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PSYCHOLOGICAL SKILLS, COACHING, AND PERFORMANCE OF CYCLO-
CROSS ATHLETES

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Grant Harrison

College of Science and Health
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PSYCHOLOGICAL SKILLS, COACHING, EXPERIENCE AND PERFORMANCE OF
CYCLO-CROSS ATHLETES

By Grant Harrison

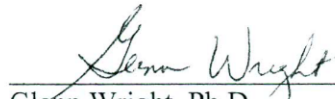
We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Science (MS) in Exercise Sport Science - Human Performance degree.

The candidate has completed the oral defense of the thesis.




Teresa Hepler, Ph.D.
Thesis Committee Chairperson

5-16-13
Date



Glenn Wright, Ph.D.
Thesis Committee Member

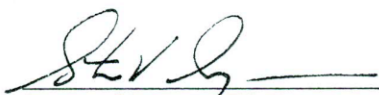
5-16-13
Date



Richard Mikat, Ph.D.
Thesis Committee Member

5-16-13
Date

Thesis accepted



Steven Simpson, Ph.D.
Graduate Studies Director

7/25/13
Date

ABSTRACT

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Psychological skills have been shown to predict performance in many types of athletes (Hayslip, Petrie, MacIntire, & Jones, 2010; Krane & Williams, 2006; Kruger, 2010; MacNamara, Button, & Collins, 2010), as coaching can positively influence performance in athletes. (Amorose, and Horn, 2000; Gould, Medbery, Damarjian, and Lauer, 1999; Rieke, Hammermeister, & Chase, 2008). In cycling sports there is often an absence of coaching throughout all levels of competitor, which requires further analysis of how a coach may be contributing to the success of cycling sport athletes. The purpose of this study was to explore the influence of psychological skills, coaching, and cycling experience on the performance of Cyclo-cross athletes. Participants in this study (n = 107) were athletes competing in the 2013USA Cycling National Championships. The results of this study support that goal-setting and frequency of communication with a coach indicates better performances. The results also show that a level of worry was experienced in the higher performing athletes, yet no other psychological skills were predicted by the presence of a coach. These findings support the need for coaches to work more closely with their athletes to strengthen other psychological skills traits, potentially contributing to performance.

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CHAPTER I

INTRODUCTION

Psychological skills, also referred to as mental skills, have been shown to predict performance in many types of athletes (Hayslip, Petrie, MacIntire, & Jones, 2010; Krane & Williams, 2006; Kruger, 2010; MacNamara, Button, & Collins, 2010). Though physical ability plays a large role in sport performance, it also important to investigate how psychological skills may influence one's ability to perform. Psychological skills can contribute to performance as attributes that an individual possesses such as mental preparation, anxiety coping, confidence, concentration, and motivation (Ebben & Gagnon, 2012; Sheard & Golby, 2006), but may also contribute through active processes such as goal setting, relaxation, imagery, and self-talk (Thelwell & Greenlees, 2001; Weinberg, Miller, & Horn, 2012). Of the major factors that contribute to psychological skills, research supports that coaching can positively influence and foster improved performance in athletes. (Amorose, and Horn, 2000; Gould, Medbery, Damarjian, and Lauer, 1999; Rieke, Hammermeister, & Chase, 2008). However, in cycling sports there is often an absence of coaching throughout all levels of competitors as many athletes rely on their own training regimen to improve and succeed. Coaches serve athletes by providing training structure and methods of goal-setting seem to play an important role in coaching. (Locke, Shaw, Saari, & Latham, 1981; Locke and Latham, 1985; Simões, Vasconcelos-Raposo, Silva, & Fernandes, 2012; Tenenbaum, Pinchas,

Elbaz, Bar-Eli, & Weinberg, 1991; Vasconcelos-Raposo, 2001. In addition to coaching, a level of experience in the sport also seems to be a necessary component in order to achieve success (Ericsson, Krampe, & Tesch-Römer, 1993). The unique relationship between psychological skills, coaching, experience, and performance of high-intensity endurance athletes, warrants in-depth investigation of which factors are likely to contribute the most to performance.

Cyclo-cross is a discipline of competitive cycling that requires the athlete to perform near maximal efforts for about one hour. These high-intensity endurance races elicit similar physiological responses to swimming, running, and other disciplines of cycling. The terrain in a Cyclo-cross race is highly variable and could include flat or hilly sections of pavement, gravel, mud, snow, sand, and natural and man-made barriers. A unique aspect about the sport is that the race is designed to have sections where a competitor must dismount their bicycle to run up stairs, jump over barriers, or otherwise navigate difficult terrain. These challenging aspects to the sport are widely accepted and even sought after by Cyclo-cross race promoters. Due to the intense physical demands, changing terrain, and often inclement weather and conditions, the nature of the sport is such that it begs the question that possessing strong psychological skills is not only helpful, but necessary to succeed in the sport.

Another element to the sport is that not all athletes have coaches. For instance, it is common for some amateur-level athletes to have a coach, yet other amateur and even many elite riders do not have coaches. This unique aspect of Cyclo-cross and other disciplines of cycling raise the question of how much coaching can contribute to the development and success of an athlete. Though there is no shortage of information

available to competitive cyclists through books, the internet, or other athletes, the role of a coach in cycling sports seems to be more than providing training program design, data analysis, or passing down acquired knowledge of the sport. A factor that seems equally, if not more important, is the role a coach may play in providing a framework for the acquisition and use of psychological skills. Expanding knowledge of this topic could give coaches a better idea of how they can better serve their athletes to be more skillful psychologically, and in turn have better performances.

Though there is an undeniable contribution a coach may have in fostering the development of an athletes' physical and psychological skills, it seems necessary for an athlete to demonstrate a high level of commitment to be successful in sport. This commitment was hypothesized to be marked not only by experience but also by performance. Having measured the effect of years coached, and years of continuous experience on Cyclo-cross experience, it was expected that these variables would significantly impact performance.

Therefore, the purpose of this study was to examine the relationship between psychological skills, coaching, and performance of Cyclo-cross athletes competing in a major event. Another aim of this study was to examine whether or not formal coaching in the sport may contribute towards the psychological skill-sets of Cyclo-cross athletes. Of the athletes who are coached, this study also sought to examine how the frequency of communication with a coach relates to performance. Accordingly, this study examined the various relationships between psychological skills, coaching, and performance in Cyclo-cross.

The study was conducted based on the following hypotheses:

H1: Psychological skills, coaching, and experience will be positive predictors of race performance.

H2: Athletes who currently have a coach will have stronger psychological skills than those who do not have a coach.

H3: For those athletes who have a coach, frequency of communication with a coach will positively influence performance.

Limitations

Although athletes competed in a National Championship event, many elite athletes indicated a higher importance on the Cyclo-cross World Championships to be held approximately three weeks later. The sample size was relatively small, only collecting responses from 125 out of 1196 total registrations at the Cyclo-cross National Championships. Participants in this study were assessed on the performance of only one race. Multiple performances may provide a more accurate representation of skills.

Delimitations

The delimitations of this study helped ensure that many of the assumptions came to full fruition, and that the limitations are minimized as much as possible. No participants from vulnerable populations participated. All participants were 18 years of age or older. Competitors must have placed a high importance on competing in the event, therefore, those who answered lower than 2 out of 10 in commitment to Cyclo-cross Nationals, were identified as outliers and thus removed from statistical analysis. Being that there were multiple events for which many competitors could compete in, competitors were asked of their event of their highest priority event. Given that several senior categories contained very few competitors, athletes who competed in events in which fewer than 10 people starting the race were excluded from analysis.

Definition of Terms

Coached:

Coaching or coached refers to whether or not an athlete is currently working with another person to guide training and competitions.

Commitment to training:

Asks the athlete of his/her commitment to training on a 10 point scale.

Commitment to competing in the discipline of Cyclo-cross: Asks the athlete of his/her commitment to the discipline on a 10 point scale.

Commitment/ Importance of competing in Cyclo-cross National Championships:

Asks the athlete of his/her commitment to Cyclo-cross Nationals on a 10 point scale.

Cycling experience:

Participants were asked of their continuous experience in competitive cycling. The data was categorized as such: less than 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, or more than 10 years.

Cyclo-cross:

A discipline of cycling sanctioned by the Union Cyclist International (UCI) and USA Cycling (USAC)

Cyclo-cross experience:

Participants were asked of their continuous experience in the discipline of Cyclo-cross. The data was categorized as such: less than 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, or more than 10 years.

Elite athletes:

Men or women competing in Pro/1/2, UCI/ Elite category races

Frequency of communication:

A categorical variable expressing how often coached athletes communicate with their coach. Categories were: Never, Less than once/month, Once/month, 2-3 times/month, Once/week, 2-3 times/week, Daily

Importance of frequent communication with a coach:

Participants' were asked to rank their importance of frequent communication with a coach, measured on a 1-10 Likert scale.

Performance:

Performance in this study was evaluated by a competitors' percentage of placing, relative to other competitors in their highest priority race. This number was calculated by taking their placing and dividing it by the total number of competitors in their race. A lower number indicates a better performance.

Psychological skills: Psychological skills in this study were defined by the ACSI-28 (Athletic Coping Skills Inventory-28) and its' seven subscales (Smith & Christensen, 1995).

The subscales are the following:

Coachability: Open to and learns from instruction; accepts constructive criticism without taking it personally and becoming upset.

Concentration: Not easily distracted; able to focus on the task at hand in both practice and game situations, even when adverse or unexpected situations occur.

Confidence & Motivation: Is confident and positively motivated; consistently gives 100% during practice and games and works hard to improve his skills.

Coping with Adversity: Remains positive and enthusiastic even when things are going badly. Remains calm and controlled and can quickly bounce back from mistakes and setbacks.

Freedom from Worry: Does not put pressure on himself by worrying about performing poorly or making mistakes; does not worry about what others will think if he performs poorly.

Goal setting & mental preparation: Sets and works toward specific performance goals.

Peaking under pressure: Is challenged rather than threatened by pressure situations and performs well under pressure; a clutch performer.

Years coached:

If coached, participants were asked to report the duration of their coaching relationship. The data was categorized as such: less than 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, or more than 10 years.

Years coached past:

If coached in the past but not currently, participants were asked to report the duration of their coaching relationship. The data was categorized as such: less than 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, or more than 10 years.

CHAPTER II

REVIEW OF LITERATURE

Psychological Skills as Contributors to Performance

Endurance event performance is largely a function of exercise capacity, yet there are many other factors outside of physical ability that may contribute to a successful performance. Because the outcome or performance is many times not the direct result of pure physical ability, it is important to identify the role that mental or psychological skill has in contributing towards performance. In a review of the related research Krane and Williams (2006) presented that an association exists between a certain psychological skills and peak athletic performance. The major contributing factors to success included (a) *feelings of high self-confidence and expectations of success*, (b) *being energized yet relaxed*, (c) *feeling in control*, (d) *being totally concentrated*, (e) *having a keen focus on the present task*, (f) *having positive attitudes and thoughts about performance*, and (g) *being strongly determined and committed*. Krane and Williams (2006) also found that those who felt self-doubt, lacked concentration, were distracted, or overly or under aroused, tended to be those who performed the worst. Additionally, athletes who used mental skills such as *goal-setting, thought control strategies, arousal management techniques, well-developed competition plans, well-developed competition strategies, and pre-competition readiness plans* were achieving their peak performance.

In analyzing the psychological characteristics of athletes that are either more or less successful, Kruger (2010) conducted a study that surveyed 106 female field hockey players participating in the South African Students Sport Union (SASSU) tournament. “Group A” was categorized as the “successful” group and contained members of teams that finished in the top 8 of the previous years’ tournament, whereas “Group B” members were categorized as less successful and were members of teams who finished in the bottom 8 of the previous years’ tournament. In the psychological assessment of athletes, athletes responded to the Psychological Skills Inventory (PSI), developed by Wheaton (1998), and the Ottawa Mental Skills Assessment Tool-3 (OMSAT-3) produced by Durand-Bush, Salmela and Green-Demers (2001). The questionnaires addressed various psychological skills such as achievement motivation, confidence, mental rehearsal, goal-setting, and focusing. The results of the study showed that on 12 of the 18 subsets of psychological skills tested, the more successful group received higher average scores than the less successful group. Additionally, six of the tested variables (achievement motivation, stress reactions, fear control, self-confidence, imagery/mental rehearsal and relaxation) were identified as significant discriminators between successful and less successful female field hockey players. One factor to consider is how an individual’s assessment of their own psychological skills is likely affected by previous performances and successes. Without regard to the potential for past athletic success effecting psychological skills, the study concluded that psychological skills may be predictors of future success.

In further exploring the implication that performance can be predicted by psychological skills, Hayslip, Petrie, MacIntire, and Jones (2010) explored the influence

of golf expertise on mental skills utilization and the influences of the use of mental skills and anxiety on performance at a major national golf competition. Golfers (n=1334) were categorized into groups of least skilled, moderately skilled, and most skilled, and were measured on the basis of psychological skill using three separate measures. The three measures included general psychological skills, using the Test of Performance Strategies (TOPS; Thomas, Murphy, & Hardy, 1999), golf specific skills, using the Golf Performance Survey (GPS; Thomas & Over, 1994), and competitive trait anxiety, using the Sport Anxiety Scale (SAS; Smith, Smoll, & Schultz, 1990). Results revealed that the *most skilled* group differed significantly from the *moderately skilled* and *least skilled* golfers in the measures of: use of self talk, automaticity, goal setting, imagery, activation, relaxation, and less negative thinking. Additionally, *moderately skilled* golfers reported higher levels of activation and more use of goal setting than the *least skilled* golfers during competition. Furthermore, performance in a golf tournament was related to a number of psychological variables. In the comparison of the scales to the golfers mean scores throughout the tournament, all three scales (TOPS, GPS, and SAS) were found contribute significantly to the variance of the golfers' scores across the three rounds of the tournament. The golfers having the lowest scores, or performing the best, had better scores across all three measures of psychological skills.

To expand on how psychological characteristics contribute to performance, MacNamara, Button, and Collins (2010) examined retrospective accounts of elite class athletes representing various sports. Each athlete (n=7) and one of their parents (n=7) were interviewed with specific questions to identify attributes that were perceived to have contributed to their elite status and development, in addition to identifying the challenges

they encountered through initiation and advancement in their sport. Though investigators placed no higher importance on physical, technical, or psychological factors, a common theme seen in this investigation was that the athletes de-emphasized the significance of physical attributes and stressed the importance of psychological characteristics. The interviews with the athletes revealed several common themes that contributed to their success. Of the common themes, athletes' demonstrated their *desire to prove themselves*, had *realistic evaluations of their own success*, the ability to *regulate arousal under pressure*, had *employed imagery techniques*, and were *driven to do their best*. The investigators also garnished support from related literature (Jess, Dewar, & Fraser, 2004), that also found that perceived competence and self-belief are necessary attributes for individuals as they attempt to negotiate the pathway to excellence. Of these mental skills, the use of *imagery* stood out as an important factor. The parents of the interviewed athletes all "highlighted how their sons/daughters were very good at recalling sporting situations and used this skill to review their performances from early on in their development" (MacNamara, Button, and Collins, 2010, p.68). Of the themes that emerged from those interviews, the qualities of *desire to prove themselves* and *driven to do their best* demonstrate that these athletes were highly motivated.

Psychological Skills Training

Having reviewed how psychological skills may contribute to success and the performance of athletes, it is important to examine how an intervention or a psychological skills training program can be implemented to increase the quality of performance in athletes. Various mental skills training programs have been shown to positively influence performance (Sheard and Golby, 2006; Thelwell and Greenlees,

2001; Weinberg, Miller, and Horn, 2012). In implementing a seven week psychological skills training (PST) program, Sheard and Golby (2006) evaluated the effects of the program on swimming performance and positive psychological development in national level swimmers. The PST consisted of weekly sessions each of goal setting, visualization, relaxation, concentration, and thought stopping. Prior to the PST (week one), subjects filled out an array of PST questionnaires. The PST was performed individually and based on the participants needs. In addition, subjects of this study kept a logbook to monitor their own feelings and perceived progress that helped guide each training session. Post intervention, subjects filled out the same PST questionnaires and were debriefed individually. The research found that swimming performance improved in 64% of the swimmers, whereas positive psychological development improved in 94% of participants.

A similar study utilized the Psychological Skills Inventory for Sports-R5 (PSIS-R5) (which evaluates concentration, motivation, self-confidence, anxiety, mental preparation, and team emphasis) in relating mental skills to stock-car racing performance (Ebben and Gagnon, 2012). In this study, drivers' performance was gauged by track points standings and by regional and national rankings. An important finding of this study was that track points standings were negatively correlated with mental preparation ($r = -0.46, p = 0.004$) and anxiety coping ($r = -0.53, p = 0.028$) scores, meaning that drivers who placed higher (e.g., first, second, etc.), showed greater mental preparation and anxiety coping skills. Additionally, motivation was correlated with self-confidence ($r = .48, p = .047$), mental preparation ($r = .48; p = .03$), and team emphasis ($r = .46, p = .04$)

scores, as Concentration was correlated with self-confidence ($r = .64, p = 0.002$) and anxiety coping ($r = .65, p = .002$) scores.

Further supporting that psychological skills interventions have direct effects on performance, Weinberg, Miller, and Horn (2012) studied the influence of a self-talk intervention on collegiate cross-country runners. In their study, 81 collegiate cross-country runners was randomly assigned to one of six groups. All groups received motivational and/ or instructional messages that were either assigned or self-selected. These procedures created six individual conditions (with 13 or 14 runners in each condition) including (a) *motivational statements/chosen*, (b) *motivational statements/assigned*, (c) *instructional statements/chosen*, (d) *instructional statements/assigned*, (e) *instructional plus motivational statements/chosen*, and (f) *instructional plus motivational statements/assigned*. Runners were tested for time on a one-mile run a week in advance of the intervention to establish a baseline value for time. One week later, the runners were exposed to one of the six experimental conditions prior to running a second trial, which included three minutes of selected messages received via headphones playing music from a compact disc. The results of this study found that three of the groups (*combined self-set, motivational self-set, and instructional assigned*) showed significant change in one mile times. The other three groups also showed improvements in one mile times, although the changes were not shown to be statistically significant. This study provides support that mental skills interventions can acutely increase performance, and in turn the success of an athlete.

In a single-subject design, Thelwell and Greenlees (2001) examined the effects of a mental skills training package on gymnasium triathlon performances in five adult

participants. The mental skills training package was comprehensive and included elements of goal setting, relaxation, imagery, and self-talk. Participants' performance was based on the time to completion. In addition the subjects were evaluated on their use of mental skills during and post-intervention. Overall, participants improved triathlon times significantly after the intervention phase compared to the baseline triathlon time. Once the intervention period was implemented the use of mental skills also improved in all five subjects. The authors of this study present a key argument for which to base future research, in that these improvements were brought about in gymnasium athletes not in real competition. Though there was an incentive to do well with every triathlon trial completed, it can only be a simulation of a real competition. Due to this element of the study, the investigators recognized the need to compare the effects of a mental skills package on performance in a real competition.

Given the amount of support that psychological skills can be influenced through intervention as presented in the above research, it is important to discuss what factors of mental skills training contributed the most to successful performances or improvements in performance. Of the various methods of psychological development, goal setting is one specific technique which has been shown to be consistently related to performance in sport. In a review of over 100 studies, Locke, Shaw, Saari, and Latham (1981), found strong support of the hypothesis that given the acceptance of specific or difficult goals, the result would be higher performance compared to easy goals, vague goals, or no goals. In an attempt to define goal-proximity, Locke and Latham (1985) hypothesized that using short-term goals plus long-term goals will lead to better performance than using long-term goals alone. Due to the conflicting findings regarding the proximity of goal-setting,

Tenenbaum, Pinchas, Elbaz, Bar-Eli, and Weinberg (1991), analyzed the effect of short-term goals (i.e., improve by 8% per week), long-term goals (i.e., improve by 40% by end of the study), short and long-term goals, do your best goals, and no goals, on muscular endurance (sit-ups) performance. Results of this study found the groups that had the combination of both short and long-term goals consistently exhibited the greatest improvements in sit-up performance. Additionally the combination of both short and long-term goals groups improved significantly throughout the study, whereas the do-your-best group and control groups elicited no significant increase in performance. The findings of this study show strong support for the need to develop both short and long-term goals in planning for athletic success. As there is extensive research pertaining to the various methods and theories surrounding goal-setting, it seems that goal setting is an important psychological skill for high intensity endurance athletes to learn and utilize.

In testing a coaching model proposed by Vasconcelos-Raposo (2001), Simões, Vasconcelos-Raposo, Silva, and Fernandes, (2012), evaluated the effect of a goal-setting and mental skills intervention on the performance of competitive swimmers. The longitudinal study consisted of a two year evaluation where the first year implemented a process oriented goal-setting intervention in which the coach, athlete, and mental skills trainer were actively involved. The weekly mental program training included progressive construction of the task according to partial chronometric data regarding final time whereas goals were defined by progressive simulation from partial times to full construction of the mental race. Another key element to the weekly exercises was the identified coping strategies learned and transferred into swimming practice according to causes of mistakes. Conversely, the second year was without intervention but rather

focused on evaluating the swimmers' performance. The results of the study found that the intervention contributed to better performances perhaps through clearer objectives and greater adherence to meet the goals set-forth by the athlete, coach and mental skills trainer. The researchers in this study, in congruence with supporting research (Burton, 1989; Giannini et al., 1988; Pierce and Burton, 1998; Salmela, 1989; Weinberg et al., 1993, 1994) concluded that the model of goal-setting was effective in enhancing swimmers' performance, confirming the significance of goal setting in sports. This study shows how a systematic method of mental skills training can lead to improvements in performance. Furthermore this study shows that coaches can play an important role in the process of mental skills training.

Coaching and Psychological Skills

The previous research demonstrates how coaching can influence psychological skills and performance and through implementing goal-setting techniques. Beyond goal-setting and other intervention strategies, it is important to discuss what other elements of coaching are contributing to the psychological skills and performances of athletes. Of the major factors that contribute to psychological skills, research supports that coaching styles and behaviors can positively influence the development of psychological skills and improve performance (Amorose, and Horn, 2000; Gould, Medbery, Damarjian, and Lauer, 1999; Rieke, Hammermeister, & Chase, 2008). A recent study by Grant, Curtayne and Burton (2009) demonstrated that executive coaching in the workplace using a cognitive-behavioral model enhanced goal attainment, increased resilience and workplace well-being, and reduced depression and stress. Participants in this study also reported that coaching helped increase self-confidence and personal insight, build management skills,

and helped participants deal with organizational change. In presenting the efficacy of periodizing psychological skills training, Balague (2000) presents that “psychological skills relevant to sport performance are just that - skills - and can thus be improved by training in the same manner as the physical skills” (pg. 231). This point demonstrate how coaches can be an integral component of implementing psychological skills training, much like training or conditioning of strength, or a sport-specific skill.

One study that involved Canadian curling teams, examined the direct relationship between coaching and athlete confidence (Paquette & Sullivan, 2012). Specifically, this study examined the relationship between coaches’ psychological skills training (PST) attitudes and behaviors, and the perceptions of their athletes (i.e., perceptions of their coaches and self-confidence). The results of this study found that coaches’ PST behavior significantly predicted the athletes’ perceptions of their coaches, which significantly predicted the confidence of the athletes. These findings imply that as a coach demonstrates a more positive attitude towards PST their behavior will reflect this attitude. Additionally, positive coaching behaviors indicated more positive perceptions of their coaches and in turn, higher athlete self-confidence.

In an attempt to examine the relationship among athletes’ intrinsic motivation (IM), gender, scholarship status, perceptions of the number of teammates receiving scholarships, and perceptions of coaches’ behavior, Amorose and Horn (2000) found that perceived coaching behaviors were related to IM. A key conclusion of this study was that “athletes with higher IM perceived their coaches to exhibit a leadership style that emphasized training and instruction and was high in democratic behavior and low in autocratic behavior.

According to Greenleaf (1977), “servant leaders place other people’s needs, aspirations and interests above their own. The servant leader’s chief motive, paradoxically, is to serve first as opposed to lead”. Building on these findings, Rieke, Hammermeister, & Chase (2008), studied the effectiveness of a servant leadership model in high-school varsity basketball students. The results suggest that high-school athletes who perceived their coach to be a “servant leader” also displayed higher intrinsic motivation, were more satisfied with their sport experience, were mentally tougher, and performed better as a team and as individuals when compared with athletes’ coached by non-servant leaders.

As a strengths’ based approach has shown to be effective in non sports settings for development and growth (Sheldon, Kasser, Smith, & Share, 2002), coaches should also incorporate principles into training that focus on strengths. Gordon and Gucciardi (2011) studied a strengths based coaching model to develop mental toughness in cricket players. The study proposed that a strengths based coaching model should seek to *marshal realized strengths, maximize unrealized strengths, moderate learned behavior, and minimize weaknesses*. Through this investigation the authors’ conclude in congruence with supporting research (Connaughton et al., 2008; Connaughton et al., 2010) that a single approach is unlikely to be appropriate for all age and competitive levels. The authors also support that a combination of traditional psychological skills training and a strengths based approach would be optimal with consideration given to the developmental stage of the athletes.

Role of Experience

Beyond examining the numerous implications of psychological skills and coaching techniques, it should be noted that a level of experience should be necessary to create top performances on a consistent basis. It would be expected that consistent expert performance be the product of long term intentional practice of the requisite physical and psychological skills, in addition to continued positive reinforcement from ones' environment.

In the analysis of potential factors contributing to expert performance in a given domain, Ericsson, Krampe, and Tesch-Römer (1993) discuss the different environmental factors that could selectively promote and facilitate the achievement of elite performance. This extensive and comprehensive research explored the contributions of human genetics and environmental circumstances (such as the duration and structure of activities), to the acquisition and development of expert performance. In their study, the authors proposed expert performance (in terms of acquired characteristics) results from extended deliberate practice, limiting innate characteristics to general levels of activity and emotionality. Though inherent ability had shown to contribute to the success of the best performers, the notion that inherited characteristics play the largest role in becoming an expert was dismissed. The key conclusion the authors made in this research is the view that expert performers are not merely domain specific experts, but rather experts in maintaining high levels of practice and improving performance.

Based on the reviewed literature, it should be expected that an athlete who is coached, will not only have stronger psychological skills, but should have better performances as an effect of the athlete/coach relationship. Given the apparent lack of

research pertaining to psychological skill use with coached and un-coached athletes, as well as the lack of research of Cyclo-cross athletes, this study sought to expand on how various factors relate to performance in a unique discipline of cycling.

CHAPTER III

METHOD

Participants

Participants in this study were 80 males and 27 females, between 19 and 69 years of age ($M = 36.58$, $SD = 13.06$), competing in the 2013 USA Cycling Cyclo-Cross National Championships, January 9th- 13th of 2013. Riders under 18 years of age were excluded from the study. Participants in this study ranged from amateur level to world-class. Many masters men's and women's categories were included as well as non-championship and single speed categories.

Instrumentation

Athletes consenting to participate in the study filled out a survey packet at least 90 minutes prior to competing in the event. The survey packet consisted of a demographic questionnaire and the ACSI-28.

Demographic questionnaire

The demographic questionnaire assessed various background information, such as age and gender, as well as information specific to Cyclo-cross. Specifically, the demographic questionnaire asked the athlete to report the duration of their continuous experience in the sport of cycling and the discipline of Cyclo-Cross. Athletes were asked if they had received coaching either in the past or present, and if they had received coaching, how they would rate the *importance of frequent communication with a coach*.

Frequency of communication with a coach was assessed by the survey asking athletes to choose from the options of: Never, Less than once/month, Once/month, 2-3 times/month, Once/week, 2-3 times/week, and Daily. Additionally, if the athlete was coached or had been coached in the past, the participant was asked how long they had been coached given the choices: less than 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, or more than 10 years. The same scale was applied to *cycling experience*, and *Cyclo-cross experience*. The demographic questionnaire also asked of the participants' *importance of frequent communication with a coach*, *commitment to training*, *commitment to the discipline of Cyclo-cross*, and their *commitment to competing in the Cyclo-cross National Championships* on a 10 point Likert scale. The demographic questionnaire is provided in Appendix A.

Athletic Coping Skills Inventory-28

The ASCI- 28 assessed the athletes' psychological skills based on seven subscales. The survey contains items that assessed the psychological skills of: *coachability* (I improve my skills by listening carefully to advice and instruction from coaches and managers), *concentration* (It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to.), *confidence & motivation* (I feel confident that I will perform well.), *coping with adversity* (When things are going badly, I tell myself to keep calm, and this works for me.), *freedom from worry* (I think about and imagine what will happen if I screw up.), *goal setting & mental preparation* (I tend to do lots of planning about how I reach my goals.), and *peaking under pressure* (To me, pressure situations are a challenge that I welcome.) Responses to these statements consisted of: Almost Never, Sometimes, Often, and Almost Always. The ACSI-28 has

been shown to be a valid and reliable measure (Smith, Schutz, Smoll, and Ptacek, 1995). Alpha coefficients (internal consistency) for the seven subscales of the ACSI-28 ranged from .62 (concentration) to .78 (peaking under pressure). The overall alpha coefficient for all subscales combined was .86. The entire ACSI-28 survey is presented in Appendix C

Performance

Performance of each athlete was evaluated based on how each participant finished relative to their category, and based on percentage of those who started the race. *Performance* was calculated by taking their place amongst other competitors in their race and dividing it by the total number of competitors in their race. In this way, each athlete could be compared to other riders in their category as well as across all categories. A participant who finished the race in first place would receive a score approaching 0.00, whereas a last place finisher would receive a score of 1.00. Individuals who started the race but did not finish received a score of 1.1. With this method, a lower score indicates a better performance.

Procedure

Participants had the opportunity to complete either electronic or paper copies of the survey. Specifically, the USA Cycling event coordinator sent all registered athletes an e-mail which contained a link to the survey and encouraged competitors to complete the survey. In addition, surveys were distributed on site at Badger Prairie Park in Verona, Wisconsin each day of the competition including the day prior to the event at registration and packet pick-up. In both electronic and on-site surveying, competitors were first asked if they were of 18 years of age, and also asked when they would be competing, as no competitor was surveyed within 90 minutes of competition. Electronic surveying was

conducted using Qualtrics (Qualtrics Labs, Provo, UT) and the paper copies of the survey were distributed in person (see appendix A and appendix B).

Data analysis

A multiple regression analysis was used to test if psychological skills, coaching, and experience significantly predicted performance. A MANOVA was used to examine the effect of coaching on the psychological skills subsets. In analyzing the third research hypothesis, a simple linear regression was used to determine the effect of frequency of communication with a coach.

CHAPTER IV

RESULTS

Preliminary Analysis

Participants in this study ($n = 107$, 80 men and 27 women) were comprised of competitors across many different categories of riders. The highest contributing category of competitors was the Elite/cat1/2/U23 Women's category ($n = 11$) (Table 1.). Other major contributing groups were the Masters Men age 35-39 ($n = 9$), Masters Men age 55-59 ($n = 9$), Men-Pro/1/2 ($n = 8$), and Collegiate Division 1 ($n = 8$). Of the participants in the study, 63 reported to be coached either in the past or present, as 58 reported to be currently coached. Of those who responded to frequency of communication with a coach ($n = 63$), the majority (84.2%) reported to have communicated at least once per week with their coach (Once/week = 26.3%, 2-3 times/week = 31.6%, and Daily = 28.1%) (Table 2). The ACSI-28 subscales for all participants are reported in Table 3, and correlations between these subscales are reported in Table 4.

As several correlations were found within the ACSI-28 subscales, there were also correlations between the ACSI-28 subscales and other descriptive statistics. Of these correlations, commitment to training was correlated with concentration ($r = .26, p = .008$), Confidence & motivation ($r = .50, p = .000$), & goal setting ($r = .45, p = .000$). The variable of *coached* was positively correlated with *goal-setting* ($r = .32, p = .001$) yet negatively correlated with *freedom from Worry* ($r = -.248, p = .01$). *Commitment to*

training was positively correlated with the subscales of *concentration* ($r = .26, p = .008$), *confidence & motivation* ($r = .50, p = .000$), and *goal-setting* ($r = .45, p = .000$). It was found that *frequency of communication* was positively correlated with *performance* ($r = .32, p = .008$), and reported *commitment to competing in Cyclo-cross nationals* was also positively correlated with *performance* ($r = -.25, p = .01$) and *coached* ($r = .27, p = .005$). *Cyclo-cross experience* and *freedom from worry* were also positively correlated ($r = .24, p = .011$).

In testing the first research hypothesis, the results of the regression indicated the predictors to account for 23.7 % of the variance ($R^2 = .24$, adjusted $R^2 = .167$, $F(9,97) = 3.36, p = .001$, RMSE = .284). It was found that coaching significantly predicted performance ($\beta = .403, p = .000$) as did goal setting ($\beta = .323, p = .003$). In addition, the predictive validity of cyclo-cross experience on performance was approaching statistical significance ($\beta = -.172, p = .067$). None of the other variables significantly predicted cyclo-cross performance.

In testing the second research hypothesis, MANOVA results revealed significant differences in psychological subsets based on the independent variable of coaching ($Wilks' \Lambda = .820, F(7,99) = 3.09, p = .005$). It was found that goal setting differed significantly ($p = .001$) between those who are coached ($M = 7.57$) and those who are not coached ($M = 5.92$). It was also found that freedom from worry differed significantly ($p = .010$) between the coached ($M = 7.55$) and those who are not coached ($M = 8.69$).

In analyzing the third research hypothesis, 57 of the 58 coached participants responded to the frequency of communication with their coach. A linear regression revealed that *frequency of communication* accounted for 10.1% of the variance in

performance ($R^2=.10$, $F(1,55) = 6.197$, $p = .016$). It was found that *frequency of communication* significantly predicted performance ($\beta = -.318$, $p = .016$).

Table 1. Number of participants in each category

Category	Frequency	Percent
10-29 non-championship	2	1.9
30-39 non-championship	2	1.9
30-39 non-championship women	1	.9
40-99 non-championship	4	3.7
Men/elite pro 1/2	8	7.5
Single Speed	4	3.7
Collegiate men Division 1	8	7.5
Collegiate men Division 2	6	5.6
Collegiate women Division 1	3	2.8
Collegiate women Division 2	2	1.9
Elite/ pro1/2/ U23 women	11	10.3
U23 men	4	3.7
Masters men 30-34	6	5.6
Masters women 30-34	2	1.9
Masters men 35-39	9	8.4
Masters women 35-39	1	.9
Masters men 40-44	7	6.5
Masters women 40-44	2	1.9
Masters men 45-49	3	2.8
Masters women 45-49	2	1.9
Masters men 50-54	4	3.7
Masters women 50-54	3	2.8
Masters men 55-59	9	8.4
Masters men 60-64	2	1.9
Masters men 65-69	2	1.9
Total	107	100.0

Table 2. Frequency of Communication with Coaches

	n	%
Never	1	1.7
Less than once/month	0	0
Once/month	2	3.5
2-3 times/month	5	8.8
Once/week	15	26.3
2-3 times/week	18	31.6
Daily	16	28.1

Table 3. ACSI-28 Means and Standard Deviations of subscale

	<i>M</i>	<i>SD</i>
Coping with Adversity	7.40	2.064
Coachability	9.55	1.766
Concentration	7.92	2.137
Confidence & Motivation	8.21	2.109
Goal-Setting	6.81	2.567
Peaking Under Pressure	6.71	2.723
Freedom from Worry	8.07	2.301

Table 4. Correlations of Psychological Skills

		1	2	3	4	5	6	7
1.	Pearson Corr. Sig. (2-tailed)	1						
2	Pearson Corr. Sig. (2-tailed)	.329** .001	1					
3	Pearson Corr. Sig. (2-tailed)	.587** .000	.182 .060	1				
4	Pearson Corr. Sig. (2-tailed)	.425** .000	.180 .064	.575** .000	1			
5	Pearson Corr. Sig. (2-tailed)	.132 .176	.217* .025	.246* .010	.432** .000	1		
6	Pearson Corr. Sig. (2-tailed)	.430** .000	.098 .314	.555** .000	.526** .000	.234* .015	1	
7	Pearson Corr. Sig. (2-tailed)	.319** .001	.034 .729	.416** .000	.232* .016	-.079 .418	.196* .043	1

1. Coping with Adversity, 2. Coachability, 3. Concentration, 4. Confidence & Motivation, 5. Goal-Setting, 6. Peaking under Pressure, 7. Freedom from Worry

*p < .05

**p < .01

CHAPTER V

DISCUSSION

Results Analysis

The results of the current study demonstrate that performance in sport is contingent upon many factors. The first aim of the study was to examine the combined influence of psychological skills, coaching, and experience, on subsequent high-intensity endurance performance. In a preliminary analysis, significant correlations were identified among the psychological skills subscales (see Table 4). Given these correlations, further statistical analysis was needed to revealed significant differences.

Of the analyzed variables displayed in the results, *coached* and *goal-setting* were both positive predictors of *performance*. Regarding *goal-setting*, these findings were consistent with the extensive research previously examined (Burton, 1989; Giannini et al., 1988; Locke, Shaw, Saari, and Latham, 1981; Pierce and Burton, 1998; Salmela, 1989; Vasconcelos-Raposo, Silva, and Fernandes, 2012; Weinberg et al., 1993, 1994). In general, goal-setting helps direct attention, mobilize effort, optimize performance, and formulate strategies toward desired outcomes (Fung, Rice, and Carstensen, 2005). Given the correlation between *coached* and *goal-setting* ($r = .32, p = .001$) coaches seem to play a large role in facilitating goal-setting. Cycling coaches are known to work with their athletes in designing training bouts, scheduling workouts, providing sport specific skill instruction, and providing social support and feedback. The design of training is also

contingent upon the cyclists' needs and goals. That said, it would be expected that coaching could help an athlete set higher quality, perhaps more realistic goals and objectives, and guide their progress to achieve those goals. Seeing that the presence of a coach may positively predict performance, it is important to investigate how a coach may also influence an athlete's psychological skills.

In the consideration for sport-specific experience predicting performance, it was expected that *Cyclo-cross experience*, would be a significant indicator of performance across all categories. In this study, across all categories *Cyclo-cross experience* and *performance* were not significantly correlated, however within the largest category of respondents (Elite/ pro1/2/ U23 women, n=11) there was a significant correlation ($r = .902, p = .000$). Given larger sample sizes, other categories could be expected to show significant correlations.

It was a secondary aim of this study to analyze to how having a coach would impact the psychological skills subscales measured. In the present study, the comparison of two groups of athletes that are either coached or not coached provides insight to an area of research that seems to have very little, if any, examination in cycling-sport athletes. In this study, the presence of a coach (*coached*) positively predicted *performance*. In order to further examine the potential effect that coaching may have on an athlete, the two different *coached groups* were compared on the subscales of psychological skills. From the analysis, *coached* demonstrated to be a positive predictor of *goal-setting*, yet was negatively associated with *freedom from worry*. In other words, athletes who were coached set more goals, but also had less freedom from worry (e.g., they worried more about their performance). Having already established that *coached* and

goal-setting were positive predictors of performance, the positive relationship between *coached* and *goal-setting* imply that goal-setting is a major function of the coach/athlete relationship. Past research comparing overachieving baseball players to normal and underachievers, revealed that overachievers scored higher on all ASCI-28 subscales including freedom from worry (Smith, Schutz, Smoll, & Ptacek, (1995). In the present study, coached athletes' performed better, yet experienced more worry. This finding may indicate that coached athletes feel pressure to perform better not only for themselves, but for their coaches. However, another interpretation could be that those athletes that take their performance more seriously (such as elite athletes) have a higher commitment to the sport are those that seek out coaching to better their performance, and consequently experience a higher level of worry independent of coaching. It may also be that competitors' levels of stress or worry were acutely influenced as many participants filled out the survey on the same day of their competition. Although *goal-setting* and *freedom from worry* both showed associations, no other sub-scales were significantly predicted with the presence of a coach. In this study, it was expected that all subscales would be significantly impacted by the effect of coaching. Given that no-other subscales were predicted by the presence of coaching, this finding may demonstrate the need for coaches to work more closely with their athletes to strengthen other psychological aspects that could contribute to performance.

It was a third aim of this study to examine the relationship between an athletes' performance and the number of times an athlete communicates with their coach. The results of this analysis showed that those who communicated more frequently with a coach had better performances. This finding implies that quality of coaching is not just in

providing a training plan, but in providing a regular system of support. Although qualities of coaching (such as how motivating a coach is, or perceived leadership role) were not addressed in this study, the findings indicate that frequent communication is an important factor in providing support to athletes.

Limitations

In analyzing certain psychological skills, performance, and the effect of coaching, the results of this study were measured across a heterogenous sample population. It is a strength of this study that the findings may be applied across levels of competitors, however, it would also be important to describe the differences between each category of competitor. In this study, the highest reporting category was the UCI Elite 1/2/ U23 Womens category (n=11) with a total of 78 starters in the race.

One intention of the survey instrument was that it be brief and easy to fill out to maximize the number of responses. Although the ACSI-28 was not altered, several demographic questionnaire responses were categorized to simplify the responses. Specifically participants were asked to report the *frequency of communication* with their coach given categories of responses. In addition, on-site survey responses asked *Cyclo-cross experience, cycling experience, years coached* and *years coached past* as open-ended questions. Because the online survey categorized these responses, the continuous data from the on-site surveys was converted to fit these same categories.

Another unexpected element to the on-site survey responses was that participants reported that their highest priority race to be the World-Championships taking place three weeks later. Though most participants of this study were not eventual competitors in the

World-Championships, a small number of elite athletes did indicate that the National Championships was not their highest priority.

Although the present study did not find statistical significance in Cyclo-cross experience positively predicting performance, it should be noted that experience became categorized to simplify survey responses. Had the variables of cycling experience and Cyclo-cross experience remained continuous variables it would be expected both of these would be significant positive predictors of performance.

Practical Applications

The present study shows the need for coaches to implement a psychological skills component to training athletes, however, formal psychological skills training may have its' difficulties. Coaches are presented with various road-blocks such as lack of time, a lack of player interest, difficulty evaluating mental skills training success, and a lack of models or examples of coaches actually teaching mental skills (Gould, Medbery, Damarjian, & Lauer, 1999). Like many other athletes, endurance athletes spend many hours training and coaches of endurance athletes likely experience similar set-backs as presented above. Another unique element to coaching endurance athletes is that there is generally not a set-practice time where the coach and athlete have a chance to interact. Supported by the results of this study, this aspect highlights the importance of a cycling coach to frequently engage their athletes.

In addition to being in frequent communication with their athletes, coaches should seek to develop mental skills training sessions, that are not overly time consuming and provide the right type of support. The results of this study showed that only *goal-setting* and *freedom from worry* were significantly impacted by the presence of a coach. It would

be expected that all other psychological skills variables measured could be improved with intentional psychological skills training. As self talk interventions have shown to be effective in cross-country runners Weinberg, Miller, and Horn (2012), a similar scenario could be created for cycling athletes to reduce anxiety over performance. In the present study, High levels of worry, associated with coached and elite athletes, show the need for more psychological skills training techniques such as imagery, relaxation, and meditation. Other psychological skills training methods should also prove to be beneficial provided the coach and athlete are able to identify the needs of improvement and are equally committed to the process.

Future research

This study was able to identify that cycling coaches are an influential component to the performance of athletes in a range of categories. Although coached athletes displayed a higher amount of goal-setting and better performances, associations between coaching and other psychological skills were lacking. This finding may demonstrate the need for coaches to work more closely with their athletes to strengthen other psychological aspects that could contribute to performance. Future research should seek to examine what elements of the coach/athlete relationship contribute the most to the development of the athlete through qualitative analysis. Expanding upon this idea, it would be useful to know from an athletes' perspective how they perceive their coach to help areas such as motivation, anxiety coping, and confidence in addition to reaffirming the importance of goal-setting. Beyond examining the coach/athlete relationship, it would be most useful to construct a model to guide coaches and athletes through the process of developing strong psychological skills.

Conclusions

The results of this study provide support for the effectiveness of the presence of a coach in Cyclo-cross athletes. Specifically, Goal-setting seems to be a major contributor to performance and is likely imparted by a cyclists coach. Given the unique relationship between an athlete and a coach, the quality and quantity of communication seem to play a major role in athletic performance. Despite the contributions a coach may have in contributing to performance and success, there is an apparent need for coaches to support their athletes in other psychological skills areas and develop strategies that are individualized and easy to implement.

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APPENDIX A
DEMOGRAPHIC QUESTIONNAIRE

Appendix A
Demographic Questionnaire

1. Gender (circle ONE): Female Male
2. Age: _____
3. What is your name?
4. What is your racing category?
5. What is your highest priority event you plan to participate in this weekend?
6. Are you participating in the Collegiate National Championships? Yes ___ No ___
7. How many years of cycling experience do you have? Years _____ Months _____
8. How many years of CX racing experience do you have? Years _____ Months _____
9. Have you had cycling specific coaching in the past? Yes _____ No _____
10. Do you currently have a cycling specific coach? Yes _____ No _____

If NO, Skip to question #14

11. If so, how long have you had a coach? Years _____ Months _____
12. How often do you communicate with your coach via E-mail, Phone, in person, or another form of communication? **(Circle only one)**

(Never)(Less than once/month) (Once/month)(2-3 times/month)(Once/week)(2-3 times/week) (Daily)

13. How high would you rank the importance of frequent communication with a coach?

0	1	2	3	4	5	6	7	8	9	10
not at all					somewhat					very
important					important					important
14. How high would you rate your commitment to training?

0	1	2	3	4	5	6	7	8	9	10
not at all					somewhat					very
committed					committed					committed
15. How high would you rate your commitment to competing in the cyclo-cross discipline of cycling?

0	1	2	3	4	5	6	7	8	9	10
not at all					somewhat					very
committed					committed					committed
16. How high would you rate your commitment to competing in this event?

0	1	2	3	4	5	6	7	8	9	10
not at all					somewhat					very
committed					committed					com

APPENDIX B

SURVEY OF ATHLETIC EXPERIENCE

APPENDIX B

Survey of Athletic Experiences

Directions: Please read each statement carefully and then recall as accurately as possible how often you experience the same thing. There are no right or wrong answers. Do not spend too much time on any one item.

Please circle how often you have these experiences when cycling.

1. On a daily or weekly basis, I set very specific goals for myself that guide what I do.
Almost Never Sometimes Often Almost Always
2. I get the most out of my talent and skills.
Almost Never Sometimes Often Almost Always
3. When a coach or manager tells me how to correct a mistake I've made, I tend to take it personally and feel upset.
Almost Never Sometimes Often Almost Always
4. When I am cycling, I can focus my attention and block out distractions.
Almost Never Sometimes Often Almost Always
5. I remain positive and enthusiastic during competition, no matter how things are going.
Almost Never Sometimes Often Almost Always
6. I tend to perform better under pressure because I think more clearly.
Almost Never Sometimes Often Almost Always
7. I worry quite a bit about what others will think of my performance or results.
Almost Never Sometimes Often Almost Always
8. I tend to do lots of planning about how I reach my goals.
Almost Never Sometimes Often Almost Always
9. I feel confident that I will perform well.
Almost Never Sometimes Often Almost Always
10. When a coach or manager criticizes me, I become upset rather than helped.
Almost Never Sometimes Often Almost Always
11. It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to.
Almost Never Sometimes Often Almost Always
12. I put a lot of pressure on myself by worrying about how I will perform.
Almost Never Sometimes Often Almost Always
13. I set my own performance goals for each practice.
Almost Never Sometimes Often Almost Always
14. I don't have to be pushed to train or race, I give 100%.
Almost Never Sometimes Often Almost Always
15. If a coach or manager yells at me, I correct the mistake without getting upset about it.
Almost Never Sometimes Often Almost Always
16. I handle unexpected situations in cycling races or training very well.
Almost Never Sometimes Often Almost Always

17. When things are going badly, I tell myself to keep calm, and this works for me.
Almost Never **Sometimes** **Often** **Almost Always**
18. The more pressure there is during a race, the more I enjoy it.
Almost Never **Sometimes** **Often** **Almost Always**
19. While competing, I worry about making mistakes or not coming through.
Almost Never **Sometimes** **Often** **Almost Always**
20. I have a race strategy worked out, long before the race begins.
Almost Never **Sometimes** **Often** **Almost Always**
21. When I feel myself getting too tense, I can quickly relax my body and calm myself.
Almost Never **Sometimes** **Often** **Almost Always**
22. To me, pressure situations are a challenge that I welcome.
Almost Never **Sometimes** **Often** **Almost Always**
23. I think about and imagine what will happen if I screw up.
Almost Never **Sometimes** **Often** **Almost Always**
24. I maintain emotional control, regardless of how things are going for me.
Almost Never **Sometimes** **Often** **Almost Always**
25. It is easy for me to direct my attention and focus on a single object or person.
Almost Never **Sometimes** **Often** **Almost Always**
26. When I fail to reach my goals, it makes me try even harder.
Almost Never **Sometimes** **Often** **Almost Always**
27. I improve my skills by listening carefully to advice and instruction from coaches and managers.
Almost Never **Sometimes** **Often** **Almost Always**
28. I make fewer mistakes when the pressure is on because I concentrate better.
Almost Never **Sometimes** **Often** **Almost Always**