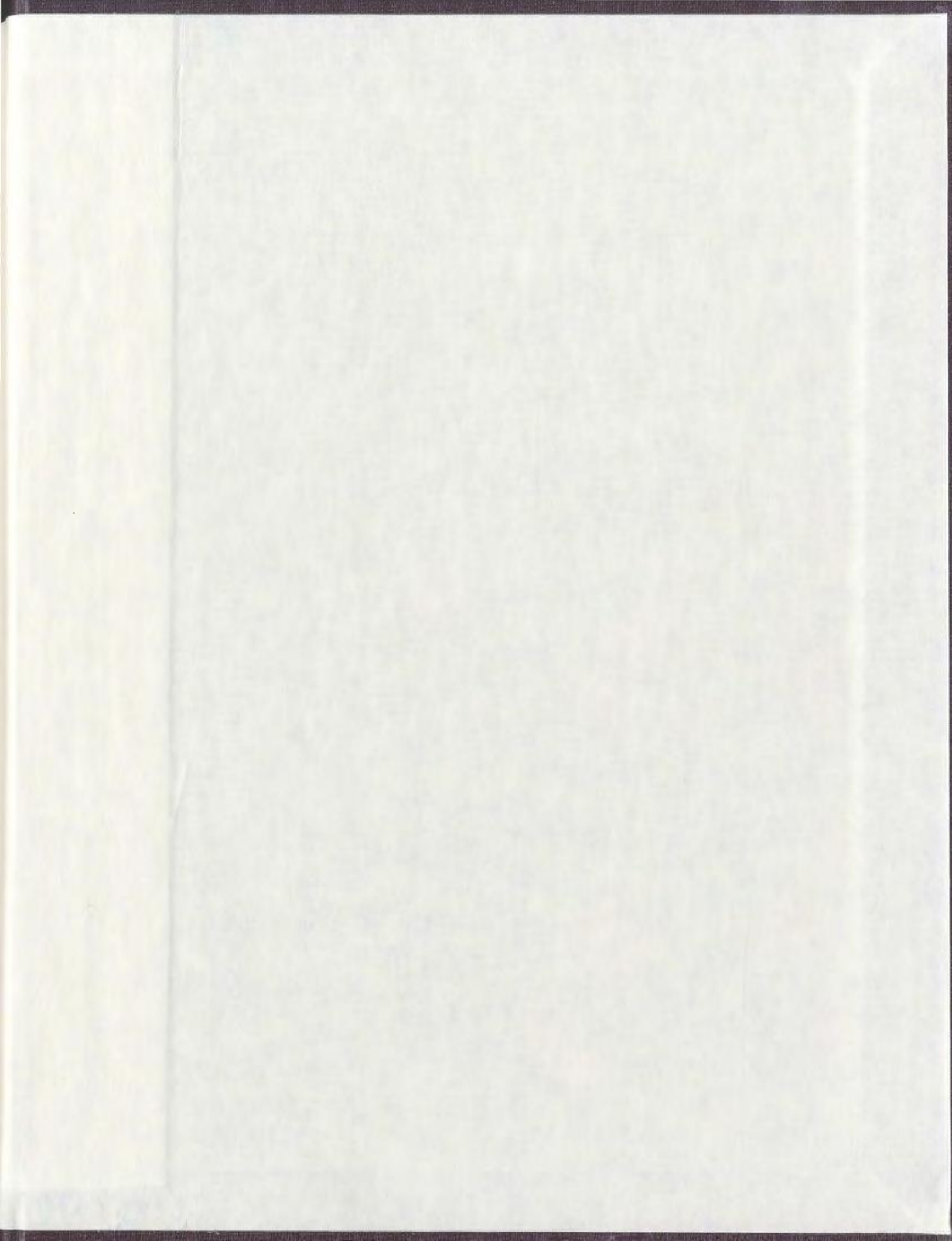# AN EXAMINATION OF THE PSYCHOMETRIC PROPERTIES
OF THE ATHLETIC COPING SKILLS INVENTORY-28
FOR ADULT RECREATIONAL RUNNERS

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AN EXAMINATION OF THE PSYCHOMETRIC PROPERTIES

OF THE ATHLETIC COPING SKILLS INVENTORY-28

FOR ADULT RECREATIONAL RUNNERS

by

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Abstract

The Athletic Coping Skills Inventory-28 (ACSI-28) is a validated psychometric questionnaire that measures sport-specific psychological skills thought to be instrumental to sport performance. Its extensive application history covers a wide variety of competitive, mainly team-based sports, but there has been no published verification of the ACSI-28's psychometric properties when applied to recreational runners (RR). The purpose of this research was to explore the factor structure and composition of the existing ACSI-28 in a sample of RR. Participants (n = 345) completed an online ACSI-28, and self-assessed themselves as either recreational or competitive runners. Exploratory Factor Analysis of the results indicated support for only three factors (Goal Setting and Planning, Freedom From Worry, and Peaking Under Pressure) compared with the original seven factor ACSI-28. These three factors were associated with 15 items and formed the ACSI-RR (15,3) model which was tested using Confirmatory Factor Analysis that indicated the ACSI-RR model is a better fit to the RR data than the original ACSI-28 model, although neither models produced an acceptable level of fit to the data. Differences between recreational and competitive athletes are discussed to help explain the results. In summary, our findings did not support the psychometric structure of the original ACSI-28 but did support a modified version, the ACSI-RR(15,3), as an interim measurement tool of RR psychological skills.

Keywords: ACSI-28, psychometric properties, recreational, running

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1 Introduction

1.1 Overview

Cardiovascular diseases are the leading cause of morbidity in the world (World Health Organization, 2005) and other diseases, such as hypertension, obesity and type 2 diabetes are considered to be at epidemic levels (World Health Organization, 2004). In Canada, health care expenditures related to physical inactivity were estimated at $5.3 billion in 2004 (Katzmarzyk & Janssen, 2004). Physical activity can be a very effective, low-cost preventative treatment to cardiovascular diseases (Hawley 2004; Hawley & Lessard, 2008; Pedersen & Saltin, 2006) but many people are reluctant to engage in exercise, often citing "lack of time" and "lack of enjoyment" as reasons for not exercising (Stutts, 2002; Trost et al., 2002).

Sports psychology has its history in helping elite athletes improve their performance, (Gill, 1995), and may have a role to play in helping more diverse populations "enjoy sport more, or help them become better individuals and live a better life." (Rainer, 2006, pg. 2). Such diverse populations may benefit from receiving psychological skills training (PST), especially if PST could be designed and tailored to identify and meet the needs of each population group. An important element of most PST is measurement. Psychometrics is the branch of psychology that deals with measurement in general and, in particular, addresses the design, administration, and interpretation of quantitative tests for the measurement of psychological variables, such as intelligence, attitude, aptitude, and personality traits (Ogilvie, 1993).

The Athletic Coping Skills Inventory-28 (ACSI-28) is a psychometric tool (Smith et al., 1995) that has a history almost exclusively devoted to competitive, team-based athletes. It has been used to help athletes improve their performance (Meyers et al., 2008), prevent injury (Johnson et al., 2005), overcome adversity and sustain participation in sport at elite level (Devantier, 2011; Meyers et al., 2008; Smith & Christensen, 1995).

In contrast to the gains competitive athletes may have received from PST, recreational athletes in general, and recreational runners (RR) in particular, appear to have benefitted very little from potential gains through PST, gains that could help RR prepare for and manage psychological challenges faced in their sport. For example, goal setting, planning and overcoming adversity are attributes of successful athletes (Devantier, 2011;Meyers et al., 2008) but a thorough literature review revealed no psychometric tool designed to evaluate and assist RR in these and other dimensions, even though recreational running is a popular physical activity and many RR could benefit from such a tool. The lack of PST and absence of psychometric tools designed for RR are also in contrast to the increasing support and innovations that runners have benefitted from in the past 30 years in other aspects of their sport such as improved clothing (synthetic materials with waterproof, thermal and wicking capabilities), technology applications (GPS, biofeedback, virtual partners), support groups (local and online), training programs, dietary and physiotherapy advice. For PST to benefit RR, a reasonable starting point may be to examine an existing psychometric tool used with competitive athletes and determine whether or not it could be usefully applied to RR.

1.2 Purpose of Study

The purpose of this thesis was to examine the psychometric properties of the ACSI-28 when applied to RR. Such an investigation may reveal whether or not the ACSI-28's well documented applications to competitive, team based athletes could be extended to RR.

1.3 Research Question

This research study examined the psychometric properties of the ACSI-28 when applied to RR. In particular, the study sought to investigate the following question: will the factorial structure and composition of the ACSI-28 be supported in a sample of RR?

1.4 Significance of the Study

Many developed countries are facing health care problems due, in part, to the fact that a growing percentage of their population is becoming more susceptible to cardiovascular risk factors, including high blood pressure, dyslipidaemia, insulin resistance, and obesity (Dalleck et al., 2012). Many of these risk factors are a result of excess calorie intake and the adoption of a sedentary lifestyle. Physical activity can be a very effective, low-cost preventative treatment (Howley, 2004; Hawley & Lessand, 2008) and many RR may benefit from psychological skills training to help them start and adhere to regular physical activity. The findings of this study may help in understanding

how the ACSI-28, a commonly used psychometric tool, may be applied to help RR improve and sustain their participation in sport.

1.5 Definitions

The following definitions will be used in this study:

Athletic Coping Skills Inventory-28: The ACSI(28) is a psychometric questionnaire (Smith et al., 1995) designed to measure multiple psychological skills considered to be important in sports.

Recreational Runners (RR): RR are operationally defined as athletes who self-assess themselves as "always" or "mostly" running for the enjoyment of the running process, or for the benefits it brings them, and they see other runners as fellow participants; they run on average 3 to 4 times per week, are less likely to challenge themselves while running, and are more likely to follow less structured and lower intensity training programs than competitive runners.

Competitive Runners (CR): CR are operationally defined as athletes who self-assess themselves as "mostly" or "always" running to see how they rank against other runners, who they view as the opposition; they run on average 3 to 4 times per week, are more likely to challenge themselves while running, and are likely to follow more structured and higher intensity training programs than recreational runners.

1.6 Summary

A large number of RR engage in exercise regularly, and such physical activity is a low-cost, highly effective preventative treatment to avoid cardiovascular diseases (Hawley 2004; Hawley & Lessard, 2008; Pedersen & Saltin, 2006). Sustaining RR's participation in exercise may be helped by providing them with guidance or training in how to overcome the psychological challenges they may face in their sport. Such PST would be more effective if there was a psychometric tool designed to identify and measure psychological skills required by RR, but currently no such psychometric tool for RR exists. As a preliminary step towards creating a psychometric tool for RR, this study examined the psychometric properties of the ACSI-28 when applied to RR.

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2   Review of Literature

2.1 Introduction to Psychometric Tools

Measurement is a critical component of most scientific research, and measurement tools used in any study depend on the variables being studied. According to Kerlinger (1979), psychological "measures" can include both "tests" and "scales" and are regarded as the "quantitative estimates of the amount of a property or characteristic that individuals or groups possess" (p. 25). In psychological research, the variables may include intelligence (Furnham, 2009), attitude (Ye Yang, 2013), aptitude (Hovanitz, 2012) and personality traits (Özguven, 2012). Psychometrics is the branch of psychology that deals with the measurement of psychological variables and psychometric tools have an important part to play in the design, administration and evaluation of psychological skills training (PST; Birrer & Morgan, 2010). Measurement tools may be used in a wide variety of fields such as sports, business, law, performing arts and surgery; and basic PST often involves one or more of five psychological skills: goal setting, relaxation, imagery, self-talk and concentration (Anderson, 1999).

2.2 Types of Psychometric Tools

Psychometric tests, such as the Sport Competition Anxiety Test (Martens et al., 1995), allows researchers to compare participants' scores against those from a normative

group. Psychometric tests measure psychological variables such as emotional intelligence (Maul, 2012), cognitive intelligence (Reynolds, 2013), situational judgment (Libbrecht, 2013), non-verbal intelligence (Delen et al., 2012), and emotional self-awareness (Killian et al., 2012). In contrast to psychometric tests, psychometric scales typically do not have data norms for comparison purposes, but do allow researchers to perform between-subject and within-subject comparisons. Psychometric scales measure a broad spectrum of psychological variables including authenticity (Susing et al., 2011), sportsmanship coaching behaviors (Bolter, 2013), academic behavioural confidence (Sander, 2011), emotional intelligence (Kaur, 2011) and sense of community in adolescents (Chiessi et al., 2010). Psychometric tests and scales can be single or multi-dimensional in nature and may differ in the degree to which they are sport-specific.

2.3 Psychometric Specificity

Psychometric tools, tests or scales, may be generalized or sport-specific. Generalized psychometric tools are designed to measure psychological traits, aptitudes and abilities and can be applied to a wide variety of settings such as processes of change (Guo et al., 2011), spatial ability (Hogan, 2012) and social interaction phobia (Reilly et al., 2012). Conversely, sport-specific psychometric tools are designed to measure a particular sport-trait or be applied within a sport setting such as measuring mental toughness in sport (Gucciardi, 2012), sport leadership (Hyungil et al., 2009), and sport motivation (Mallett et al., 2007). Greater specificity of psychometric tools may increase their measurement validity but may also decrease their applicability.

2-2

Deciding on which type of psychometric tool to use, sport-specific or generalized, single trait or multidimensional, can be a challenge when carrying out research or administering PST. This challenge may be best addressed by focusing on the purpose of the research or PST, and evaluating the potential usefulness of a sport-specific or generalized tool in measuring the required psychological variables pertinent to the research or PST being carried out. One such generalized, multi-dimensional sports and exercise psychometric tool is the Athletic Coping Skills Inventory-28 (ACSI-28; Smith et al., 1995). The ACSI-28 measures seven psychological skills associated with success in sports.

2.4 The Athletic Coping Skills Inventory

The ACSI-28 was designed based on input from competitive team-based athletes across two studies. In the first study (Smith et al., 1995), 762 male and female high school athletes participating in three different high school sports (not specified) and college football players, completed the ACSI. Exploratory factor analysis revealed seven psychological subscales: (1) Coping with Adversity, (2) Concentration, (3) Confidence and Achievement Motivation, (4) Goal Setting and Planning, (5) Peaking Under Pressure, (6) Coachability, and (7) Freedom from Worry. Each subscale consisted of four items, collectively producing a 28-item tool, and Smith and colleagues reported impressive statistical results to support the reliability and validity of the ACSI-28 as a psychometrically sound multidimensional measure of coping skills. This data included factor loadings ranging from .46 to .77, and test-retest coefficients ranging from .47 to

.87. Convergent and discriminant validity was assessed by athletes in the validation sample completing a number of other relevant measures, including cognitive-behavioral coping skills (Rosenbaum, 1980), sport anxiety (Smith et al., 1990), mental health (Veit & Ware, 1983), global self-esteem (Smoll et al., 1993), generalized self efficacy (Coppel, 1980), and tendency to respond in a socially desirable manner (Crowne & Marlowe, 1960).

The 762 athletes in the first study obtained ACSI total scores and, after a sporting season, their coaches rated the athletes' sporting performance in one of three ways: "underachievers" (did not perform to their coaches' expectations), "normal achievers" (performed up to their coaches' expectations), or as "overachievers" (performed better than their coaches' expectations). The overachievers had significantly higher ACSI-28 scores than the others groups on several subscales (Coachability, Concentration, Coping with Adversity).

In the second study, (Smith & Christensen, 1995), 104 professional baseball players completed the ACSI-28 and their ACSI scores were then compared with their sporting performance. Higher scores on the ACSI-28 were associated with higher batting averages for hitters, lower earned run averages for pitchers, and higher player survival or continued involvement in professional baseball two and three years later. The ACSI-28 has also been used to measure psychological skills thought to be needed to be successful in other competitive, team-based sports including NCAA Division 1 basketball (Karamousalidis et al., 2006; von Guenthner & Hammermeister, 2007), expert cricket

(Weissensteiner et al., 2012), competitive figure skating (Frank, 1995), elite ice hockey (Bognar et al., 2009), provincial netball (Grobbelaar & Eloff, 2011), professional car racing (Arguelles, 2008), elite rowing (Baltzell, 1999), national and provincial rugby (Kruger et al., 2010), professional soccer (Devantier, 2011) and collegiate tennis (South, 2005). With only a few exceptions, car racing (Arguelles, 2008) and competitive skating (Frank, 1995), the majority of published studies involving the ACSI-28 focused on competitive team sports.

Although the ACSI-28 focuses on psychological skills associated with being successful in sports, it has often been used correlatively with studies that explore non-psychological aspects of success in sport, including preventing athlete injury in elite soccer players (Johnson et al., 2005), predicting athlete injury in professional soccer players (Devantier, 2011), predicting athletic performance and survival in professional baseball (Smith & Christensen, 1995), predicting clutch performance in Division I Varsity team sports (Birky et al., 2007), determining characteristics required for different team playing positions in provincial netball players (Grobbelaar, 2011), assessing the effectiveness of stress management training of Division I collegiate athletes (Brent, 2005), and developing skills in Olympic soccer players (Meyers et al., 2008).

2.4.1 ACSI-28 Challenged

Crocker et al. (1998) challenged Smith et al.(1995)'s description of the ACSI-28 as a measurement of coping skills. Crocker and colleagues asserted that the ACSI-28

was probably best considered a measure of psychological skills rather than actual coping. Contextually, basic psychological methods are considered to be specific actions directed toward the self-regulation of behavioural, emotional, and cognitive states underlying successful athletic performance (Thomas et al., 1999). By contrast, coping behaviour is defined as "encompassing actions that are used to change and/or avoid a [stressful] situation and one's emotions" (Hoar et al., 2006, p. 49). As the ACSI-28 appears not to include avoidance in its multiple dimensions, and as avoidance is an essential component in Hoar et al. (2006)'s functional definition of coping, for the purposes of this research, the ACSI-28 will be considered to be a measure of basic psychological skills rather than a measurement of coping skills. This emphasis on basic psychological skills is consistent with many previous research studies that have also used the ACSI to explore basic psychological skills (Karamousalidis et al., 2006; von Guenthner & Hammermeister, 2007; Devantier, 2011).

2.5 Recreational Runners

Recreational runners (RR) have been studied from different psychological perspectives including hydration perceptions (O'Neal et al., 2011), anxiety and coping strategies (Campen and Dawn (2001), mindfulness (De Petrillo et al., 2009), obligatory running (Ogles, 1995) and motives for running (Breheny, 2002). A thorough literature review revealed the absence of a psychometric tool designed specifically to meet the psychological challenges faced by RR.

2.5.1 Differences Between Recreational and Competitive Athletes

When a generalized tool is created, such as the ACSI-28, the authors typically encourage others to test the new psychometric tool with a variety of populations in an effort to better define the applicability boundaries of their newly created tool. Although the ACSI-28 was created in 1995 (Smith et al.) and has an extensive application history, its applicability boundaries may not yet be fully defined given its limited application to recreational and individual athletes.

As psychometric tests have been shown to be culturally sensitive (de Alencar Caidas et al., 2012), selecting the appropriate psychometric tool needs to take into consideration cultural differences, such as language, social norms and assessment expectations, that may exist between large populations. Within these large populations, sub groups often exist with their own distinct set of behaviours, motivations and beliefs. For example, as differences may exist between recreational and competitive athletes, it may be reasonable to deduce that the competitive-based ACSI-28 in its current form may need to be further refined to measure the different psychological needs of RR. For example, as the ACSI-28 was designed with inputs from competitive, team-based athletes, it is no surprise that it describes situations competitive athletes may relate to, but recreational athletes may not, such as enjoying, welcoming and performing well under pressure, understanding the usefulness of a coach or group leader criticizing them, and being able to focus their attention and block out distractions while competing in their sport.

2.6 Purposes

The purpose of this research was to assess the psychometric properties of the ACSI-28 when applied to RR. In particular, this study examined the factor structure and composition of the ACSI-28 to determine if its structure is supported in a sample of RR.

2.7 Summary

Psychometric tools play an important role in the assessment, design and evaluation of PST. Such tools usually consist of scales and tests, which can be single or multi-dimensional. The ACSI-28 (Smith et al., 1995) is a multi-dimensional psychometric tool consisting of seven psychological subscales deemed to be essential to successful sport performance. The applicability boundaries of the ACSI-28 may not yet be fully established as its design and multi-sport application history appear to be limited to competitive, team-based athletes. Its design was based on experiences common to team-based competitive athletes and such experiences, plans, motivations and approaches may differ significantly from those experienced by recreational individual athletes. These differences between competitive and recreational athletes, if they exist, may mean that the psychometric properties of the ACSI-28 should be further examined to determine its useful application to RR.

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3 Co-Authorship Statement

I will address the development of my thesis idea, and the contributions of my co-authors in the following statements:

i)   I completed my first of five marathons in 1982 and since then have marvelled at the advances made in the sport of recreational running. These advances cover many dimensions of the sport including clothing, technology, training programs, social support, physiotherapy and dietary advice to name just a few. Such a list of advances also serves a different purpose. For those interested in psychological well-being, for those sure that psychology has an important part to play in maintaining and sustaining interest in sport, that list of advances serves only to highlight a glaring gap: Sports psychology has not delivered commensurate benefits to recreational runners in the past 30 years as it has to competitive athletes. That gap was the primary motive for me, as a mature student, to undertake a Masters program to help address the following question: Why can't the benefits of sports psychology, that have been experienced by competitive athletes, be extended to recreational runners?

ii)   Dr. Basil Kavanagh, my supervisor for the duration of my studies, has a wealth of practical knowledge of applied psychology. He was more than willing to share his experiences with me and offer guidance throughout my studies. Dr. Kavanagh also has an extensive running background, including marathon running and coordinating many highly organized running events, all of which means he was ideally suited to understand the differences that may exist between recreational and competitive runners. Dr. Kavanagh helped to advertise the study to local running groups and introduced me to running group leaders. He further helped by approving a timeline to collect the data and complete the thesis, as well as providing valuable editorial comments on draft manuscripts.

iii)   Dr. Erin McGowan joined our team in the third and final year of my studies. Her positive and practical input was evident from our very first meeting. At that point, I had created a number of possible thesis options and had not yet decided on the best course of action. Dr. McGowan providing pivotal advice on the implications of each option, which gave me essential

information upon which I made the decisive choice of examining the psychometric properties of the ACSI-28 when applied to recreational runners. Thereafter, Dr. McGowan has consistently provided invaluable guidance in terms of modern research and statistical procedures, especially relating to Exploratory Factor Analysis and Confirmatory Factor Analysis.

4 AN EXAMINATION OF THE PSYCHOMETRIC PROPERTIES OF THE ATHLETIC COPING SKILLS INVENTORY-28 FOR ADULT RECREATIONAL RUNNERS

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4.1 Abstract

Abstract

The Athletic Coping Skills Inventory-28 (ACSI-28) is a validated psychometric questionnaire that measures sport-specific psychological skills thought to be instrumental to sport performance. Its extensive application history covers a wide variety of competitive, mainly team-based sports, but there has been no published verification of the ACSI-28's psychometric properties when applied to recreational runners (RR). The purpose of this research was to explore the factor structure and composition of the existing ACSI-28 in a sample of RR. Participants (n = 345) completed an online ACSI-28, and self-assessed themselves as either recreational or competitive runners. Exploratory Factor Analysis of the results indicated support for only three factors (Goal Setting and Planning, Freedom From Worry, and Peaking Under Pressure) compared with the original seven factor ACSI-28. These three factors were associated with 15 items and formed the ACSI-RR (15,3) model, which was tested using Confirmatory Factor Analysis (CFA). The CFA revealed that the ACSI-RR model is a better fit to the RR data than the original ACSI-28 model, although neither models produced an acceptable level of fit to the data. Differences between recreational and competitive athletes are discussed to help explain the results. In summary, our findings did not support the psychometric structure of the original ACSI-28 but did support a modified version, the ACSI-RR(15,3), as an interim measurement tool of RR psychological skills.

Keywords: ACSI-28, psychometric properties, recreational, running

4.2 Introduction

Psychometrics is the branch of psychology that deals with the design, administration, and interpretation of quantitative tests for the measurement of psychological variables such as intelligence, attitude, aptitude, and personality traits (Ogilvie, 1993). The history of psychometrics may be traced back to scientists such as Ernst Heinrich Weber (1795–1878) and Gustav Theodor Fechner (1801–1887) who attempted to measure the mathematical relationships between the physical magnitudes of external stimuli and the psychological intensities of the resulting sensations. Most psychometric tools used in Sports Psychology were designed to help competitive and often professional athletes better understand themselves and improve their athletic performance when used in combination with other assessment tools and training programs (Birrer et al., 2010; Gordon, 2012).

Competitive and professional athletes often strive for performance excellence (Appleton et al., 2012) and commit time and effort to develop their skills in all required areas, including psychological dimensions leading to mental toughness. In contrast, recreational athletes, such as recreational runners (RR), may be more motivated by health issues and social interaction (Leedy, 2000) than by performance excellence, and may have less of an appetite for psychological skills training (PST) than their competitive counterparts. Very little psychometric attention has been given to RR even though the sport of recreational running is extremely popular and crosses gender, age and country boundaries (Clough et al., 1989; Szabo & Abraham, 2013).

In a world where obesity is a growing problem and is placing considerable strain on health care systems, any assistance that RR could receive to help start and adhere to their sport participation is timely and should be encouraged. A thorough literature review revealed the absence of any psychometric tool designed specifically to help RR measure the psychological challenges they experience. Such a measurement tool, if it existed, may increase RR's self-awareness and provide them with a way to monitor their progress on psychological dimensions to enhance their enjoyment of and participation in sport.

A pragmatic approach to addressing this gap in RR psychometric research is to examine the psychometric properties of an existing and well established psychometric tool to determine its applicability to RR. One such competitive-based psychometric tool is the Athletic Coping Skills Inventory-28 (ACSI-28; Smith et. al, 1995). The ACSI-28 is a multidimensional psychometric tool that measures seven psychological subscales deemed to be essential to successful sport performance. Crocker et al. (1998) challenged Smith et al. (1995)'s description of the ACSI-28 as a measurement of coping skills. Crocker and colleagues asserted that the ACSI-28 is probably best considered a measure of psychological skills rather than actual coping. In this context, basic psychological methods are considered to be specific actions directed toward the self-regulation of behavioural, emotional, and cognitive states underlying successful athletic performance (Murphy & Tammen, 1998; Thomas et al., 1999). By contrast, coping behaviour is defined as "encompassing actions that are used to change and/or avoid a [stressful] situation and one's emotions" (Hoar et al., 2006, p. 49).

As the ACSI-28 appears <u>not</u> to include avoidance in its multiple dimensions, and as avoidance is an essential component in Hoar et al. (2006)'s functional definition of coping, for the purposes of this research, the ACSI-28 will be considered to be a measure of basic psychological skills rather than a measurement of coping skills. This emphasis on basic psychological skills is consistent with many previous research studies that have also used the ACSI to explore basic psychological skills (Devantier, 2011; Karamousalidis et al., 2006; von Guenthner & Hammermeister, 2007).

The ACSI-28 has been applied extensively to team-based competitive athletes (NCAA Division 1 basketball, Karamousalidis et al., 2006; expert cricket, Weissensteiner et al., 2012, elite ice hockey, Bognar et al., 2009, national and provincial rugby, Kruger et al., 2010, professional soccer, Devantier, 2011). A thorough review of published articles revealed only one study (Kruger et al., 2012) that used the ACSI-28 with long distance runners. The runners were described as "talented" with aspirations for making running their career, so Kruger's study may be considered more of a focus on competitive runners than on RR.

Psychometric tools have been shown to be sensitive to cultural differences. In sports psychology, differences between recreational and competitive athletes may include motivation to perform, frequency of participation, intensity and structure of training programs, response to pressure situations and performance levels and expectations (Leedy, 2000). As the ACSI-28 was designed with competitive, team-based athletes, differences that may exist between recreational and competitive athletes may mean the ACSI-28 in its current form may need to be

further refined to measure the different psychological needs of RR. For example, the ACSI-28 describes situations competitive athletes may relate to but RR may not, such as enjoying, welcoming and performing well under pressure, understanding the usefulness of a coach or group leader criticizing them, and being able to focus their attention and block out distractions while competing in their sport.

The purpose of this research was to examine the psychometric properties of the ACSI-28 when applied to RR. In particular, the study explored the factor structure and composition of the existing ACSI-28 in a sample of RR. It is hypothesized that not all components of the ACSI-28 will be supported by our sample of RR due, in part, to differences between competitive athletes and RR.

4.3 Methods

4.3.1 Participants

The sample used to examine the psychometric properties of the ACSI-28 consisted of 345 male ($n = 176$) and female ($n= 169$) runners from local running groups. They were advised that the purpose of the study was to investigate the "experiences of recreational runners." Participants were 19 years or older and had been running for between 1 to 50 years, with a mean of 11.01 years (SD = 10.2), during which time the runners had completed runs of various distances: 1km ($n= 187$), 5km ($n= 309$), 10km ($n= 299$), 10 miles (16km, $n= 283$), half marathon (21 km, $n= 249$), and full marathon (42km, $n= 147$). They ran on average 3.6 times per week (SD = 1.06) and described their running programs as having no structure ($n =$

9), very casual structure ($n = 62$), somewhat casual structure ($n = 78$), somewhat structured ($n = 168$) or very structured ($n = 28$). They described the intensity of their running programs as very easy ($n = 11$), somewhat challenging ($n = 232$), challenging ($n = 96$) or very tough ($n = 6$).

Participants were asked to identify the reasons why they run. They were provided a list of reasons and asked to rate on a 4 point scale (1 = *very important, 2 = important, 3 = somewhat important, 4 = not important*) how important each reason was to them, and were also given an option to add additional reasons not included in the list. They ran for a variety of reasons they considered very important: their health ($n = 202$), how it made them feel ($n = 190$), to challenge themselves ($n = 156$), because they enjoyed running ($n = 142$), and stress relief ($n = 129$). They also ran for reasons they considered important: help keep them sane ($n = 120$), social ($n = 108$) and "me" time ($n = 99$). All participants had agreed to take part in a study of RR and, therefore, by implication, had identified themselves as RR. However, it is recognized that RR may differ in their motives for running and so were given the opportunity to self-assess themselves as always recreational (n = 77), mostly recreational (n = 213), mostly competitive (n = 49), always competitive (n = 6).

4.3.2 Measures

The ACSI-28 was developed by Smith and colleagues (1995) to measure multidimensional psychological skills of athletes. It contains seven sport-specific subscales, each with four items: (1) Coping with Adversity, (2) Peaking Under

4-7

Pressure, (3) Goal Setting/Mental Preparation, (4) Concentration, (5) Freedom

From Worry, (6) Confidence and Achievement Motivation, and (7) Coachability.

Each item was rated on a 4-point Likert scale, anchored from *almost never* (0) to

almost always (3). Smith et al. (1995) established that the seven ACSI-28 subscales

had adequate internal consistencies, with alphas ranging from .62 to .86, and factor

loadings ranging from .46 to .77. Two of the 28 factor loadings were .46 while the

other 26 factors were in the .51 to .77 range. Test-retest coefficients ranged from

.47 to .87. Convergent and discriminant validity was assessed by the athletes in the

validation sample completing a number of other relevant measures, including a

measure of cognitive-behavioral coping skills (Rosenbaum, 1980), sport anxiety

(Smith et al., 1990), mental health (Veit & Ware, 1983), global self-esteem (Smoll

et al., 1993), generalized self efficacy (Coppel, 1980), and tendency to respond in a

socially desirable manner (Crowne & Marlowe, 1960).

4.3.3 Procedure

Ethical approval for this research was obtained from the Interdisciplinary

Committee on Ethics in Human Research at Memorial University of Newfoundland.

Participants were recruited from a variety of local running groups. Runners were

advised that the purpose of the study was to examine the experiences of RR, and

that the research would be carried out using a confidential online survey which

would take about 15 minutes to complete. They were informed of the voluntary

nature of the study and were assured of confidentiality should they choose to

participate anonymously. All participants, however, were given the option of

obtaining a copy of their individual survey results as well as an invitation to attend a

presentation of the survey results at group level. Most participants (n=200) wished

to remain anonymous, while the remaining participants (n=145) elected to receive

their individual results and provided their email addresses.

The survey was entitled "Experiences of Recreational Runners" and was

administered online consisting of 40 questions divided into two sections (see

Appendix A). The first section consisted of a collection of items including

participants' informed consent, preference regarding obtaining a copy of their

individual results, confirmations that they were aged 19 or above, and a self-

assessment of their running experience (i.e., years running, reasons for running,

distances ran, personal best times, personal assessment of the frequency, structure

and intensity of their running programs, type of runner). The second section

contained the ACSI-28 psychometric tool in which participants were asked to

indicate as accurately as possible how often they had experienced what was

described in each of 28 statements (see Appendix B). Minor changes to the

wording of some of the ACSI-28 statements (see Appendix C) were made to ensure

the statements provided contextual meaning to RR while at the same time

maintaining the original meaning of the statements. For example, some of the

original ACSI-28 statements used words such as "to play", "during a game" and

"manager." In this study involving RR, these words were replaced with "to run",

"while I am running" and "group leader" respectively.

Participants were instructed to "Read each statement carefully, then rate the frequency with which they have experienced it; there are no right or wrong answers; do not spend too much time on any one statement."

4.4 Results

4.4.1 Quality Data Check

The data used in this study were based on valid responses received from participants (n=345). Invalid responses (n=23) were excluded as they did not contain critical information such as confirmation of participant's age, ACSI-28 responses, runner type and/or gender.

4.4.2 Suitability of Data for Exploratory Factor Analysis

The data were examined to determine their suitability for Exploratory Factor Analysis (EFA). The sample size (n=*345*) meets Tabachnick and Fidell (2007)'s recommended minimum number of 300 cases for factor analysis and satisfies Field (2005)'s suggested ratio of 10-15 participants for each item (n =28). The correlation matrix was examined to verify that many of the coefficients were greater than .3 (Tabachnick & Fidell, 2001). Bartlett's test of sphericity relating to item interdependence was examined and indicated significance (chi square = 3061, p = <.001) and the Kaiser-Meyer-Olkin sampling statistic of .86 was sufficient, indicating that factor analysis procedures were appropriate.

4.4.3 EFA Results

A principal component factor analysis was conducted using SPSS v19 in both orthogonal and oblique rotations. The oblique rotation was preferred because it was assumed that the latent factors would be correlated. The number of factors in the analysis was not restricted thus allowing the items to load to any number of factors. The results of this factorial analysis are shown as a scree plot in Figure 1 and as total variance explained in Appendix D.

Catell (1966) recommends retaining all factors above the elbow in the scree plot, as these factors contribute the most to explaining the variance in the data set. Field (2005) explains that the "elbow", or point of inflexion, is where the slope of the line changes dramatically and that only factors to the left of the point of inflexion are retained. Field goes on to explain that the point of inflexion represents an error factor and "so most people do not retain the factor at the point of inflexion." (Field, 2005, p. 640). From the scree plot shown at Figure 1, the point of inflexion appears to occur at Factor 4. Stevens (2002) argues that the scree plot provides a fairly reliable criterion for factor selection when the sample size is more than 200 participants.

There may be other ways to interpret the scree plot, such as retaining the factor at the point of inflexion as well as those above it. Such an approach revealed a four-factor model with 20 items, the ACSI-RR(20,4).

However, as the sample size in this study (n=345) adequately meets Stevens (2002)'s sample size criterion, only the first three factors, that is, those to the left of

(above) the point of inflexion, were retained. The three factors that were retained cumulatively explained 41.50% of response variance (see Appendix D).

This retention of three factors is shown in greater detail in the pattern matrix of factor loadings in Appendix E. As an interim identifier, this three-factor tool will be labelled as the ACSI-Recreational Runners (ACSI-RR). This three-factor solution was supported by the Kaiser criterion, and by parallel analysis (Horn, 1965). Appendix E shows only factorial loadings in excess of .30. Item retention was based on factor loadings greater than .45 on the primary factor and less than or equal to .30 on a secondary factor. Even though the structure matrix (see Appendix F) was also examined and verified the three factors shown in the pattern matrix, retention or elimination of items was based solely on information obtained from the pattern matrix as it includes common variance and excludes variance due to error.

Appendix E shows that the three-factor ACSI-RR contains 17 items ranging in factorial loading from .45 to .845. Factor 1 originally consisted of eight items (items 1, 8, 13, 20, 2, 14, 26 and 9). Item 14 was double loaded and therefore eliminated. Item 9 had a factor loading of only .441, below the .45 threshold, but was temporally retained to be reassessed in a secondary EFA. This left Factor 1 with seven items covering four psychological entities: goal setting, planning, confidence, and motivation. Clearly debatable, the first ACSI-RR factor was named *Goal Setting and Planning.*

Factor 2 in the ACSI-RR (see Appendix E) consisted of five items (items 12, 19, 7, 23 and 5) that generated factor loadings ranging from .365 to .801. As

four of these items came from the original ACSI-28 subscale *Freedom From Worry*, the second factor in the ACSI-RR was also labelled *Freedom From Worry*.

Finally, Factor 3 in the ACSI-RR (see Appendix E) was a complete verification of the original ACSI-28 subscale, *Peaking Under Pressure*, as all four items in this ACSI-28 subscale were retained (items 18, 6, 22 and 28) in this study, as was the factor name, *Peaking Under Pressure*, with factor loadings ranging from .805 to .845.

The three retained ACSI-RR factors initially consisted of 16 items (see Appendix E). A second principal component factor analysis was then carried using only these 16 items. The results of this second EFA (see Appendix G) identify one double-loaded item, item 9, which loaded .449 on Factor 1 and -.315 on Factor 2. This item was eliminated because of its double loading, thus reducing the ACSI-RR from 16 to 15 items, while maintaining its three factors, and therefore forming the ACSI-RR (15, 3) model. A third EFA was carried out using only these 15 items. The pattern matrix and response variance results of this third EFA as shown in Appendix H, and Appendix I respectively. The total response variance explained by the ACSI-RR's (15,3) had increased to 56.96% (see Appendix I).

The ACSI-RR (15,3) contains factor loadings ranging from .431 to .862 (see Appendix H). The majority of the factor loadings are positive, although all four items in the third factor are negative (-.798 to -.862), and one item in the second factor is negative (-.431). As can be seen from Appendix I, these three factors have eigenvalues ranging from 1.672 to 4.273.

In summary, Table 1 shows the psychometric properties of the ACSI-RR including factor loadings, eigenvalues, percentage of variance explained and Cronbach's Alphas of the ACSI-RR. Cronbach's alpha measurements of internal consistencies for the subscales range from .72 to .85.

4.4.4 Reviewing the Structure of the Original ACSI-28

As the purpose of this research was to examine the psychometric properties of the ACSI-28 when applied to RR, it was necessary to examine the factorial structure of the original ACSI-28 in light of the response variance received from RR. The EFA results from this study support a three-factor, 15-item ACSI-RR, which differs substantially from the seven-factor, 28-item structure of the original ACSI-28. However, even though 13 of the original 28 ACSI factors were eliminated in this study, 15 were retained in either their original or new configurations. The first ACSI-RR factor, *Goal Setting and Planning,* was created from two former ACSI-28 subscales, *Goal Setting and Planning, and Confidence and Motivation.* The second and third ACSI-RR factors, *Freedom From Worry* and *Peaking Under Pressure,* were transferred directly from the original ACSI-28 subscales of the same names. Three remaining ACSI-28 subscales (Coping with Adversity, Coachability, and Concentration) were eliminated in this study for a variety of reasons that are summarized in Table 2.

4.4.5 Confirmatory Factor Analysis

The three-factor structure identified through EFA was then evaluated using the more rigorous approach of confirmatory factor analysis (CFA) using SPSS AMOS v19 maximum likelihood procedures. CFA evaluated the degree to which the structural characteristics of the original ACSI-28 model, and the two ACSI-RR models created in this study, conformed to the hypothesized underlying psychometric model. Following the same approach used by Smith et al. (1995), the fit of each model was evaluated with a number of indices, including the p value associated with the chi-square statistic, Steiger's (1990) root mean square error of approximation (RMSEA), Bollen (1989)'s incremental fit index (IFI), and Bentler's (1990) comparative fit index (CFI). IFI and CFI values of .90 and larger are deemed to indicate an adequate fit of the model to the data (Albright, & Park, 2009). A RMSEA of .08 or less indicates a "reasonable fit" (Joreskog & Sorbom, 1993). To test if a reduced or alternate model was a statistically significant improvement (or decrement) over another model, the chi-square difference $\{X^m\}$, or Q test (i.e., the difference in the chi-square values of the two models evaluated in terms of the difference in the degrees of freedom) was employed. A Q value of less than 5.0 is deemed acceptable. CFA was carried out using the common constraint procedure of setting the variance of latent variables to one and not constraining their covariances (Albright & Park, 2009).

The CFA results are shown at Table 3. The Q values indicated that both ACSI-RR models represented a statistically significant improvement over the original ACSI-28 model when used with RR, and that the ACSI-RR (15, 3) model

represented the best fit to the data. However, RMSEA values of .082 and .092, as well as IFI and CFI values of less than .85, indicate that neither ACSI-RR models represented an acceptable fit to the hypothesized underlying psychometric model for RR.

4.4.6 Differences between recreational and competitive runners.

Responses from participants who assessed themselves as *always recreational* (n=77) or *mostly recreational* (n=213) were grouped as "recreational" runners (n=290), while those who selected *mostly competitive* (n=49) or *always competitive* (n=6) were grouped as "competitive" runners (n=55). These two groups differed significantly in background variables as shown in Figures 2 and 3. Independent-sample T-tests were carried out and the results, shown on Table 4, indicated that competitive runners differed in having training programs that were more structured and had greater intensity, had faster personal best times for 10 miles, were more highly motivated by the enjoyment and challenge of running, ran more frequently and had been running for a greater number of years than RR. The first four differences had a medium effect size, while the last three had small effect sizes.

4.5 Discussion

The primary aim of the current study was to examine the psychometric properties of the ACSI-28 when applied to RR. The results from the current study reduce the original ACSI from 28 to 15 items, and from seven to three factors to produce the Athletic Coping Skills Inventory (Recreational Runners) ACSI(RR).

The ACSI-RR explained 56.96% of response variance. Thirteen items from the original ACSI-28 were eliminated, possibly due to differences between competitive athletes and RR in areas such as situational guidance and performance expectations.

In terms of situational guidance, competitive athletes often have coaches, whereas recreational athletes do not. Such guidance is expected and presumably valued by competitive athletes, but this guidance may not be expected or valued by RR.

In terms of performance expectations, coaches may correct or criticize competitive athletes and the competitive athletes are expected to accept that such correction is both necessary and beneficial to their performance, whereas recreational athletes may show very little tolerance or appreciation for being "corrected" or "criticized" when taking part in their recreational sport.

This athlete-coach relationship underpins the original ACSI-28 *Coachabilty* subscale which was developed with competitive athletes in mind. As RR in general do not have coaches, it was no surprise that the *Coachability* subscale did not generate factorial support when used with RR.

Another possible reason for the elimination of some of the original ACSI-28 items, and which may also add to differences between recreational and competitive athletes, relate to the theories of achievement motivation. The need for achievement refers to an individual's desire for significant accomplishment, mastering of skills or high standards. The term was first used by Young (1938) and coined by Gill (2000) who explained achievement motivation as a variety of actions including

intense, prolonged and repeated efforts to accomplish something difficult. Driven-to-achieve competitive athletes are often task focused, seek out challenges and are highly motivated to succeed, whereas recreational athletes may be more focused on outcome goals, seek easy tasks, and are highly motivated to avoid failure.

Such differences between competitive and recreational athletes were supported by the divergence in responses in this study compared with responses received in Smith et al. (1995)'s original study. In particular, Smith's original subscale *Coping with Adversity* contained four items that focused on how athletes respond to setbacks when they are performing: *I remain positive and enthusiastic during competition, no matter how badly it goes; When I feel myself getting too tense, I can quickly relax my body and calm myself; I maintain emotional control no matter how things are going with me; When things are going badly, I tell myself to keep calm and this works for me.* Implicit in this *Coping with Adversity* subscale is the concept of striving for excellence or striving to master a task, both of which are desirable attributes of competitive athletes, but are absent from the views expressed by recreational athletes.

These motivational differences between competitive and RR may help explain why three of the four original *Coping With Adversity* subscale items were eliminated from the ACSI for RR. The only *Coping With Adversity* subscale item that obtained factorial support in this study, and was transplanted to another subscale, referred to keeping calm: *When things go badly I tell myself to keep calm and this works for me.* Its factorial support may be related to the ambiguous nature of the statement. The phrase "When things go badly" may be sufficiently

ambiguous to be meaningful to both competitive and recreational athletes but not in the same manner. "Going badly" for competitive athletes may be taken as an objective measure of their poor performance relative to a standard of excellence, whereas "going badly" to RR may be taken as a subjective measure of how they are feeling about themselves without necessarily benchmarking their performance against a desired standard. Even though competitive and recreational athletes may have considerably different performance expectations, the phrase "going badly" may be sufficiently ambiguous to produce different but nevertheless consistent within-group meaning so that the *going badly* statement produces response clustering from both competitive and RR.

Three of the original ACSI-28 subscales, each originally containing four items, remained substantially unchanged as the items were verified and retained as part of their original subscale: Freedom From Worry (no change), Peaking Under Pressure (no change), Concentration (all four original items were verified and retained) and one item (*When things are going badly, I tell myself to keep calm and this works for me*) was added to this subscale.

This study revealed that significant differences may exist between self-assessed recreational and competitive runners. Furthermore, as psychometric tools can be culturally sensitive, the differences between recreational and competitive runners may help to explain why some of the original ACSI items and scales did not obtain psychometric validation when applied to RR.

4.6 Summary

In summary, this study is the first to examine the psychometric properties of the ACSI-28 when applied to RR. As hypothesized, our findings did not support the ACSI-28 in its original form, however, our results did support the modification of the original model to create the ACSI-RR(15,3) model. The elimination of some elements of the original ACSI-28 may be, in part, due to differences in guidance, motivations and performance expectations between competitive and RR.

This RR sample represents a large number of active athletes, spanning age and gender barriers. Information gathered from this research study may help RR better understand themselves which, in turn, may increase their awareness of psychological challenges they may face in their sport. It may also assist RR in maintaining their active participation in sport, a key element in combating society's growing obesity problem. Also, the availability of the ACSI(RR) may draw helpful attention to psychological factors RR may have previously considered to be beyond their control, and may assist in the development of RR's greater self-awareness, which often is considered to be a precursor to personal progress. For example, the ACSI(RR) draws attention to goal setting and planning, and provides RR with feedback on these behaviours. Such feedback may encourage RR to consider implementing goal setting behaviour, or to reinforce this behaviour if already present.

The large, clearly defined sample group of RR and EFA/CFA results supporting a three-factor ACSI-RR model may be considered as strengths of this

study. Although better than the original ACSI-28 model, the ACSI-RR still needs improvement. The primary limitation of this study is related to the generalizability of the results to other recreational athletes. As this study intentionally focused on RR, consideration should be given to testing the ACSI-RR (15,3) with other recreational athletes. Secondly, the definition of RR may need greater clarity to avoid the possibility of having a competitive RR. Also, the lack of test-retest data means the ACSI-RR, at best, could be considered an unverified psychometric tool. The next step would be to verify the results of this study with an independent sample.

Finally, for those interested in enhancing the ACSI-RR (15,3) as a psychometric tool, consideration should be given to identifying and testing new statements applicable to RR that go beyond the 28 statements used in the ACSI-28 and beyond the 15 statements retained in the ACSI(RR). The CFA results clearly indicate factorial support for three factors linked to those 15 items, but it is reasonable to assume that there are other psychometric items and factors to be discovered with RR. Such items and factors may be obtained in a number of ways, including holding focus groups with RR to suggest challenges they may face while running. Such challenges may include overcoming the desire to stop running when tired, dealing with negative self-talk, breaking a long run into smaller more manageable sections, and maintaining a sense of progress and control while running. Future research into identifying and measuring psychological variables important to RR is recommended, as well as exploring the ACSI-28 in recreation athletes beyond RR.

4.7 References

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4.8 Tables and Figures

Table 1

Factor Loadings, Eigenvalues, Percentage of Variance Explained and Cronbach's Alphas of the ACSI-RR (15 items)

Subscale and Items	Factor 1	Factor 2	Factor 3
Goal Setting and Planning			
1 Setting specific goals daily and weekly	.81		
13 Setting performance goals for each practice	.76		
8 Planning about how to reach my goals	.71		
20 Creating my own game plan	.70		
2 Getting the most out of my talent and skills	.58		
26 Trying harder when I fail to reach my goals	.54		
Freedom From Worry			
12 Pressurizing myself to perform well*		.78	
7 Worrying about what others think*		.77	
19 Worrying about making mistakes*		.77	
23 Imaging what will happen if I fail*		.69	
5 Remaining Positive		-.43	

6	Thinking more clearly when under pressure			-.86
18	Enjoying pressure			-.84
28	Concentrating better when under pressure			-.82
22	Welcoming pressure situations			-.80
	Eigenvalue	4.27	2.51	1.76
	Percentage of variance	28.48	16.73	11.75
	Cumulative Percentage of Variance		56.96	
	Cronbach's Alpha	.79	.72	.85

Note. * reverse scored

Table 2

Factor Loadings and ACSI-RR Statement Inclusion Decisions

Factor Loading	ACSI-28 Statement (item number)	ACSI-RR Item Inclusion
	Coping with Adversity	
TL	I remain positive and enthusiastic during competition, no matter how badly it goes. (5)	Not included
-0.46	When things are going badly, I tell myself to keep calm and this works for me. (17)	Transferred
DL	When I feel myself getting too tense, I can quickly relax my body and calm myself. (21)	Not included
DL	I maintain emotional control no matter how things are going for me. (24)	Not included
	Confidence and Motivation	
0.61	I get the most out of my talent and skills. (2)	Combined
DL, RR	I feel confident that I can perform well. (9)	Not included
DL	I don't have to be pushed to practice or train hard - I give 100%. (14)	Not included
0.49	When I fail to reach my goals, it makes me try even harder. (26)	Combined

Table 2

Factor Loadings and ACSI-RR Statement Inclusion Decisions

Factor Loading	ACSI-28 Statement (item number)	ACSI-RR Item Inclusion
	Coachability	
TFL	When a coach or group leader tells me how to correct a mistake I have made, I tend to take it personally and feel upset. (3)	Not included
TFL	When a coach or group leader criticizes me, I become upset rather than feel helped. (10)	Not included
TFL	If a coach/group leader criticizes or yells at me, I correct the mistake without getting upset about it. (15)	Not included
TFL	I improve my skills by listening carefully to advice and instruction from coaches and group leaders. (27)	Not included
	Peaking Under Pressure	
0.77	I tend to run better under pressure because I think more clearly. (6)	Included
0.77	The more pressure there is while I am running, the more I enjoy it. (18)	Included
0.83	To me, pressure situations are challenges that I welcome. (22)	Included
0.83	I make fewer mistakes when the pressure is on because I can concentrate better. (28)	Included

Table 2 Continued

Factor Loadings and ACSI-RR Statement Inclusion Decisions

Factor Loading	ACSI-28 Statement (item number)	ACSI-RR Item Inclusion
	Goal Setting and Planning	
0.77	On a daily or weekly basis, I set very specific goals for myself that guide what I do. (1)	Combined
0.72	I tend to do lots of planning about how to reach my goals. (8)	Combined
0.69	I set my own performance goals for each practice. (13)	Combined
0.66	I have my own game plan worked out in my head long before the run begins. (20)	Combined
	Concentration	
DL	When I am running, I can focus my attention and block out distractions. (4)	Not included
-0.82	It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to. (11)	Included
-0.42	I handle unexpected situations that may occur during a run very well. (16)	Included
-0.72	It is easy for me to direct my attention and focus on a single object or person. (25)	Included

Table 2 Continued

Factor Loadings and ACSI-RR Statement Inclusion Decisions

Factor Loading	ACSI-28 Statement (item number)	ACSI-RR Item Inclusion
	Freedom From Worry	
0.77	I worry quite a bit about what others think of my performance. (7)	Included
0.80	I put a lot of pressure on myself by worrying about how I will perform. (12)	Included
0.78	While competing, I worry about making mistakes or failing to perform. (19)	Included
0.59	I think about and imagine what will happen if I fail or screw up. (23)	Included

Note. Factor Loading: TL - loaded too low (< .4), TFL - too few loadings onto a single factor, DL - double loaded onto two factors with ACSI-28 items, DL RR - double loaded onto two ACSI-RR items.
ACSI(RR) Item Inclusion: Included – ACSI-28 item included in ACSI(RR) within the same subscale as used in ACSI-28, Not Included – ACSI-28 item not included in ACSI(RR), Combined – ACSI-28 item included in ACSI(RR) but in a new scale created by combining items not previously combined in the ACSI-28, Transferred - ACSI-28 item included in ACSI(RR) by transferring it from an original ACSI-28 subscale to a different ACSI(RR) subscale

Table 3

Confirmatory Factor Analysis Model-Testing Results

Model	Chi Sq	Df	Q	IFI	CFI	RMSEA	P
ACSI-28 (28,7)	958	336	2.85	.78	.77	.073	<.001
ACSI-RR (20,4)	559	168	3.33	.82	.81	.082	<.001
ACSI-RR (15,3)	355	90	3.95	.84	.84	.092	<.001

Note: Values in parenthesis are number of items and number of factors in the model.

Q = ratio of chi square to degrees of freedom

IFI = incremental fit index

CFI = comparative fit index

RMSEA = root mean square error of approximation

P = the probability associated with the chi-square difference test with the preceding model

Thresholds:

Q	<= 5	indicates an "acceptable" level of fit
IFI/CFI	>= .90	indicates an "adequate" level of fit
RMSEA	<=.08	indicates a "reasonable" level of fit

Table 4

Statistically Significant Mean Differences Between Recreational and Competitive
Runners   in Background Variables

Background Variable	Recreational (n=290)		Competitive (n=55)		t (df)	p <	r	Effect Size
	Mean	SE	Mean	SE				
Structure of training program	3.34	.055	3.82	.133	t (343) = 3.32	.001	.36	Medium
Intensity of training program	2.20	.029	2.71	.085	t(343) = 6.69	.001	.34	Medium
Best time (minutes) 10 miles	82.97	1.07	65.58	1.407	t (277) = 1.68	.001	.34	Medium
Run because I enjoy running	4.18	.047	4.47	.093	t(343) = 2.85	.05	.30	Medium
Run to challenge myself	4.169	.046	4.60	.088	t(343) = 3.76	.001	.20	Small
Number of runs per week	3.48	.056	4.31	.181	t (343) = 5.51	.001	.29	Small
Number of years running	10.07	.568	15.96	1.52	t (343) = 4.04	.001	.21	Small

Figure 1. Scree Plot of Eigenvalues Against Factors (Component Values)
Stemming from Recreational Runners' (n=345) Responses to the ACSI-28.
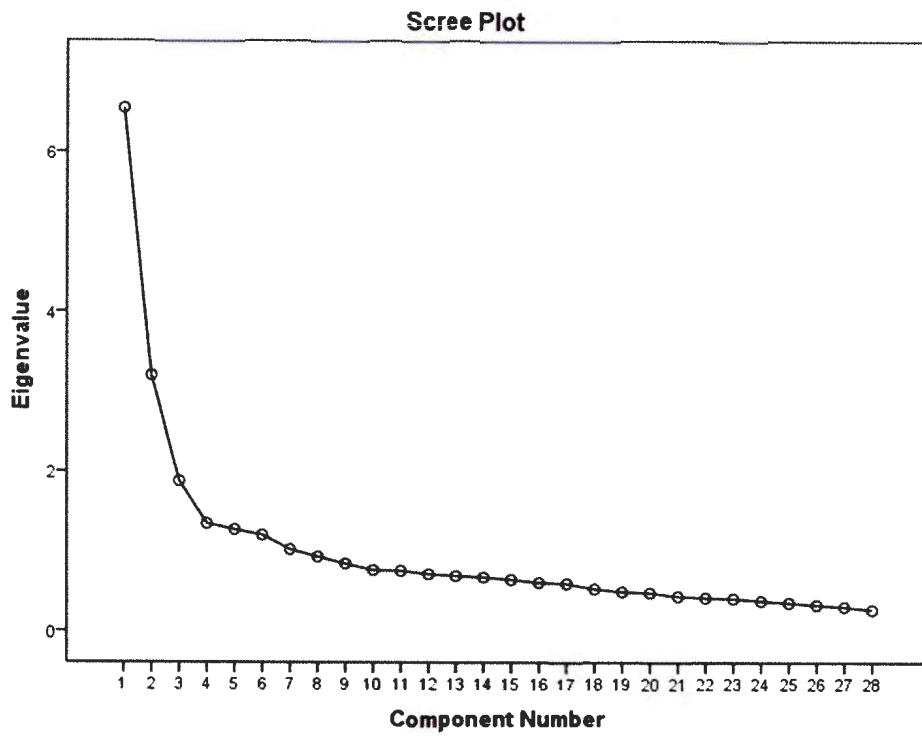
Figure 2. Statistically Significant Mean Differences Between Recreational and Competitive Runners in Background Variables
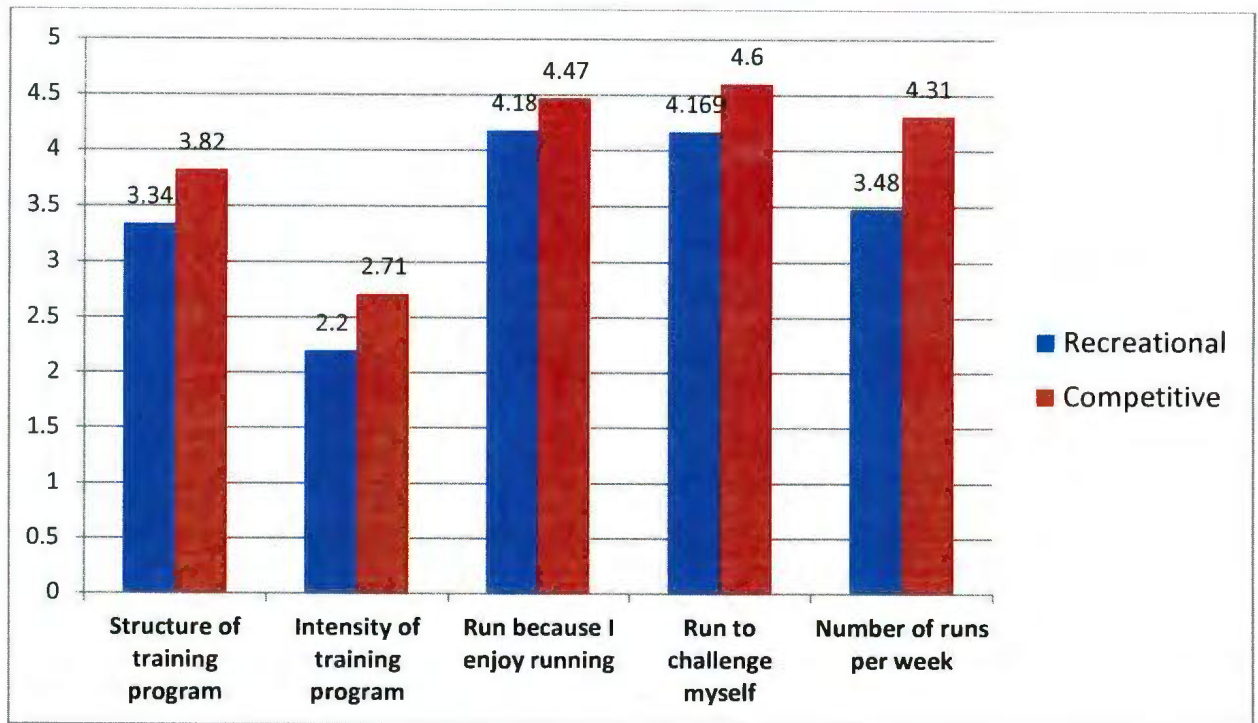
Figure 3. Statistically Significant Mean Differences in Best Times for Running
Ten Miles for Recreational and Competitive Runners

Figure 4. Confirmatory Factor Analysis Results from the ACSI (28,7) Model

Figure 5. Confirmatory Factor Analysis Results from the ACSI (20,4) Model

Figure 6. Confirmatory Factor Analysis Results from the ACSI (15,3) Model

4.9 Appendices

Appendix A

Survey into Experiences of Recreational Runners

Appendix B

ACSI-28 Item Statements

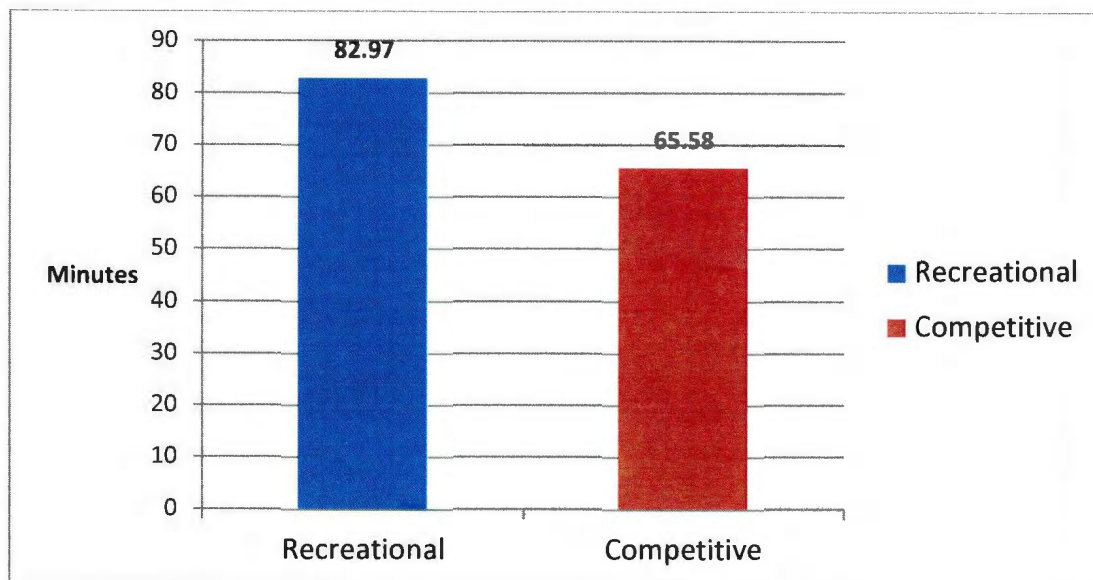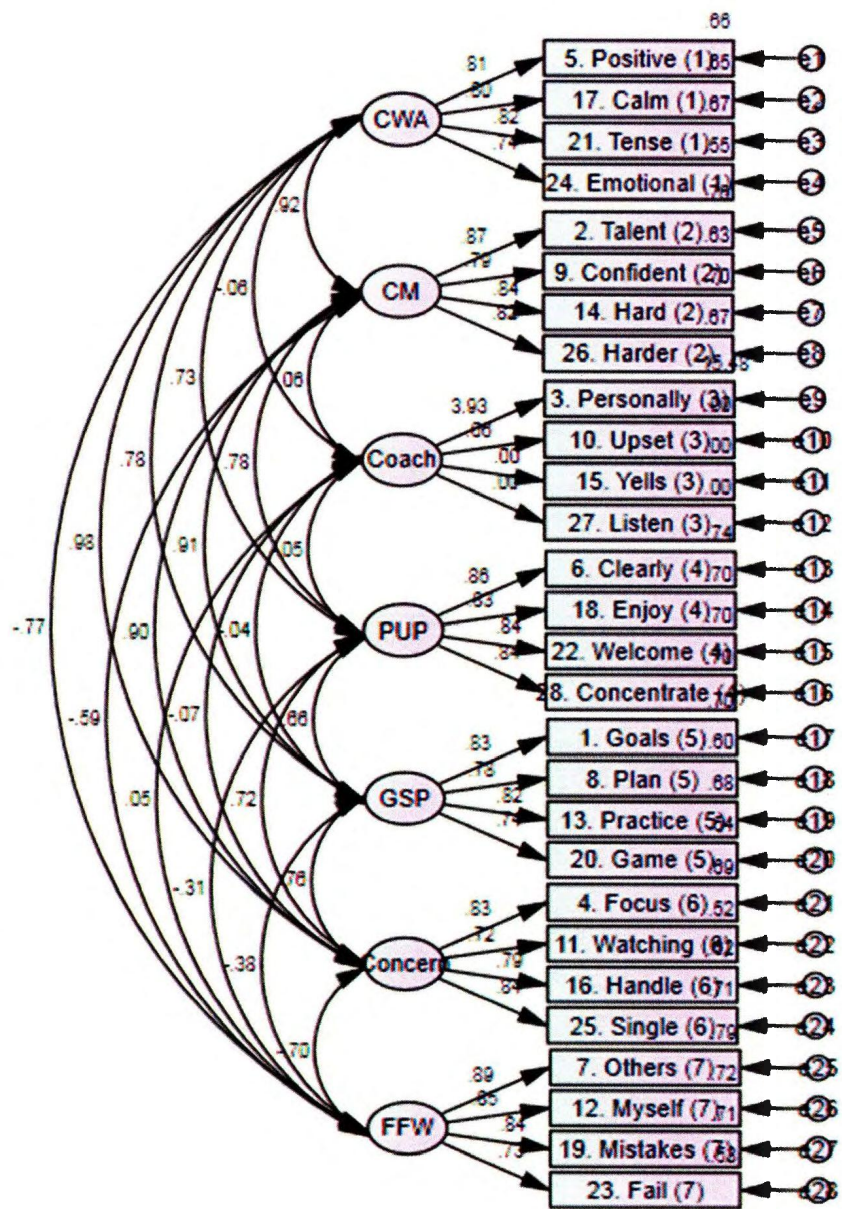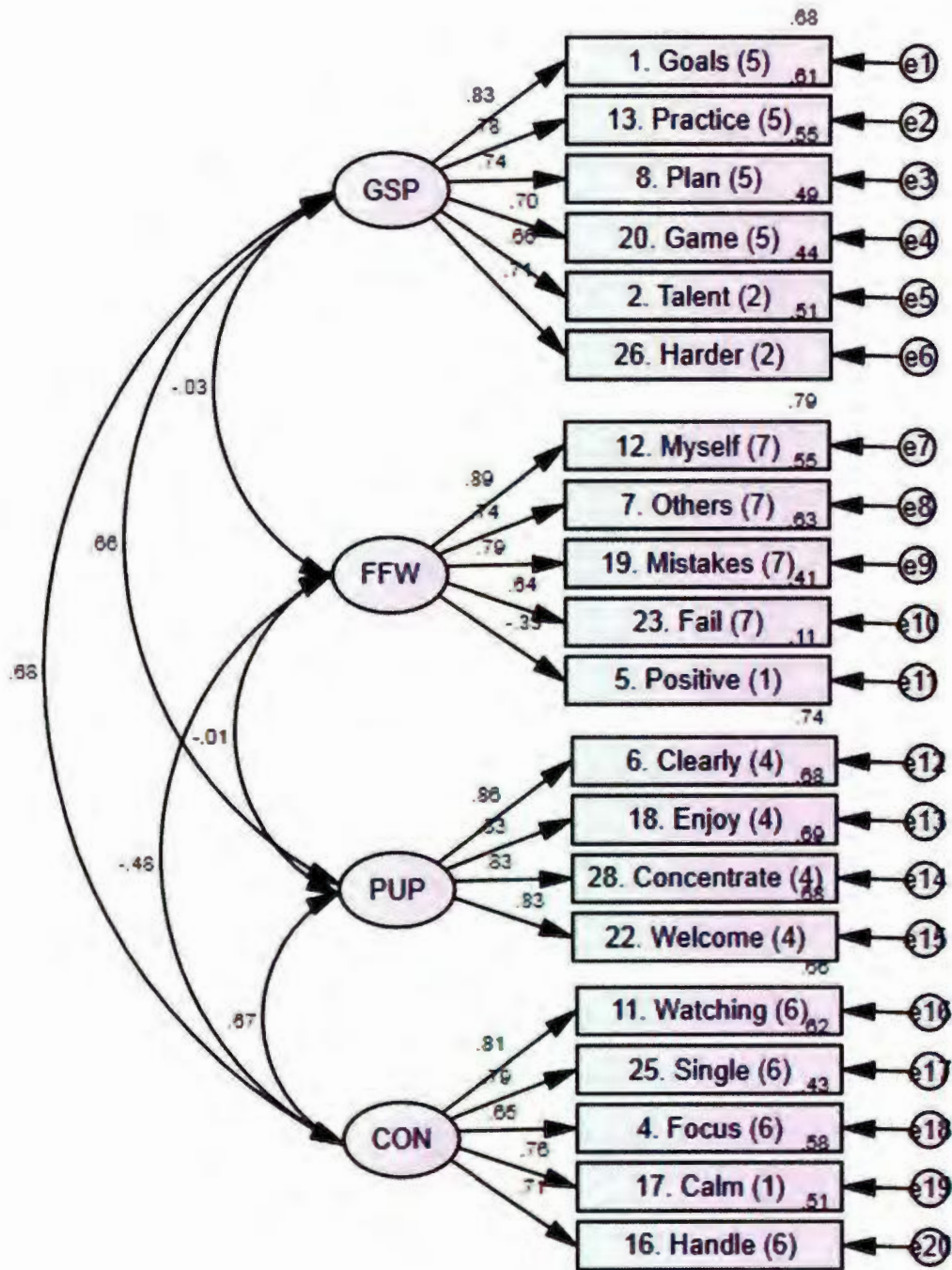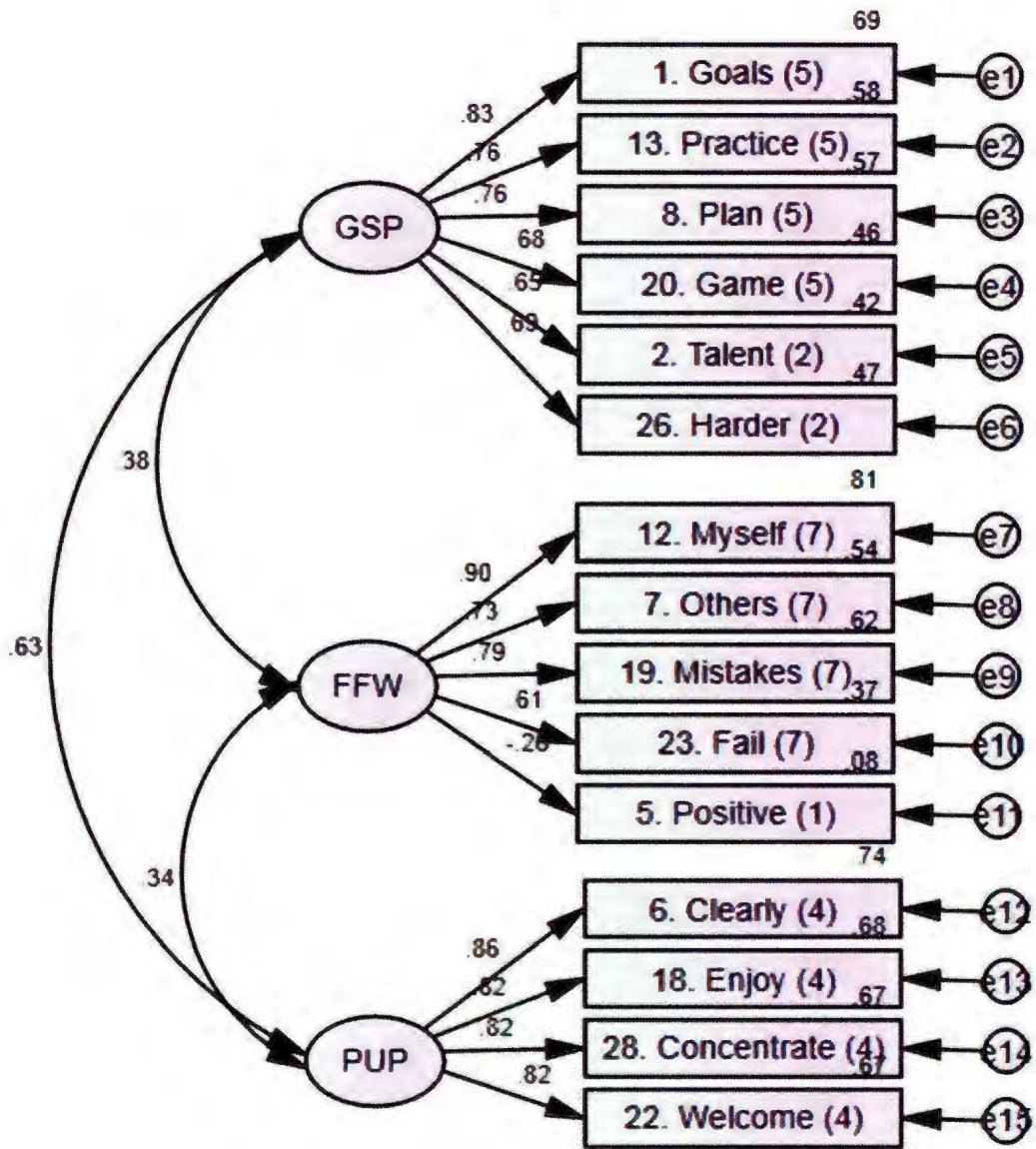| Item	ACSI-28 Item Statement (Subscale number)
1	On a daily or weekly basis, I set very specific goals for myself that guide what I do. (5)
2	I get the most out of my talent and skills. (2)
3	When a coach or group leader tells me how to correct a mistake I have made, I tend to take it personally and feel upset. (3)
4	When I am running, I can focus my attention and block out distractions. (6)
5	I remain positive and enthusiastic during competition, no matter how badly it goes. (1)
6	I tend to run better under pressure because I think more clearly. (4)
7	I worry quite a bit about what others think of my performance. (7)
8	I tend to do lots of planning about how to reach my goals. (5)
9	I feel confident that I can perform well. (2)
10	When a coach or group leader criticizes me, I become upset rather than feel helped. (3)
11	It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to. (6)
12	I put a lot of pressure on myself by worrying about how I will perform. (7)
13	I set my own performance goals for each practice. (5)
14	I don't have to be pushed to practice or train hard - I give 100%. (2)
15	If a coach/group leader criticizes or yells at me, I correct the mistake without getting upset about it. (3)
16	I handle unexpected situations that may occur during a run very well. (6)
17	When things are going badly, I tell myself to keep calm and this works for me. (1)
18	The more pressure there is while I am running, the more I enjoy it. (4)
19	While competing, I worry about making mistakes or failing to perform. (7)
20	I have my own game plan worked out in my head long before the run begins. (5)
21	When I feel myself getting too tense, I can quickly relax my body and calm myself. (1)
22	To me, pressure situations are challenges that I welcome. (4)
23	I think about and imagine what will happen if I fail or screw up. (7)
24	I maintain emotional control no matter how things are going for me. (1)
25	It is easy for me to direct my attention and focus on a single object or person. (6)
26	When I fail to reach my goals, it makes me try even harder. (2)
27	I improve my skills by listening carefully to advice and instruction from coaches and group leaders. (3)
28	I make fewer mistakes when the pressure is on because I can concentrate better. (4)

Appendix B Continued

ACSI-28 Subscale		Items
1	Coping with Adversity	5, 17, 21, 24
2	Confidence and Motivation	2, 9, 14 26
3	Coachability	3, 10, 15, 27
4	Peaking Under Pressure	6, 18, 22, 28
5	Goal Setting and Planning	1, 8, 13, 20
6	Concentration	4, 11, 16, 25
7	Freedom From Worry	7, 12, 19, 23

Appendix C

Word Changes from Original ACSI-28 Statements

Subscale and Items	Original ACSI-28 Wording

Coachability

9	When a coach or group leader tells me how to correct a mistake I have made, I tend to take it personally and feel upset.	The word "group leader" was originally "manager."
10	When a coach or group leader criticizes me, I become upset rather than feel helped.	The word "group leader" was originally "manager."
11	If a coach/group leader criticizes or yells at me, I correct the mistake without getting upset about it.	The words "coach/group leader" were originally "coach."
12	I improve my skills by listening carefully to advice and instruction from coaches and group leaders.	The words "coaches and group leaders " was originally "coaches."

Peaking Under Pressure

13	I tend to run better under pressure because I think more clearly.	The words "to run" were originally "to play"
14	The more pressure there is while I am running, the more I enjoy it.	The words "while I am running" were originally "during a game"

Goal Setting and Planning

20	I have my own game plan worked out in my head long before the run begins.	The words "before the run begins" were originally "before the game begins."

Concentration

21   When I am running, I can focus my attention and block out distractions.

The word "running" was originally "taking part in my sport"

23   I handle unexpected situations that may occur during a run very well.

The words "that may occur during a run" were originally "within my sport"

Freedom from Worry

27   While competing, I worry about making mistakes or failing to perform.

The words "failing to perform" were originally "failing to come through."

Note. The remaining 18 ACSI-28 statements were used in their original wording.

Appendix D

ACSI-28 Total Variance from Recreational Runners' (n=345)
28 Items

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.547	23.380	23.380	6.547	23.380	23.380	4.642
2	3.197	11.417	34.797	3.197	11.417	34.797	3.205
3	1.877	6.703	41.500	1.877	6.703	41.500	4.576
4	1.344	4.799	46.300	1.344	4.799	46.300	1.899
5	1.268	4.529	50.829	1.268	4.529	50.829	3.751
6	1.201	4.289	55.118	1.201	4.289	55.118	1.552
7	1.021	3.646	58.764	1.021	3.646	58.764	1.126
8	.928	3.313	62.077				
9	.840	3.002	65.079				
10	.762	2.722	67.801				
11	.754	2.691	70.492				
12	.711	2.539	73.031				
13	.689	2.462	75.493				
14	.671	2.397	77.890				
15	.641	2.290	80.180				
16	.604	2.157	82.337				
17	.588	2.101	84.438				
18	.525	1.874	86.312				
19	.490	1.748	88.060				
20	.475	1.696	89.757				
21	.431	1.539	91.295				
22	.414	1.478	92.773				
23	.405	1.445	94.218				
24	.374	1.337	95.555				
25	.352	1.257	96.812				
26	.326	1.164	97.976				
27	.302	1.079	99.056				
28	.264	.944	100.000				

Extraction Method: Principal Component Analysis.

ACSI-28 Pattern Matrix Showing Recreational Runners (n=345)
Factor Loadings from 28 Items

	Component						
	1	2	3	4	5	6	7
1. Goals (5)	.774						
8. Plan (5)	.720						
13. Practice (5)	.691						
20. Game (5)	.655						
2. Talent (2)	.612						
14. Hard (2)	.501						-.319
26. Harder (2)	.490						
9. Confident (2)	.441						
12. Myself (7)*		.801					
19. Mistakes (7)*		.778					
7. Others (7)*		.774					
23. Fail (7)*		.595					
5. Positive (1)		.365					
18. Enjoy (4)			.845				
6. Clearly (4)			.835				
22. Welcome (4)			.808				
28. Concentrate (4)			.805				
15. Yells (3)				.825			
27. Listen (3)				.825			
11. Watching (6)					-.820		
25. Single (6)					-.719		
4. Focus (6)					-.510		-.301
17. Calm (1)					-.464		
16. Handle (6)					-.418		
3. Personally (3)*						.768	
10. Upset (3)*						.766	
24. Emotional (1)					-.401		.547
21. Tense (1)	.332	.301					.355

Appendix E Continued

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
Notes:
1. Items are numbered 1 to 28, labeled, and then subscales are numbered 1 to 7. For example, "1. Goals (5)", refers to Item 1, labeled as Goals, belonging to ACSI-28 subscale 5 – Goal Setting And Planning.
2. Only factorial loadings in excess of .3 are shown.

Appendix F

ACSI-28 Structure Matrix Showing Recreational Runners (n=345)

Factor Loadings From 28 Items

	Component						
	1	2	3	4	5	6	7
13. Practice (5)	.721				-.331		
1. Goals (5)	.712						
8. Plan (5)	.706		.308				
20. Game (5)	.670						
2. Talent (2)	.649		.373				
26. Harder (2)	.615		.453		-.318		
14. Hard (2)	.612		.425		-.383		
9. Confident (2)	.543	.333	.433				
21. Tense (1)	.464	.388	.322		-.426		.388
12. Myself (7)*		.775					
19. Mistakes (7)*		.765					
7. Others (7)*		.751					
23. Fail (7)*		.647				.311	
5. Positive (1)	.371	.441	.399		-.391		
6. Clearly (4)			.833		-.319		
18. Enjoy (4)			.821				
22. Welcome (4)	.336		.818				
28. Concentrate (4)			.810				
27. Listen (3)				.832			
15. Yells (3)				.821			
11. Watching (6)					-.763		
25. Single (6)	.308		.302		-.760		
17. Calm (1)		.344	.409		-.599		
4. Focus (6)	.395				-.583		
16. Handle (6)		.380	.366		-.567		
10. Upset (3)*						.774	
3. Personally (3)*						.772	
24. Emotional (1)		.310			-.507		.572

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

ACSI-28 Pattern Matrix Showing Recreational Runners' (n=345)
Factor Loadings to 3 Factors, 16 Items

Pattern Matrix[a]

	Component		
	1	2	3
1. Goals (5)	.805		
13. Practice (5)	.762		
8. Plan (5)	.722		
20. Game (5)	.686		
2. Talent (2)	.587		
26. Harder (2)	.522		
9. Confident (2)	.449	-.315	
12. Myself (7)		.787	
19. Mistakes (7)		.768	
7. Others (7)		.753	
23. Fail (7)		.693	
5. Positive (1)		-.428	
6. Clearly (4)			-.864
18. Enjoy (4)			-.842
28. Concentrate (4)			-.824
22. Welcome (4)			-.798

Extraction Method: Principal Component
Analysis.
 Rotation Method: Oblimin with Kaiser
Normalization.
a. Rotation converged in 7 iterations.

ACSI-RR (3,15) Pattern Matrix Showing Recreational Runners' (n=345)
Factor Loadings to 3 Factors, 15 Items

Pattern Matrix[a]

	Component		
	1	2	3
1. Goals (5)	.811		
13. Practice (5)	.761		
8. Plan (5)	.712		
20. Game (5)	.695		
2. Talent (2)	.575		
26. Harder (2)	.537		
12. Myself (7)		.784	
19. Mistakes (7)		.771	
7. Others (7)		.765	
23. Fail (7)		.692	
5. Positive (1)		-.431	
6. Clearly (4)			-.862
18. Enjoy (4)			-.840
28. Concentrate (4)			-.822
22. Welcome (4)			-.798

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser
Normalization.
a. Rotation converged in 7 iterations.

ACSI-RR (3,15) Total Variance Explained from Recreational Runners' (n=345)

Total Variance Explained

Componen t	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulativ e %	Total	% of Varianc e	Cumulativ e %	Total
1	4.273	28.484	28.484	4.273	28.484	28.484	3.460
2	2.510	16.733	45.217	2.510	16.733	45.217	2.529
3	1.762	11.746	56.964	1.762	11.746	56.964	3.505
4	.841	5.606	62.570				
5	.764	5.093	67.663				
6	.660	4.400	72.063				
7	.644	4.294	76.357				
8	.595	3.966	80.323				
9	.552	3.681	84.004				
10	.536	3.574	87.578				
11	.428	2.854	90.432				
12	.407	2.714	93.146				
13	.378	2.520	95.666				
14	.339	2.263	97.929				
15	.311	2.071	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

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