efficacy has on performance is influenced by the extent to which that person visualizes him/herself being mentally tough, confident, and focused.

Researchers such as Jones et al. (2002) and Beuchamp et al. (2002) also measured the performance outcomes of their participants, which is important in understanding if athletes' imagery use is positively influencing performance. In both studies, participants were required to complete questionnaires immediately following the completion of a competition. In contrast, participants in the current study were asked to think retrospectively about their imagery use during the past cycling season. Thus, the lack of a relationship between self-efficacy and imagery could have been influenced by the timing of the questionnaire in relation to the cyclist's performance (i.e., participating in the study at the beginning of the cycling season and thinking about their imagery use during the previous season). In addition, performance outcome was not an important aspect of this study since not all participants were competitive cyclists and those who were competitive cyclists competed in different categories.

Other researchers such as Jones et al. (2002) used an imagery script to help participants focus on using MG-M imagery and MG-A imagery throughout performances. Since past research has shown MG-M to be an efficacy enhancing source, using an imagery script might be a critical component to enhancing athletes' self-efficacy. For the purposes of this study, an imagery script was not used because the researcher was not interested in using imagery to enhance performance but rather to determine if imagery use was related to self-efficacy.

Munroe-Chandler, Hall, & Fishburne (2008) found that MG-M imagery use was as high in recreational athletes as it was with competitive athletes. The authors noted that because recreational athletes do not have competition experience, they rely more on vicarious experiences to enhance their self-efficacy beliefs. In contrast, competitive athletes rely more on their mastery experiences to enhance their self-efficacy. Moreover, research has suggested that self-confidence is crucial to all athletes' development, regardless of competitive level (Vealey, 2001).

However, research showing no relationship between imagery and self-efficacy does exist (Martin & Hall, 1995; Woolfolk et al., 1985). In these studies researchers examined only the relationship between cognitive-imagery and self-efficacy, not motivational imagery and self-efficacy. Subjects were 39-college age, "absolute beginners" in golf who were randomly assigned to one of three conditions (performance and outcome imagery, performance imagery, or control). The experiment was divided into two phases: Sessions 1, 2, and 3 were "learning oriented" and sessions 4, 5, and 6 were "performance oriented." Subjects were told that the purpose of the study was to examine the effects of training on the learning and performance of a novel task. The first three performances were devoted to training and the last three focused on performance. Results showed that despite negative feedback, participants using imagery were more motivated to practice their swing and use imagery during the sessions than control subjects. However, those participants in the imagery group were no more efficacious than the control group.

Despite the results of the current study showing no relationship between imagery use and self-efficacy in cyclists, results did show that cyclists use imagery during 65-mile bike rides (specifically MG-M imagery) and have a high self-efficacy about finishing a 65-mile bike ride. These results are consistent with Bandura's (1996) theory stating that self-efficacy and mastery imagery use complement each other. More specific, athletes' pre-competition preparation using motivational general-mastery imagery should foster positive self-efficacy beliefs. Feltz et al. (2008) stated that a ceiling effect is possible when high-level athletes score on the upper-end of self-efficacy questionnaires which is what happened in the current study. There was no way to determine if a relationship exists between imagery and self-efficacy when all cyclists scored high on the CSEQ. The current study adds to past theory and research indicating that the relationship between self-efficacy and imagery use is not as straight forward, or obvious as it might appear.

CHAPTER 6

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

Summary

This study examined the relationship between self-efficacy and the use of imagery by cyclists who rode in at least four 65-mile bike rides during the 2009 cycling season (February 14th - September 14th). Male and female cyclists ($N = 20$) volunteered and completed the Sport Imagery Questionnaire (SIQ) and the Cycling Self-Efficacy Questionnaire (CSEQ).

Five one-sample t-tests were used to compare participants' responses from the SIQ to a value of four (anything less than 4 meant they used no imagery at all). A one-way ANOVA was used to determine participants' use of MG-M imagery compared to the other four types of imagery. Finally, a multiple regression analysis was used to assess imagery influence on self-efficacy.

Results indicated that cyclists did use imagery more than sometimes on 65-mile bike rides and MG-M imagery was used more frequently than other types of imagery. However, no relationship was found between imagery and self-efficacy in cyclists, likely due to a ceiling effect with the CSEQ.

Conclusions

Results of this study support the following conclusions:

1. Cyclists do use imagery during 65-mile bike rides.
2. Cyclists use MG-M imagery more than the four other types of imagery (CS, CG, MS, or MG-A).

3. Self-efficacy as measured by the CSEQ was very high which made it impossible to see if a relationship exists between imagery and self-efficacy.

Recommendations

Recommendations for future research include:

1. Developing a CSEQ with enough gradations of difficulty to detect subtle differences in confidence to better assess cyclists self-efficacy.
2. Testing a specific population (e.g., a cycling team or club) only. This would allow the researcher to focus primarily on racing or casual exercisers, which might provide more detailed results about imagery use by cyclists and allow for the CSEQ to be measured more effectively.
3. Testing the cyclists during their cycling season rather than right before their season starts, allowing them to think about their current imagery use rather than retrospectively.
4. Testing a larger sample size of cyclists. Using more than 20 cyclists might allow researchers to better understand the relationship between cyclists' imagery use and self-efficacy.

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APPENDIX A

Informed Consent Form

1. Purpose of the Study
   The purpose of this study is to assess the relationship between self-efficacy and the use of imagery by cyclists who have completed a 65-mile bike ride during the 2009 cycling season.

2. Benefits of the Study
   This study should provide information about the relationship between self-efficacy and the use of imagery by cyclists who have completed a 65-mile bike ride. Cyclists, coaches, and sport psychology professionals may find the results beneficial when designing specific physical and mental training programs for cyclists. By participating in this study, you may also benefit by better understanding your own self-efficacy as it relates to your cycling performance.

3. What You Will Be Asked to Do
   You will be asked to fill out a questionnaire concerning the type and frequency of imagery you typically use, or have used, in previous 65-mile bike rides. In addition you will be asked to fill out a second questionnaire concerning your self-efficacy in relation to completing a 65-mile bike ride.

4. Risks
   There are no risks to you by participating in this study.

5. If You Would Like More Information about the Study
   Please feel free to contact the primary investigator, Colleen Sager at csager1@ithaca.edu or (505) 699-9397.

6. Withdrawal from the Study
   You may withdraw from the study at anytime without penalty.

7. How the Data will be Maintained in Confidence
   Your name will only be required on the informed consent form. Other paperwork that will be completed for this study will not require your name. Your participation will be kept confidential and your responses anonymous. The informed consent form will be kept in a secure location only accessible by the primary investigator.

I have read the above and I understand its contents. I agree to participate in this study. I acknowledge that I am 18 years of age or older.

I, ___________________________________ wish to participate in the following study:

"A study assessing cyclists' experiences using imagery to enhance self-efficacy"

____
Print name of participant

_____________________________________ ___________________
Participant's signature Date

APPENDIX B

Demographic Form

Please take a minute to complete the following form. Your name is not required. This is simply a way to get information about the cyclists who are participating in this study. Thank you for your time.

Male______ Female______

Age______

City currently residing:

When did you first start riding?

On average, how many months per year do you ride your bike?

On average, how many miles do you ride your bike:

Per week? __________

Per day? __________

Why do you ride (e.g., pleasure, exercise, a social aspect etc.…)?

Are you a competitive cyclist? ______ If so, what category are you? ______

How many 65-mile bike rides did you complete in the 2009 cycling season?

1-3_______ 4-6_______ 7-10_______ More than 10______

APPENDIX C

Sport Imagery Questionnaire
(Adapted from Hall, Mack, Paivio & Hausenblas, 1998)

Please rate yourself (on a scale from 1 – 7) in terms of how often you use the type of imagery implied in each item.

1	2	3	4	5	6	7
Never			Sometimes			Always

	Frequency (1 - 7)
I imagine alternative strategies in case my race/casual ride plan fails.	________
I imagine other cyclists congratulating me on a good performance.	________
I imagine myself being in control during difficult situations.	________
When I imagine a competition, I feel myself getting emotionally excited.	________
I make up new plans/strategies in my head.	________
When I imagine a race/casual ride in which I am to participate, I feel anxious.	________
I can easily change an image of a skill.	________
I imagine each section of a race/casual ride (e.g., staying with the group, climbing strong, sprinting).	________
I imagine myself winning a medal.	________
I can mentally make corrections to physical skills.	________
I imagine myself being interviewed as a champion.	________
When imaging a particular skill, I can consistently perform it perfectly in my mind.	________
I imagine the atmosphere of receiving a medal (e.g., the pride, the excitement, etc.).	________
I imagine the excitement associated with others competing.	________

I imagine myself continuing with my race/casual ride plan, even when performing poorly. ________

I can re-create in my head the emotions I feel before I compete/ride casually. ________

I can consistently control the image of a physical skill. ________

I imagine executing entire ride plan or attacks just the way I want them to happen in a race/casual ride. ________

Before attempting a particular skill, I imagine myself performing it perfectly. ________

I imagine myself to be focused during a challenging situation. ________

I imagine the stress and anxiety associated with competing. ________

I imagine myself working successfully through tough situations (e.g., staying at the front of the group, chasing and catching up with an attack, riding strong up hill with a headwind). ________

I imagine myself handling the stress and excitement of competition and remaining calm. ________

I imagine the atmosphere of winning a championship (e.g., the excitement that follows winning, etc.). ________

I imagine myself being mentally tough. ________

When learning a new skill, I imagine myself performing it perfectly. ________

I imagine giving 100% during a race/casual ride. ________

I imagine myself successfully following my ride/attack plan. ________

I imagine myself appearing self-confident in front of my opponents. ________

I imagine the audience applauding my performance. ________

APPENDIX D

Cycling Self-Efficacy Questionnaire
(For cyclists' riding 65-miles or more)

A number of situations are described below that can make riding a bike 65-miles a difficult task. Please rate (in each of the blanks on the right column) how certain you are that you can finish a 65 + mile bike ride given the circumstances presented below.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
I Cannot do at all				Moderately Certain I can do						Highly Certain I can do

How confident are you about finishing a 65-mile bike ride:	**Confidence (0-100)**
1. While keeping appropriate form on the bike, (i.e., in an effort to eliminate soreness the following day)?	________
2. While losing appropriate form (i.e., shoulders tense, back sore etc.)?	________
3. When riding alone?	________
4. When riding with and keeping up with a group of people?	________
5. Two days in a row?	________
6. More than four days a week?	________
7. In 3.5 - 4 hours?	________
8. In 4.5 – 5 hours?	________
9. When climbing is involved?	________
10. When climbing is not involved?	________
11. When sprinting is involved?	________
12. When sprinting is not involved?	________
13. With a headwind for half the ride?	________
14. With a headwind for the entire ride?	________
15. With no headwind during the ride?	________
16. With appropriate attire on?	________
17. With inappropriate attire on?	________
18. When you have necessary equipment (e.g., food, water, tools to change a flat tire, etc.)?	________