Risk for Exercise Addiction: A Comparison of Triathletes Training for Sprint-, Olympic-, Half-Ironman-, and Ironman-distance Triathlons

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RISK FOR EXERCISE ADDICTION: A COMPARISON OF TRIATHLETES TRAINING FOR SPRINT-, OLYMPIC-, HALF-IRONMAN-, AND IRONMAN-DISTANCE TRIATHLONS

By

Jason D. Youngman

A DISSERTATION

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RISK FOR EXERCISE ADDICTION: A COMPARISON OF TRIATHLETES
TRAINING FOR SPRINT-, OLYMPIC-, HALF-IRONMAN-, AND IRONMAN-
DISTANCE TRIATHLONS

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Whereas clinical professionals and the general public recognize exercise in moderate amounts as an important component of a healthy lifestyle, researchers have noted that when taken to an excessive level, exercise may become addictive. Usually considered rare in the broad exercising population, risk for exercise addiction has been found to be more prominent among certain specialized groups, such as runners. This study investigated the risk for exercise addiction in a unique group of endurance athletes—Sprint-, Olympic-, Half-Ironman, and Ironman-distance triathletes. The sample consisted of 1285 male and female triathletes, ranging in age from 18 to 70 years old, recruited through the electronic newsletter of a national triathlon organization. During the past year participants had completed at least one triathlon of Sprint-, Olympic-, Half-Ironman-, and/or Ironman-distance, or were in training for one. To measure the risk for exercise addiction, participants completed an online questionnaire, comprising the six items of the Exercise Addiction Inventory (Terry, Szabo, & Griffiths, 2004), six items added by the investigator, and a demographics section. Results indicate that approximately 20% of triathletes are at risk for exercise addiction, 79% are committed exercisers who exhibit some symptoms of exercise addiction, and 1% are asymptomatic. Results also demonstrate that female triathletes are at greater risk for exercise addiction than male triathletes. Training for longer distance races (e.g., Olympic-, Half-Ironman-,
and Ironman-) put triathletes at greater risk for exercise addiction than training for shorter races. No significant association exists between the risk for exercise addiction and either the number of years of participating in the sport or the length of training sessions. However, as the number of weekly training hours or the number of weekly training sessions increases, so does a triathlete’s risk for exercise addiction. Results demonstrate that triathletes have a lower than anticipated risk for exercise addiction, yet a higher risk than the general exercising population. Because at-risk triathletes need greater clinical attention, further research should be conducted to help clinicians develop enhanced awareness and appropriate interventions.
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CHAPTER 1: INTRODUCTION AND REVIEW OF LITERATURE

Introduction to the Problem

Regular exercise helps to prevent obesity and cardiovascular disease as well as promote better physical and mental health (Biddle & Fox, 1989; Biddle & Mutrie, 1991; Folkins & Sime, 1981). Taken to a compulsive, excessive level, however, exercise can become morbid and even fatal. Exercise can become addictive, leading to negative physical, emotional, psychological, and social consequences (Szabo, 1995, 1998, 2000). According to Terry, Szabo, and Griffiths (2004), “the prevalence of exercise addiction is very rare in reality . . . but when it is present, its negative consequences can be devastating” (p. 489).

As more people seek to obtain the benefits of exercising that have been highly publicized in the popular media, they are pursuing multiple avenues of physical activity. In recent years the sport of triathlon (swim, bike, run) has exploded in popularity because it offers a diverse form of exercising and is touted as a central part of a healthy lifestyle (Granskog, 1992). The very nature of the sport encourages individuals to challenge their physical and psychological limits. However, because triathlon demands frequent and intense training, these athletes may be practicing a dangerously excessive level of exercising.

The field of exercise addiction is relatively new, and from the beginning researchers sought to clarify exactly what was meant by an addiction to exercise. The concept of exercise addiction was formally introduced by Baekeland (1970) when he discovered in studies examining the effect of exercise deprivation on sleep patterns that participants were unwilling to decrease their amount of exercise for the purpose of his
study. In 1976 Glasser championed the idea of excessive exercise as a *positive addiction* because the health benefits of habitual exercise markedly contrasted to the deleterious effects of alcoholism, drug abuse, and other addictive behaviors. According to Terry et al. (2004), this “positive” view and subsequent colloquial use of the term *addiction* by runners and other habitual exercisers led to the casual labeling of *strong commitment* as addiction (e.g., “I’m so addicted to running”). In response to this semantic confusion, Morgan (1979) identified excessive exercise as a *negative addiction* because of the harmful effects he noted in many runners. Other researchers agreed that there was a distinction between commitment and addiction, in that committed exercisers fit exercise into their lives whereas addicts organized their lives around their exercise (Cockerill & Riddington, 1996; De la Torre, 1995).

Morgan’s term *negative addiction* was more in agreement with the theoretical view (Terry et al., 2004) that any addiction over time is negative (Rozin & Stoess, 1993). In their review of the literature, Hausenblas and Symons Downs (2002a) reported that the most commonly used term to describe excessive exercise as an unhealthy obsession has been “exercise addiction.” Other terms also have been used, such as “running addiction” (Glasser, 1976; Sachs & Pargman, 1984); “negative addiction” (Morgan, 1979); “obligatory running” (Yates, Leehey, & Shisslak, 1983); “running anorexia” (Norval, 1980); “compulsive exercising” (Lyons & Cromey, 1989); “morbid exercising” (Chalmers, Catalan, Day, & Fairburn, 1985); and “exercise dependence” (Hausenblas & Symons Downs, 2002a).

Such inconsistency has presented a problem in that the terms do not always describe the same construct (Terry et al., 2004). Researchers often have failed to clearly
operationalize and define their terms (Le Grange & Eisler, 1993). In response to this problem, Griffiths (1996, 1997, 2002) precisely reformulated the concept of exercise addiction based on Brown’s (1993) thorough conceptualization of the components of addiction. Griffiths also participated in developing a new method to measure it (Terry et al., 2004).

In addition to problems of definition, other issues emerged in the field. Some authors have questioned whether exercise addiction is a primary disorder or a secondary disorder that exists only in the presence of an eating disorder. In primary exercise addiction, the physical activity is an end in and of itself. In contrast, the principal motivation for physical activity in secondary exercise addiction is the control of caloric intake and body image (De Coverley Veale, 1987; Veale, 1995). Only recently has attention strongly shifted to exercise addiction as a primary disorder. Although the debate continues, some researchers, such as Terry et al. (2004), have studied exercise addiction without focusing on the distinction between primary and secondary; what is important to them is the identification and accurate measurement of risk for exercise addiction regardless of comorbidity.

To accurately identify and clarify its incidence, Terry et al. (2004) developed a theory-driven measurement of exercise addiction (see Appendix A). This six-item inventory was keyed to Brown’s (1993) six components of addiction. The instrument applied the general criteria of addiction to investigate exercise addiction among athletes. Most previous measures had been inconsistent with one another; some measured exercise addiction generally—not distinguishing between primary and secondary (Veale, 1995); some measured addiction to running (Carmack & Martens, 1979); and some measured
social and motivational factors (Ogden, Veale, & Summers, 1997). The most glaring inconsistency among these studies has been that the subjects were drawn from an opportunistic population of runners and gym users without accounting for the dissimilar forms of exercise that they might be performing.

In addition to the debate over terminology, type of exercise addiction, and measurement, to date the literature has insufficiently addressed the triathlon community. Though other activities (e.g., running, weight lifting, gym use) have received the bulk of attention, there is a dearth of studies focusing on triathlon in particular. Few studies have used triathletes as subjects, raising the question of generalizability of findings to this population. Whereas triathlon is frequently labeled an extreme endurance sport requiring rigorous, concentrated training, with the exception of Blaydon & Lindner (2002) few studies have examined the connection between triathlon participation and exercise addiction. Additionally, studies have not distinguished among the training for different distance triathlons (i.e., the shorter Sprint-distance, the mid-range Olympic-distance, the longer Half-Ironman-distance, and the still longer Ironman-distance events). Certainly an Ironman triathlon—2.4 miles of swimming followed immediately by 112 miles of biking followed by 26.2 miles of running—demands a greater amount of exercise training than the shorter distance races and may be more associated with the risk for exercise addiction.

Exploring the risk for exercise addiction among triathletes offered an opportunity to address some problems in the extant published literature. This study examined an under-addressed population, triathletes, who seemed most at risk for exercise addiction. Although it has been believed that exercise addiction is rare in the general population
(Szabo, 2000; Veale, 1995), one study (Blaydon & Lindner, 2002) found the incidence of exercise addiction to be far greater within a triathlete population. Additionally, by focusing on triathletes, the present study looked at athletes who predominantly performed the same type of exercises as one another (e.g., swimming, biking, and running). This study compared triathletes training for three different distance triathlons.

The primary question this study aimed to answer was, “Is the risk for exercise addiction greater among triathletes training for the longer Half-Ironman- and Ironman-distance events as compared to those triathletes training for the shorter Sprint- and Olympic-distance races?” That is, since increasing tolerance of a stimulus has been regarded as a diagnostic criterion of addiction, would performance in longer distance triathlons be accompanied by a greater risk for exercise addiction? Furthermore, would the number of years an individual participated in the sport of triathlon contribute to a greater risk for exercise addiction? This study used the Exercise Addiction Inventory (Terry et al., 2004; see Appendix A), a valid and reliable theory-driven measure, to identify the risk for exercise addiction. Given the element of endurance that is characteristic of triathlon, would participation in the sport increase the risk for exercise addiction and/or would it attract people already at risk for exercise addiction? Must a triathlete meet the criteria for exercise addiction in order to be successful in competition or even participate in the sport?

This study contributes to the extant exercise addiction literature by applying the concept to an overlooked population who participates in a sport likely to be associated with a high risk for the disorder. Moreover, the theory-driven Exercise Addiction Inventory (Terry et al., 2004), which has been shown to be a valid and reliable instrument
with clear cut-off points for high risk for exercise addiction in preliminary studies, had never been used with triathletes. By comparing athletes training for different distance triathlons, this study investigated whether the distance of the race specifically (and not the sport in general) was a variable of great interest with regards to risk for exercise addiction. Furthermore, this study examined the relationship between the length of a participant’s history in triathlon and the risk for exercise addiction. This information is important to the triathlon community because it provides a caveat about how the risk for exercise addiction may increase depending on various training regimens. Many athletes begin competing in triathlons as a recreational outlet that is part of a healthy lifestyle, but because the risk for exercise addiction may be higher for certain triathletes, they should be cautioned. This study therefore promotes further awareness which may lead to increased self-monitoring and effective clinical intervention.
Review of Literature

Although addiction has been a term reserved to describe excessive behaviors in general, it has been most commonly associated with chemical substance abuse. However, addiction has also been used to describe excessive behaviors, such as eating, gambling, sex, Internet use, and exercise (Griffiths, 1996; Orford, 2001). Whereas exercise, like the other aforementioned behaviors, is in moderation viewed as quite healthy, in extreme forms it can be harmful or even fatal. Most authors have agreed with this view (e.g., Garman, Hayduk, Crider, & Hodel, 2004; Griffiths, 1997; Sachs & Pargman, 1984; Terry et al., 2004; Warner & Griffiths, 2006).

Scrutinizing the published research on exercise addiction, this review of literature examines the following issues: the development of the concept of exercise addiction; the distinction between positive and negative addiction; the association between exercise addiction and eating disorders (primary and secondary exercise addiction); the diagnosis of exercise addiction; the measurements of exercise addiction; and the relationship between triathletes and exercise addiction.

Following discussion of these issues in the published literature, a concluding section provides a summary of the most significant research contributions in the area of exercise addiction; highlights the deficiencies in the literature and states how the current study addresses them; and presents the hypotheses of the study.

The Development of the Concept of Exercise Addiction

The study of exercise addiction is relatively new, with research beginning only 40 years ago. Little (1969) initiated the examination of excessive exercise when he studied middle-aged men who ran despite injury and referred to this phenomenon as exercise...
dependence. In 1970 Baekeland found support for this idea when he investigated the effect of exercise deprivation on sleep. Baekeland had difficulty recruiting habitual runners (i.e., individuals who ran five to six days/week) because they adamantly refused to suspend their exercise schedule for the month required for his study. In fact, these athletes declined to participate even after Baekeland offered them monetary compensation. The only runners willing to participate were those who ran less frequently (i.e., three to four days/week). Yet as a result of exercise deprivation, this group reported withdrawal symptoms, such as “increased anxiety, nocturnal awakening, and sexual tension” (Hausenblas & Symons Downs, 2002a, p. 114). Thus, Baekeland’s experience suggested an association between excessive exercise and at least two qualities of addiction, namely a preoccupation with the activity and immediate withdrawal symptoms upon abstaining from the activity.

In the years following Little’s (1969) and Baekeland’s (1970) discoveries, the exploration of excessive exercise continued to expand. Subsequent researchers used multiple terms interchangeably to describe the phenomenon of excessive exercise. It was often unclear, however, if the various terms truly represented the same phenomenon or if studies were even measuring the same variable. Many authors failed to operationally define their terms and sometimes the terms were not, in fact, synonymous with exercise addiction. Although “exercise addiction” has been the term most frequently used in the literature (Hausenblas & Symons Downs, 2002a), other purported synonyms that have reappeared include “running addiction” (Glasser, 1976; Sachs & Pargman, 1984); “negative addiction” (Morgan, 1979); “obligatory running” (Yates et al., 1983); “running anorexia” (Norval, 1980); “compulsive exercising” (Lyons & Cromey, 1989); “morbid
exercising” (Chalmers et al., 1985); and “exercise dependence” (Hausenblas & Symons Downs, 2002a).

A significant illustration of the problem of definition involved the confusion between commitment/compulsion to exercise and addiction to exercise. According to Sachs (1981), committed exercisers were motivated by the extrinsic rewards of the exercise (e.g., social relationships and/or prestige), whereas addicted exercisers participated for intrinsic rewards (e.g., mood changes). Furthermore, Sachs posited that committed exercisers viewed exercise as an important but not central aspect of their lives, in marked contrast to addicted exercisers, who considered exercise paramount. Sachs believed that committed exercisers did not usually experience withdrawal symptoms when deprived of exercise, whereas addicted exercisers did. De la Torre (1995) and Szabo, Frenkl, and Caputo (1997) agreed that committed/compulsive and addicted exercisers were two distinctly separate categories. Committed/compulsive people used excessive exercise “to serve their rigid compulsivity needs with its precise routine . . . while at the same time providing a sense of control and moral superiority” (Allegre, Souville, Therme, & Griffiths, 2006, p. 635). Exercise addicts, on the other hand, used exercise to self-regulate their mood, and the exercise eventually dominated their lives.

Although the field has not yet agreed on uniform definitions of either exercise addiction or exercise dependence, Hausenblas and Symons Downs (2002a) contended that the two terms were synonymous. In the current study, these terms are used synonymously and defined as “a craving for leisure-time physical activity, resulting in uncontrollable excessive exercise behavior, that manifests in physiological (e.g.
tolerance/withdrawal) and/or psychological (e.g. anxiety, depression) symptoms” (Hausenblas & Symons Downs, 2002a, p. 90).

Researchers further developed the concept of exercise addiction when they aligned the construct with the traditional characteristics of chemical substance dependence. For example, De Coverley Veale (1987) and Veale (1995) conceptualized exercise addiction by using the criteria of substance dependence established by the Diagnostic and Statistical Manual for Mental Disorders (DSM-III, 1980; DSM-IV, 1994). Later, Griffiths (1996, 1997, 2002) added to this paradigm an emphasis on behavioral addiction and its components.

From this perspective, researchers observed that perhaps the most significant of the criteria present in both chemical and behavioral addictions was withdrawal symptoms resulting from the deprivation of the addictive activity. They conducted numerous studies of the withdrawal symptoms connected to exercise deprivation. Eleven experimental studies in particular (Baekeland, 1970; Chan & Grossman, 1988; Conboy, 1994; Crossman, Jamieson, & Henderson, 1987; Gauvin & Szabo, 1992; Mondin et al., 1996; Morris, Steinberg, Sykes, & Salmon, 1990; Szabo & Gauvin, 1992; Thaxton, 1982) identified the following negative psychological effects of exercise deprivation: “guilt, depression, irritability, restlessness, tension, stress, anxiety, and sluggishness” (Szabo et al., 1997, as cited in Hausenblas & Symons Downs, 2002a, p. 115). In a more recent study of 60 exercise addicted runners who voluntarily abstained from exercise, Aidman and Woollard (2003) found that after just one day of exercise deprivation, subjects experienced an increase in anger, confusion, and resting heart rate. (People who abstain from exercise involuntarily because of injury or other serious health concerns may
experience these withdrawal symptoms more intensely.) Aidman and Woollard believed that both non-addicted and addicted exercisers experienced these effects when deprived of exercise, although the former did so to a lesser extent. These studies confirmed that excessive exercise should be understood as a form of addiction.

*The Distinction between Positive and Negative Addiction*

Although researchers have conceptualized excessive exercise as an addiction, some have debated whether it is a positive or negative addiction. Because exercise is associated with so many benefits, there is a trend in both the scholarly literature and in exercise communities to refer to excessive exercise as “addictive,” implying that it is solely a positive habit. Within the extant literature, the controversy has generally revolved around a single type of exercise—running/jogging. Glasser (1976) was the first to describe excessive exercise as a *positive addiction* because its health benefits were in distinct contrast to the negative effects of chemical substance abuse and other injurious addictive behaviors. Glasser argued that exercise addiction was “an enjoyable activity that produced extreme pleasure (euphoria), increased mental strength, and provided mystical self-transcendence” (Allegre et al., 2006, p. 632). Sachs (1981) suggested that many runners experienced an emotional continuum, ranging from a general sense of well-being to a state of peak sensation. Glasser conceptualized the negative sequelae of exercise deprivation not as withdrawal symptoms but as longings for the euphoric experience of running. Furthermore, Glasser found no indication that exercise negatively dominated the lives of excessive exercisers.

The trend emphasizing the positive nature of excessive exercise continued with Sachs and Pargman (1979). They investigated the positive aspects of exercise addiction
through in-depth interviews of 12 adult male runners identified as exercise addicts. The authors found that most exercisers ran for health benefits, including weight control, stress reduction, and general fitness. More recently, Cox and Orford (2004) interviewed ten subjects in a qualitative study and found the following advantages of exercise: (1) the gain of physical, emotional, and psychological control; (2) the provision of structure, stability, comfort, predictability, consistency, and reliability in an otherwise chaotic world; (3) the creation of a perceived ideal body shape; (4) the long-term benefits of improved health/fitness and increased confidence and well-being; (5) the short-term rewards of general enjoyment and elevated mood; and (6) the presence of a healthy alternative to other addictions. Griffiths (1996) noted the following perceived positive characteristics of addictions in general: mood modification and escapism; pleasure, arousal, and/or relaxation (Pargman & Burgess, 1979); disinhibition; temporary protection against narcissistic injury; emotional insulation from other people; indirect expression of aggression, threats, revenge, and/or rebellion; and personal identity and/or life meaning.

Whereas many researchers who argued the concept of positive exercise addiction often highlighted the beneficial psychological and physiological effects, they failed to recognize the disruption and negative effects that excessive exercise could have on one’s physical health and social functioning (De Coverley Veale, 1987). Proponents of a positive addiction model usually overlooked the aspects of “neuroadaptation (withdrawal symptoms and tolerance) and adverse consequences (practice despite medical contraindication)” (Allegre et al., 2006, p. 636). Some advocates of a positive addiction model, nevertheless, did acknowledge the negative consequences of excessive exercise.
Sachs and Pargman (1979) found some psychological and physiological withdrawal symptoms in cases of positive addiction. Cox and Orford (2004) conceded that excessive exercise could, in fact, have negative results, which included physical risks of long-term injury, psychological short-term mood changes (e.g., depression and irritability), and the fears experienced when individuals were unable to exercise.

Morgan (1979) viewed excessive exercise as a completely negative addiction. Recognizing the harmful effects of excessive exercise in runners, Morgan used the term negative addiction (see also Hailey & Bailey, 1982; Sachs & Pargman, 1984). Most researchers since Morgan have concurred that excessive exercise is an addiction with negative effects (Szabo, 1998). Morgan equated the processes of excessive exercise to chemical dependence because he recognized among addicted runners the symptoms of tolerance, withdrawal, and preoccupation to the detriment of family, work, and health. In eight case studies of runners, Morgan discovered that exercise addicts believed that they could not live without daily exercise, that they required exercise to cope, and that they continued to exercise “even when it is medically, vocationally, and socially contraindicated” (p. 59). Furthermore, exercise addicts assigned top priority in their lives to exercise—above work, love, and socializing. Morgan observed:

after loved ones and friends have been relegated, intentionally or unintentionally, to roles of insignificance, and after running has taken on vocational overtones and the job is viewed avocationally, the stage is set for the final development of the addiction. The exercise addict finds himself in much the same place as the alcoholic or heroin addict. Feeling good becomes more important than anything else. (p. 62)

Morgan (1979) noticed in his clinical practice that runners often continued to run despite injury, even to the point of self-destruction. This occurred particularly when runners reached a schedule of 100 miles per week: “Runners in this range risk self-
destructing in much the same way that chronic drug abusers risk overdosing” (p. 62).
Morgan believed that although runners should be assessed on a case-by-case basis, general guidelines could be used to determine the amount of running (dosage) that characterized an addicted jogger. In contrast to a “hobby jogger” who ran one to three miles, three to seven days a week, and the “relatively serious runner” who ran five miles a day, seven days a week, the addicted runner averaged 10 to 15 miles a day, seven days a week (p. 62). Morgan allowed that there were certain exceptions to these guidelines: not all high-mileage runners lost perspective or abandoned their responsibilities and not all “relatively serious runners” were immune to exercise addiction. Morgan emphasized that exercise should be a means for achieving physical and mental health and not an end in itself.

*The Association between Exercise Addiction and Eating Disorders (Primary and Secondary Exercise Addiction)*

Whereas early researchers of excessive exercise referred to it as either a positive or negative addiction, later researchers further developed the concept of excessive exercise to include a distinction between a stand-alone exercise addiction (primary) and a subordinate addiction that functioned as a component of an eating disorder (secondary) (e.g., Bamber, Cockerill, Rodgers, & Carroll, 2003; Hausenblas & Fallon, 2001; Pasman & Thompson, 1988). Yates et al. (1983) hypothesized that exercise addiction and an eating disorder could not exist independently of each other (secondary exercise addiction). Comparing the personalities and motivation of “obligatory runners” and anorexic patients, the authors argued that the two groups were similar in their psychopathology and in their “dangerous attempts to establish an identity” (Hausenblas
& Symons Downs, 2002a, p. 114). Subsequent researchers generally agreed that this early study lacked objective data and sound methodology; empirical research thus far has failed to support Yates et al.’s hypothesis about a common pathology (Blumenthal, O’Toole, & Chang, 1984; Coen & Ogles, 1993; Dishman & Buckworth, 1998; Krelstein, 1983; Larsen, 1983; Powers, Schocken, & Boyd, 1998; Wells, 1983). Although the results of the Yates et al. study were questioned, in a qualitative study of four female participants, Bamber et al. (2003) supported the view that whenever exercise addiction was present, it was always in the context of an eating disorder (e.g., Keski-Rahkonen, 2001; O’Dea & Abraham, 2002).

By 1987 the notion that exercise addiction could exist as a separate, independent syndrome gained support in the literature. De Coverley Veale (1987) proposed that exercise addiction might be categorized as two separate pathologies: one where it was a primary disorder unrelated to an eating disorder and one where it was a secondary disorder accompanied by anorexia or bulimia. He suggested that a diagnostic hierarchy should be used in identifying a case of exercise addiction; only after anorexia and bulimia were ruled out could a clinician make a diagnosis of primary exercise addiction.

De Coverley Veale (1987) further theorized that whereas anorexic and exercise addicted individuals might share certain behavioral features, they differed in their psychopathology and should be classified as two distinct groups (see also Warner & Griffiths, 2006). Although both groups exhibited a concern for weight reduction, anorexics dieted to achieve an ideal body image whereas exercise addicts dieted only to improve athletic performance. According to De Coverley Veale, the psychopathology traditionally associated with anorexia was not present in primary exercise addiction. The
exercise involved in primary exercise addiction was an end in itself, with the aim of improving athletic performance; on the other hand, exercise secondary to an eating disorder was associated with a powerful fear of fat and weight gain.

In an effort to further explain the dynamics of primary exercise addiction, medical researchers offered several hypotheses to explain possible biochemical factors. The three most significant psychophysiological explanations for primary exercise addiction, according to Murphy (1994), were the thermogenic, catecholamine, and endorphin hypotheses (Adams & Kirkby, 2002; Carr et al., 1981). The thermogenic hypothesis stated that by increasing body temperature, exercise lowered somatic anxiety (De Vries, 1981; Morgan & O’Connor, 1988). The catecholamine hypothesis proposed that through the release of catecholamines, exercise helped to control attention, mood, and movement, as well as endocrine, cardiovascular, and stress responses (Kety, 1966). The endorphin hypothesis suggested that the endogenous morphines (i.e., endorphins) produced by exercise reinforced a positive mood state. Thompson and Blanton (1987) argued that exercise reduced sympathetic arousal.

Many other researchers have noted a biochemical factor in the state of euphoria frequently associated with running and other aerobic activities. This euphoric experience is commonly referred to as the “runner’s high” (Pargman & Baker, 1980; Wagemaker & Goldstein, 1980). De Coverley Veale (1987) found that exercise could act as a stimulant through the release of opioid peptides, which led to temporary brain arousal but not permanent changes in the central nervous system (Keski-Rahkonen, 2001). Despite such evidence, Cox and Orford (2004) nevertheless concluded that the literature remains “contradictory and inconclusive” (p. 168) with regards to the link between endorphin
production and exercise addiction. Furthermore, Adams and Kirkby (2002) argued that there was no agreement in the literature regarding the role of endogenous opioids and catecholamines in producing primary exercise addiction.

Despite the debate about the psychophysiological elements of exercise addiction, most investigators agreed that primary exercise addiction was far less common than secondary exercise addiction (De Coverley Veale, 1987; Szabo, 2000; Terry et al., 2004; Veale, 1995). The incidence rate of primary exercise addiction has been reported to be as low as between 3% and 5% (Allegre et al., 2006; De Coverley Veale, 1987). However, using a combined quantitative and qualitative method, Warner and Griffiths (2006) discovered in an opportunistic gym-based population a slightly higher incidence rate of 8%. It is important to note that these prevalence rates apply to the general, rather than specialized (e.g., extreme endurance), exercising population.

Attempting to explain this apparent rarity, Veale (1995) claimed that primary exercise addicts usually did not seek psychological help nor were they referred to mental health clinicians—perhaps as a result of denial, lack of distress, or a belief that clinical intervention was unnecessary or unavailable. Veale further explained that primary exercise addicts did not fit exercise into their daily schedules, but rather adapted their lives to accommodate their exercise regimens. Frequently, primary exercise addicts did not seek clinical intervention until after significant psychological and/or physical damage already had occurred. For example, a female subject whom Veale examined using a standardized psychiatric interview, reported that she already had abandoned her job to accommodate her training schedule, that her romantic partner had left her because of the priority she had given her exercise regimen, that she had often argued with her family
about the amount of exercise she performed, and that she had jeopardized her physical health by exercising even when she was very ill.

These findings suggest that it is important for physicians, mental health clinicians, and other people who come in contact with athletes to better understand and properly diagnose exercise addiction in order to prevent potential physical and/or psychological damage. Some might argue that diagnosing exercise addiction is more crucial than determining whether it exists in the context of an eating disorder, although such a determination could certainly follow (Terry et al., 2004).

*Diagnosis of Exercise Addiction*

The literature demonstrates a concerted effort to elucidate the diagnostic criteria of exercise addiction. The central emphasis is on the presence of exercise addiction itself rather than on comorbidity. To diagnose exercise addiction, De Coverley Veale (1987) outlined seven criteria based on the chemical addiction model in *DSM-III* (1980). The seven criteria included (1) a repetitive, predictable pattern of exercise; (2) a preoccupation with exercise over all other activities; (3) an increased amount of exercise over time; (4) withdrawal symptoms when exercise ceases; (5) a resumption of exercise to manage withdrawal symptoms; (6) a self-awareness and recognition of the compulsive need to exercise; and (7) an immediate return to the previous level of exercise after abstaining (Allegre et al., 2006). Later, Veale (1995) modified his original criteria (De Coverley Veale, 1987) to include three associated criteria—continuing to exercise despite injury, exercising despite rising conflict within the family or at work, and dieting to improve performance.
Diverging from the views of De Coverley Veale (1987) and Veale (1995), Griffiths (1996, 1997, 2002) preferred a diagnostic model of exercise addiction based on Brown’s (1993) theoretical components of behavioral addiction. Unlike chemical addiction which involves an individual’s ingestion of an exogenous substance, behavioral addiction involves an individual’s compulsion to repeatedly perform an activity (e.g., gambling, sex, Internet use) despite its negative consequences. The components of Brown’s theory of behavioral addiction included salience, mood modification, tolerance, withdrawal, conflict, and relapse.

In adapting this theory of behavioral addiction, Griffiths (1996, 1997, 2002) clearly defined each of the components. According to Warner and Griffiths (2006), salience “occurs when the particular activity becomes the most important activity in the person’s life and dominates their thinking (preoccupations or distorted beliefs), feelings (cravings), and behavior (deterioration of socialised behavior)” (p. 14). Warner and Griffiths explained that mood modification refers to a form of escapism from a negative mood or emotional state (e.g., anger, stress). Tolerance occurs when there is a need to increase the amount of activity in order to experience the desired effects (e.g., exercise addicts need to increase the amount of exercise they do each session to experience the feelings of escapism or “high” that they initially experienced with shorter sessions). Withdrawal symptoms refer to the negative and uncomfortable sensations that one experiences when the activity ceases (e.g., moodiness, irritability). Conflict refers to clashes that develop between addicts and other people around them (interpersonal conflicts); between exercise and other activities (work, study, social interests); and within
addicts themselves (intrapersonal conflicts). Warner and Griffiths defined *relapse* as a return to a particular addictive behavior after a period of abstinence.

When these components were present, Warner and Griffiths (2006) believed that the athletes suffered from exercise addiction. For instance, Griffiths (1997) discovered clear evidence of exercise addiction in a case study of a female Jiu-Jitsu competitor. Exercise had become the central feature of the woman’s life (*salience*); she experienced feelings of elation when exercising (*mood modification*); her sessions had become increasingly longer and more frequent (*tolerance*); she experienced great agitation, irritability, headaches, and nausea when unable to exercise (*withdrawal*); her interpersonal relationships severely deteriorated; her academic work suffered, and she was deep in debt because of attending events and participating in competitions (*conflict*). Furthermore, she felt powerless to curtail or eliminate her excessive exercising (*relapse*). In sum, Warner and Griffiths identified the presence of exercise addiction when an individual’s inflexible devotion to exercise interfered with social or occupational functioning and/or more productive or desirable behavior.

*Measures of Exercise Addiction*

Attempting to measure exercise addiction, researchers have used multiple methods (Allegre et al., 2006). These have included qualitative interviews (Bamber, Cockerill, Rodgers, & Carroll, 2000; Cox & Orford, 2004; Sachs & Pargman, 1979; Warner & Griffiths, 2006); case studies (Allegre et al., 2006; Cripps, 1995; Griffiths, 1997; Veale, 1995); and self-report questionnaires (Loumidis & Wells, 1998; Ogden et al., 1997; Terry et al., 2004).
The most prominent method of investigating exercise addiction has been the self-report questionnaire, varieties of which have been developed over the past twenty years. One often-used and validated instrument was the Obligatory Exercise Questionnaire (OEQ; Thompson & Pasman, 1991), a standardized questionnaire that initially measured a wide range of exercises (e.g., running, weightlifting) but later was modified into a more comprehensive measure of excessive exercise (Allegre et al., 2006). Hausenblas and Symons Downs (2002a) nevertheless found that the subscales of this instrument were suspect both because they were based on the questionable study by Yates et al. (1983) and because the instrument provided only a partial assessment of exercise addiction.

The second significant instrument was the Exercise Dependence Questionnaire (EDQ), created by Ogden et al. (1997). In developing and validating the EDQ against the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979), Ogden et al. found that these two instruments used together could distinguish between primary and secondary exercise addiction. The EDQ was comprised of 29 items and eight subscales—“interference with social or family life, positive reward, withdrawal symptoms, exercise for weight control, insight into problem, exercise for social reasons, exercise for health reasons and stereotyped behavior” (Veale, 1995, p. 4). Allegre et al. (2006) emphasized that the EDQ further refined the measuring of exercise addiction:

The EDQ reflected motivations to continue exercising based on fear of withdrawal symptoms, experiences of positive reward following exercise, a desire to control weight and body shape, a need for social contact, and drive for physical health. It reflected some recognition that level of exercise has become a problem for the individual, an acknowledgement that exercising behavior is interfering with the individual’s social and family life and perceptions of low control. It also reflected the degree to which behavior is rigid, stereotyped, and excessive. (p. 639)
The EDQ had good internal reliability and discriminant validity, but certain items failed to properly assess exercise addiction (Terry et al., 2004). Furthermore, the EDQ provided no clear cut-off score to determine at what point one could diagnose exercise addiction.

Hausenblas and Symons Downs (2002b) subsequently developed the Exercise Dependence Scale (EDS), which was shown to have strong reliability and validity. The EDS was operationalized based on the criteria for substance dependence disorder as presented in the *DSM-IV* (1994). The authors cautioned that although the EDS was an effective tool for identifying those at risk for exercise addiction, it could not be used as the sole method to diagnose exercise addiction; an in-depth interview and a clinical examination also had to be conducted.

Terry et al. (2004) summarized the crucial limitations of the three abovementioned instruments. These authors contended that none was theory-driven and none had a clear cut-off score for determining risk for exercise addiction. All took a long time to administer and were complicated to score, making them difficult and impractical for clinicians to use in psychotherapy, physiotherapy, sports medicine, and occupational therapy settings.

In an effort to create a better instrument, Terry et al. (2004) developed a brief screening measure, the Exercise Addiction Inventory (EAI). This theory-driven, six-item instrument “can distinguish between individuals who are at-risk, have some symptoms, or have no symptoms of exercise addiction” (p. 492). Using Griffiths’s (1996) six components of behavioral addiction—salience, conflict, mood modification, tolerance, withdrawal, and relapse—the EAI operationalized the symptoms of exercise addiction (Allegre et al., 2006).
In contrast to the 21-item Exercise Dependence Scale (EDS; Hausenblas & Symons Downs, 2002b), the six-item Exercise Addiction Inventory (EAI; Terry et al., 2004) was more quickly administered and scored. Developing the EAI, Terry et al. (2004) used a convenience sample of 111 male and 89 female college students, half of whom were sport science students involved in team sports and half psychology students participating in various types of exercise (e.g., aerobic and/or gym use). By administering a comprehensive questionnaire which included the Obligatory Exercise Questionnaire (OEQ; Thompson & Pasman, 1991), the EDS, and the EAI, Terry et al. established that the EAI had strong internal reliability and good content, concurrent, and construct validity. Each of the six items of the EAI corresponded to a component of behavioral addiction, as established by Griffiths (1996). These items were statements accompanied by a five-point Likert scale, with high scores indicating characteristics of exercise addiction.

In contrast to previous instruments, the EAI included a clear cut-off score (24 out of 30) to identify those at risk for exercise addiction. A score of 13-23 indicated an exerciser who had some symptoms of exercise addiction (committed exerciser), whereas a score of 0-12 identified an asymptomatic exerciser (casual exerciser). Terry et al. (2004) discovered that 3% of their sample scored above the cut-off point of 24 on the EAI, indicating that these individuals were at risk for exercise addiction. The other 97% were identified as either committed or casual exercisers. The findings of Terry et al.’s study showed that the EAI had excellent psychometric properties and could accurately measure and identify those at risk for exercise addiction. A follow-up study (Griffiths, Szabo, & Terry, 2005) demonstrated that the EAI had good test-retest reliability. The EAI
was shown to distinguish between exercise addiction and exercise commitment through its clear cut-off points. This was significant because, as Terry et al. (2004) argued, previous instruments often mistakenly had measured exercise commitment instead of exercise addiction.

Terry et al. (2004) summarized the advantages of the EAI over other inventories of exercise addiction, such as the OEQ (Thompson & Pasman, 1991) and the EDS (Hausenblas & Symons Downs, 2002b). According to Terry et al., the EAI was easier to administer and score; was theory-driven and based on the components of behavioral rather than chemical addiction; had an established cut-off point; and because of its ease of administration, could be used more frequently than the other evaluation tools.

However, Terry et al.’s (2004) study examining exercise addiction among sport science and psychology students had limitations. First, the researchers used a convenience, rather than random, sample. Second, to establish the amount of weekly exercise performed, the authors asked only about frequency of exercise but not about duration of each exercise session or about total number of exercise hours per week. Third, researchers also failed to investigate the types of exercise performed by each study participant; it was therefore impossible to determine if a particular exercise was associated with a greater risk for exercise addiction. Finally, because the EAI was a self-report measure, the truthfulness of participants’ responses could be questioned.

Triathletes and Exercise Addiction

A recent study using the Exercise Addiction Inventory (Terry et al., 2004) showed that the risk for exercise addiction was greater in some specialized groups, such as sport science students (Szabo & Griffiths, 2007). The authors found that the greatest
distinctions between sport science students and the general exercising population at a fitness club were the paramount importance of exercise in their lives (salience), the amount of conflict they experienced with their families and friends because of their exercise (conflict), and the degree to which they used exercise as a means of changing their moods (mood modification). Results indicated that 6.9% of sport science students were at risk for exercise addiction compared to only 3.6% of the general exercising population. The risk for exercise addiction within a specialized population, therefore, was higher than that of a general exercising group.

Triathletes compose a specialized group likely to be at high risk for exercise addiction due to the endurance nature of their sport. In fact, researchers have identified certain sports, such as running, swimming, and competing in triathlons, as attracting or perhaps even creating exercise addicts (Blaydon & Lindner, 2002; Chapman & De Castro, 1990; Kerr, 1997; Pierce, McGowan, & Lynn, 1993). Sheehan (1976, as cited in Pargman & Burgess, 1979) posited that runners were the quintessential exercise addicts, who sought to challenge themselves and maximize their bodies’ performance. However, triathletes who not only run but also swim and bike may be even more likely to be at risk for exercise addiction.

Studying triathletes, who participate in a three-discipline sport (swim, bike, and run), may enhance our understanding of exercise addiction. A primary methodological weakness of early research on exercise addiction, indeed, was its focus on a single sport only, such as endurance running (Szabo, 1998). As a result of this singular focus, the generalizability of results was limited. Whereas some authors have recognized this
weakness, the field has not yet adequately studied a wide range of sports, including triathlon.

An exception to this narrow focus on just a few exercise activities (e.g., running, weight lifting), Blaydon and Lindner’s (2002) study used a population of 203 triathletes to investigate exercise addiction and its possible association to eating disorders. Using the Exercise Dependence Questionnaire (EDQ; Ogden et al., 1997) and the Eating Attitudes Test (EAT; Garner & Garfinkle, 1979), the authors identified four distinct triathlete groups, two of which showed high exercise addiction scores. The first of these groups showed the presence of exercise addiction only (primary exercise addiction), whereas the second group demonstrated evidence of both exercise addiction and an eating disorder (secondary exercise addiction). The third group of triathletes showed the presence of an eating disorder only, with no exercise addiction present (eating disorder). The fourth triathlete group had no signs of either an exercise addiction or an eating disorder (no pathology).

In contrast to the widely accepted belief that exercise addiction is rare, Blaydon and Lindner’s (2002) study found that the prevalence of exercise addiction was remarkably high (52%) among professional and amateur triathletes. Although the prevalence rate of exercise addiction among amateur triathletes was lower (43.3%) than that found among professional triathletes (64.3%), it was still significantly high when considering the results of previous studies of amateur exercisers in other sports. These findings suggested that exercise addiction was more common than previously assumed, at least within the specialized population of triathletes.
Blaydon and Lindner (2002) found that the triathletes identified as exercise addicts continued to exercise for a great number of hours per week despite wishing to exercise less. The authors also discovered that those triathletes identified as exercise addicts exercised on average well above 20 hours per week. However, even the triathletes without exercise addiction (the eating disorder and no pathology groups) trained for 16 and 12 hours per week respectively. These results markedly contrasted with Ogden et al.’s (1997) conclusion that only about five hours of exercising per week indicated the presence of exercise addiction. Because the number of training hours per week was so high even for non-addicted triathletes, Blaydon and Lindner argued that the number of training hours in itself cannot be used as a diagnostic marker of exercise addiction among triathletes. This contention may point to the importance of viewing excessive exercise within the context of the six criteria of exercise addiction, as assessed by the Exercise Addiction Inventory (Terry et al., 2004).

A possible explanation of the exceedingly high rate of exercise addiction among triathletes may be a habituation effect. Simply put, a habituation effect in this instance would mean that the more years that triathletes participate in their sport, the more hours they would devote to training, which in turn would lead to a greater risk for exercise addiction. Many triathletes challenge themselves to greater-distance events as they become more experienced in the sport. For example, fledging triathletes usually begin participation in the sport by competing in short Sprint-distance events (0.5 mile swim, 12.4 mile bike, and 3.1 mile run—16 total miles) and then later try the longer Olympic-distance events (0.9 mile swim, 24.8 mile bike, and 6.2 mile run—31.9 total miles). The next challenges might be a Half-Ironman (1.2 mile swim, 56 mile bike, and 13.1 mile
run—70.3 total miles) or a full Ironman triathlon (2.4 mile swim, 112 mile bike, and 26.2 mile run—140.6 total miles). A small number of experienced triathletes competes in an event called the Ultraman Triathlon (6.2 mile swim, 261 mile bike, and 52.4 mile run—319.6 total miles).

Along these lines, Pierce et al. (1993) found a habituation effect in their study of runners: the more the competitors ran in training (both in mileage and time), the more they were likely to demonstrate exercise addiction. The authors studied 137 competitive and non-competitive male runners and discovered that the incidence of exercise addiction was highest among marathoners (runners competing in 26.2-mile races, the equivalent of the running segment of the Ironman triathlon) and ultra-marathoners (runners competing in 50-mile races, the approximate equivalent of the running segment of the Ultraman Triathlon). Furthermore, the authors concluded that runners with higher levels of exercise addiction were drawn to competitions of increasing duration. Pierce et al. stated that there was a “linear increase in exercise [addiction] scores with increases in training mileage, training hours, or years of running experience” (p. 192). These findings clearly are of importance to the present study of triathletes.

Whereas the general public commonly views triathletes as some of the most physically fit athletes in the world, who spend many hours training each week, this population has not received appropriate attention in the literature on exercise addiction. Triathletes usually agree with the general public’s impression and often brag about their devotion to their intense training schedules; however, they actually may be practicing an unhealthy amount of exercise indicative of addiction. It was important to study the association between exercise addiction and triathlon in order to assess the possible
dangers of participation in the sport and to design relevant forms of clinical intervention. Moreover, it seemed prudent to identify those triathletes most likely to be at risk for exercise addiction—such as those participating in the longer events like the Half-Ironman- and Ironman-distance races.

Summary and Purpose of Study

As this review of literature demonstrates, researchers increasingly have clarified the construct of exercise addiction throughout the past 40 years. From the time Baekeland (1970) noticed runners’ reluctance to suspend exercising, and their withdrawal symptoms when they did abstain, researchers have progressively strengthened the argument for conceptualizing excessive exercise as an addiction. Though multiple terms have been used to identify excessive exercise and no one definition has been fully accepted by the field, the most comprehensive operational definition of exercise addiction is “a craving for leisure-time physical activity, resulting in uncontrollable excessive exercise behavior, that manifests in physiological (e.g., tolerance/withdrawal) and/or psychological (e.g., anxiety, depression) symptoms” (Hausenblas & Symons Downs, 2002a, p. 90). The refined definition of exercise addiction has become more specifically aligned with the diagnostic criteria of both chemical and behavioral addiction as the field has progressed.

This review of literature further indicates that as excessive exercise was conceptualized as an addiction, two different camps emerged: one which championed the idea that excessive exercise could be a positive addiction because of the health benefits it produced, and another which argued that by definition any addiction is negative because of its adverse consequences. Although they have recognized some positive qualities of exercise addiction, most current researchers have agreed that excessive exercise is an
addiction with serious negative effects. As Morgan (1979) observed, some endurance athletes “risk self-destructing in much the same way that chronic drug users risk overdosing” (p. 62).

A second, still unresolved, debate exists in the literature concerning the connection between exercise addiction and eating disorders. On the one hand, some researchers have suggested that exercise addiction is always found in the context of an eating disorder (secondary exercise addiction). On the other hand, some investigators have demonstrated that exercise addiction can exist independently of an eating disorder. They have argued that it is a stand-alone addiction with a separate pathology (primary exercise addiction). Still, primary exercise addiction is rare in the general exercising population, according to these researchers. Perhaps the condition is in fact as rare as reported in the literature, or perhaps its supposed rarity is a function of athletes’ denial and/or clinicians’ misdiagnosis. Some current researchers (Terry et al., 2004), therefore, have been less concerned with the distinction between primary and secondary exercise addiction than with emphasizing the presence of exercise addiction in general because athletes and clinicians may not recognize its pathological elements.

Thus, researchers have made a strenuous effort to clarify the diagnostic criteria of exercise addiction. One approach has based diagnosis on the components of chemical substance abuse, whereas the other has based it on the elements of behavioral addiction. Proponents of the behavioral addiction approach (e.g., Griffiths, 1996, 1997, 2002; Terry et al., 2004) have simplified the diagnosis of exercise addiction through a model of six necessary criteria (salience, mood modification, tolerance, withdrawal, conflict, and relapse).
The primary methods of measuring exercise addiction have been qualitative interviews, case studies, and self-report questionnaires. The most established method has been the self-report questionnaire, significant examples of which are the Obligatory Exercise Questionnaire (OEQ; Thompson & Pasman, 1991); the Exercise Dependence Questionnaire (EDQ; Ogden et al., 1997); and the Exercise Dependence Scale (EDS; Hausenblas & Symons Downs, 2002b). However, these instruments have notable limitations: none is easy to administer or score and none provides a clear cut-off point at which exercise addiction can be diagnosed. A new measure, the Exercise Addiction Inventory (EAI; Terry et al., 2004), corrected these limitations. The EAI is theory-driven, easy to administer and score, has an established diagnostic cut-off point, and can be easily employed in clinical settings.

Although the diagnosis of exercise addiction has become more precise and appropriate diagnostic instruments have been created, researchers have not examined a wide range of sports regarding the risk for exercise addiction (studies of running have dominated the literature). One exercising population previously neglected by researchers is that of triathletes. The ultra-endurance nature of triathlon suggests that its participants may be at high risk for exercise addiction. Indeed, the only exercise addiction study using a triathlete population confirmed a high incidence of the disorder among professional and amateur triathletes (Blaydon & Lindner, 2002).

Despite advances in the literature concerning definition, diagnosis, and clinical recognition of exercise addiction, an understanding of the phenomenon in the context of specialized populations, such as triathletes, is noticeably absent. Whereas runners have been described as the epitome of exercise addicts, triathletes may be more likely to be at
risk for exercise addiction because running is a mere third of their exercise regimen. To
date, one study (Blaydon & Lindner, 2002) has focused on a triathlete population with
regards to exercise addiction, but it contained some major limitations. For one thing, its
sample included both professional and amateur triathletes. If we accept the operational
definition of exercise addiction as including leisure-time exercise only, then professional
triathletes should not have been labeled exercise addicts because it is their job to exercise
excessively. The current study addressed this problem by measuring exercise addiction
only among amateur triathletes, who exercise in their free time as an avocation and who
must balance exercise with the demands of their professional and personal lives.

A further limitation of the Blaydon and Lindner (2002) study of triathletes
included the use of the EDQ (Ogden et al., 1997), an instrument that lacked a clear cut-
off point for identifying exercise addiction. To address this limitation, the current study
employed the Exercise Addiction Inventory (Terry et al., 2004), an instrument shown to
have strong internal reliability and good content, concurrent, and construct validity, while
also providing a clear cut-off point at which to identify those at risk for exercise
addiction.

Blaydon and Lindner (2002) also did not clearly describe the distance of the two
triathlons at which they recruited subjects. As the review of literature suggests, an
athlete’s years of involvement in a sport may be a crucial predictor of exercise addiction.
Additionally, as they increase their mileage and hours of training, athletes may be more
likely to exhibit exercise addiction. Not only did the current study measure the
association between years of experience in triathlon and the risk for exercise addiction,
but it distinguished among four different distance triathlons—Sprint, Olympic, Half-
Ironman, and Ironman. This demarcation revealed which types of triathlon are most associated with a high risk for exercise addiction.

Whereas Blaydon and Lindner (2002) included gender as a variable in their study of triathletes, further investigation is warranted. The present study specifically investigated the difference in risk for exercise addiction between male and female triathletes in all four distance triathlons.

In general, the major purpose of this study was to investigate the risk for exercise addiction within a specialized population of extreme endurance exercisers (triathletes), rather than within a general exercising population. To date, this group has not been studied adequately in the literature, even though it is reasonable to assume that risk for exercise addiction may be higher in this population. Evidence of a high risk for exercise addiction among triathletes may provide a necessary warning to physical and mental health practitioners, as well as members of the triathlon community. This study was imperative because the sport of triathlon continues to grow exponentially and attract participants who may be unaware of the hidden danger of exercise addiction. Clearly understanding the characteristics of exercise addiction and its potential prevalence rates among the participants of different distance triathlons is a necessary foundation for developing effective intervention strategies.

This study adds to the extant literature in several important ways. First, it provides current information about triathletes, a population relatively unexamined in the literature on exercise addiction. Second, by employing the Exercise Addiction Inventory (Terry et al., 2004), this study broadens the applicability and scope of the instrument, which heretofore has not been used to study endurance athletes. Third, by distinguishing among
the participants of four types of triathlons (Sprint-, Olympic-, Half-Ironman-, and Ironman-distance), this study reveals which types of triathlon are associated with the highest risk for exercise addiction. Fourth, the relationship between the number of years a triathlete has practiced the sport and the risk for exercise addiction sheds light on the issue of a habituation effect. Fifth, the study reveals gender differences with regards to risk for exercise addiction among the triathlete population. Most important, this study adds to the literature by providing vital information that will help clinicians clearly identify exercise addiction and develop appropriate interventions. This study also may help triathletes recognize when their level of exercise becomes dangerous to their physical, psychological, and emotional health.

Hypotheses

1. More than 50% of all sampled triathletes are at high risk for exercise addiction, as evidenced by a score of 24 or above on the Exercise Addiction Inventory (Terry et al., 2004).

2a. There are significant differences in exercise addiction scores depending on a triathlete’s gender, such that male triathletes are at greater risk for exercise addiction.

2b. There are significant differences in exercise addiction scores depending on the distance of the triathlon for which the athlete is training, such that as the distance of the triathlon increases so does the risk for exercise addiction.

3. A triathlete’s risk for exercise addiction increases the longer he or she has been participating in the sport.

4. A triathlete’s risk for exercise addiction increases as the total number of his or her weekly training hours increases.
CHAPTER 2: METHOD

Participants

As of February 2007, 692,000 people in the United States identified themselves as triathletes, according to the Sporting Goods Manufacturers Association (T. Yount, personal communication, September 7, 2007). For the purpose of this study, the accessible population consisted of the over 90,000 members of USA Triathlon (USAT), who were contacted through an announcement that appeared in the July 31, 2007 issue of *USAT News Wire*, the semi-monthly electronic newsletter distributed by the organization. The announcement included a short introduction to the study, an explanation of the anonymous and voluntary nature of participation in the study, and a link to the online survey. Additionally, the representatives of each triathlon club listed on USAT’s website received an email that similarly described the study, invited participation, included a link to the online survey, and requested that the information be distributed to triathletes. To participate in the study, subjects had to be 18 years or older and had to have completed at least one triathlon within the previous year or be in the process of training for their first triathlon.

A total of 1285 people participated in the study; however, between 12 and 47 participants (less than 3.7%) failed to answer every item in the Demographics section of the survey. Therefore, the numbers and percentages reported herein reflect only those participants who responded to the particular item on the survey. Of the 1273 triathletes who identified their gender, 589 (46.3%) were male and 684 (53.7%) were female. Means and standard deviations for age, height, weight, and Exercise Addiction Inventory (Terry et al., 2004) score are presented in Table 1 (see p. 36).
Table 1

Means and Standard Deviations for Age, Height (in feet), Weight (in pounds), and Exercise Addiction Score

<table>
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<th>Max.</th>
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<td>3.32</td>
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</table>

The majority of participants were Caucasian, married, had bachelor’s degrees, and were employed. Just under 50% had annual incomes greater than $100,000 (see Tables 2-6 for frequencies and percentages).

Table 2

Frequency and Percentage of Triathletes by Race

<table>
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<th>%</th>
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</thead>
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</tr>
<tr>
<td>African American</td>
<td>9</td>
<td>.7</td>
</tr>
<tr>
<td>Middle Easterner</td>
<td>6</td>
<td>.5</td>
</tr>
<tr>
<td>Native American</td>
<td>4</td>
<td>.3</td>
</tr>
<tr>
<td>Caribbean</td>
<td>3</td>
<td>.2</td>
</tr>
<tr>
<td>Total</td>
<td>1245</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 3

Frequency and Percentage of Triathletes by Relationship Status

<table>
<thead>
<tr>
<th>Relationship Status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>762</td>
<td>59.9</td>
</tr>
<tr>
<td>Single</td>
<td>249</td>
<td>19.6</td>
</tr>
<tr>
<td>Significant Other</td>
<td>163</td>
<td>12.8</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>96</td>
<td>7.5</td>
</tr>
<tr>
<td>Widowed</td>
<td>2</td>
<td>.2</td>
</tr>
<tr>
<td>Total</td>
<td>1272</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4

Frequency and Percentage of Triathletes by Education

<table>
<thead>
<tr>
<th>Education</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's Degree</td>
<td>533</td>
<td>41.9</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>410</td>
<td>32.2</td>
</tr>
<tr>
<td>Doctorate</td>
<td>186</td>
<td>14.6</td>
</tr>
<tr>
<td>Some College</td>
<td>73</td>
<td>5.7</td>
</tr>
<tr>
<td>Associate's Degree</td>
<td>45</td>
<td>3.5</td>
</tr>
<tr>
<td>Graduated from High School or GED</td>
<td>17</td>
<td>1.3</td>
</tr>
<tr>
<td>Trade/Technical Training</td>
<td>9</td>
<td>.7</td>
</tr>
<tr>
<td>Total</td>
<td>1273</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 5

Frequency and Percentage of Triathletes by Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>961</td>
<td>75.8</td>
</tr>
<tr>
<td>Self-employed</td>
<td>170</td>
<td>13.4</td>
</tr>
<tr>
<td>Student</td>
<td>67</td>
<td>5.3</td>
</tr>
<tr>
<td>Homemaker</td>
<td>43</td>
<td>3.4</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4</td>
<td>.3</td>
</tr>
<tr>
<td>Retired</td>
<td>22</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>1267</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 6

*Frequency and Percentage of Triathletes by Annual Income (in thousands of dollars)*

<table>
<thead>
<tr>
<th>Annual Income</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 100</td>
<td>622</td>
<td>49.8</td>
</tr>
<tr>
<td>91-100</td>
<td>117</td>
<td>9.4</td>
</tr>
<tr>
<td>81-90</td>
<td>60</td>
<td>4.8</td>
</tr>
<tr>
<td>71-80</td>
<td>85</td>
<td>6.8</td>
</tr>
<tr>
<td>61-70</td>
<td>105</td>
<td>8.4</td>
</tr>
<tr>
<td>51-60</td>
<td>83</td>
<td>6.7</td>
</tr>
<tr>
<td>50 or Less</td>
<td>176</td>
<td>14.1</td>
</tr>
<tr>
<td>Total</td>
<td>1248</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The largest proportion of participants was “Middle-of-the-pack Age-groupers” (see Table 7). Of the 1266 triathletes who identified where they lived, 1252 (98.9%) reported living in the United States and 14 (1.1%) reported living elsewhere.

Table 7

*Frequency and Percentage of Triathletes by Competitor Status*

<table>
<thead>
<tr>
<th>Competitor Status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle-of-the-pack Age-grouper</td>
<td>593</td>
<td>46.7</td>
</tr>
<tr>
<td>Competitive Age-grouper</td>
<td>510</td>
<td>40.2</td>
</tr>
<tr>
<td>Recreational/Casual Age-grouper</td>
<td>162</td>
<td>12.8</td>
</tr>
<tr>
<td>Professional Triathlete</td>
<td>4</td>
<td>.3</td>
</tr>
<tr>
<td>Total</td>
<td>1269</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Concerning their participation in the sport of triathlon, 76 (6.0%) athletes reported that they would like to train fewer hours; 718 (56.6%) participants reported that they would like to train more hours; and 474 (37.4%) participants reported that they would like to train the same number of hours as they had been training. Six hundred and sixty-two (52.1%) participants reported that their next triathlon would take place in one to three
weeks; 421 (33.1%) participants reported that their next triathlon would take place in one to two months; and 188 (14.8%) participants reported that their next triathlon would take place in more than two months.

Measures

All data used in this study were gathered from a specially designed questionnaire that was posted online on a secure website (see Appendix B). The questionnaire consisted of two sections. One section included the Exercise Addiction Inventory (Terry et al., 2004), as well as six additional questions. The other section collected demographic information (e.g., gender, age, ethnicity, number of years competing in triathlon, distance of longest triathlon completed during the past year, total number of hours exercising each week, etc.).

Level of Exercise Addiction

Exercise Addiction Inventory (EAI; Terry et al., 2004). The EAI consists of six statements which are based on a behavioral model of addiction (Griffiths, 1996). Each statement corresponds to one of the six components of addiction (salience, conflict, mood modification, tolerance, withdrawal, and relapse) as defined by Griffiths (1996) and is accompanied by a five-point Likert scale. The statements are coded such that high scores indicate addictive exercise behavior: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree. The six statements included in the EAI are as follows:

(1) Exercise is the most important thing in my life.
(2) Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do.
(3) I use exercise as a way of changing my mood.
(4) Over time I have increased the amount of exercise I do in a day.
(5) If I have to miss an exercise session I feel moody and irritable. 
(6) If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before. (Terry et al., 2004, p. 494)

A score of 24 or above on the EAI indicates a high risk for exercise addiction, whereas a score of 13-23 indicates an exerciser with some symptoms of exercise addiction (often called a committed exerciser). A score of 0-12 indicates an asymptomatic exerciser.

The Exercise Addiction Inventory (EAI; Terry et al., 2004) has been shown to have excellent psychometric properties (Terry et al., 2004) including good test-retest reliability (Griffiths et al., 2005); strong internal reliability; and good content, concurrent, and construct validity (Terry et al., 2004). Terry et al. reported a Cronbach’s alpha value of 0.84 for the EAI when administering it to the 200 subjects in their study.

Procedure

Data for this study were gathered from the online questionnaire, which was posted for one week during July 2007. In order to create the comparison groups for this study, triathletes were categorized based on their responses to the survey question #16, “What is the longest triathlon for which you are training this year?” For example, if participants endorsed Sprint as a response to this survey question, they were identified and grouped as Sprint triathletes. The same sorting procedure was used for those triathletes endorsing two other options, Olympic and Ironman. The fourth option, Other, produced a considerable number of responses naming the triathlon category Half-Ironman, so the investigator subsequently made the decision to create a fourth comparison group, Half-Ironman.

There were three criteria for exclusion from this study: (1) the participants identified themselves as professional triathletes; (2) the participants failed to complete all
six questions of the EAI; or (3) the participants either skipped question #16 or checked the category Other but failed to write in Half-Ironman.
CHAPTER 3: RESULTS

Preliminary Analyses

Before testing the hypotheses of this study, various preliminary analyses were performed. Data were entered into SPSS statistical software (version 12.0 for Windows), which was used to conduct all statistical analyses for this study. Statistical analyses first were performed to examine the items composing the Exercise Addiction Inventory (Terry et al., 2004). Then, statistical procedures were carried out to prepare the data for the Primary Analyses.

Item Analyses

Frequencies and percentages of participants’ responses to Items 1-12 on the survey are presented in Table 8 (see p. 43). Survey items 1-6 were the complete Exercise Addiction Inventory (Terry et al., 2004) and survey items 7-12 were statements added to capture more robust information. Five hundred and twenty-nine (41%) triathletes disagreed with the statement that exercise was the most important thing in their lives. Five hundred and two (39%) agreed that conflicts had arisen with their families and/or partners because of the amount of exercise they were doing. Seven hundred and forty-four (57.7%) triathletes reported that they used exercise to change their moods, and 671 (52.1%) agreed that they had increased their daily amount of exercise over time. Five hundred and ninety-nine (46.6%) triathletes agreed that when they missed an exercise session they were moody and irritable. Six hundred and thirty-five (49.4%) participants agreed that when they cut down the amount of exercise they did and then started again, they always returned to the same level of exercise as before. Six hundred and twenty (48.2%) triathletes disagreed that they had conflicts with friends because of the amount of
exercise they do and 652 (50.7%) disagreed that conflicts had arisen at work because of the amount of exercise they do. Five hundred and thirty-eight (41.9%) triathletes disagreed that over time they had increased the amount of exercise they did in order to experience the same feelings of escapism or high that they had previously experienced from shorter periods of exercise. The last three items on the questionnaire inquired about issues concerning weight: 526 (40.9%) triathletes disagreed that they were unconcerned about weight loss; 558 (43.4%) agreed that they were trying to lose weight in order to improve their athletic performance; and 395 (30.7%) disagreed that they had a fear of being fat.

Table 8

*Frequency and Percentage of Triathletes' Responses to Items 1-12*

<table>
<thead>
<tr>
<th>SQ</th>
<th>Item Theme</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exercise Most Important</td>
<td>108 8.4</td>
<td>529 41</td>
<td>318 24.7</td>
<td>281 21.8</td>
<td>53 4.1</td>
</tr>
<tr>
<td>2</td>
<td>Conflicts with Family/Partner</td>
<td>165 12.8</td>
<td>398 30.9</td>
<td>117 9.1</td>
<td>502 39</td>
<td>104 8.1</td>
</tr>
<tr>
<td>3</td>
<td>Exercise to Change Mood</td>
<td>12 0.9</td>
<td>122 9.5</td>
<td>141 10.9</td>
<td>744 57.7</td>
<td>270 20.9</td>
</tr>
<tr>
<td>4</td>
<td>Increased Amount of Exercise</td>
<td>1 0.1</td>
<td>80 6.2</td>
<td>117 9.1</td>
<td>671 52.1</td>
<td>420 32.6</td>
</tr>
<tr>
<td>5</td>
<td>Moody and Irritable after Missed Session</td>
<td>23 1.8</td>
<td>228 17.7</td>
<td>269 20.9</td>
<td>599 46.6</td>
<td>167 13</td>
</tr>
<tr>
<td>6</td>
<td>Cut Down and Start Again</td>
<td>14 1.1</td>
<td>145 11.3</td>
<td>337 26.2</td>
<td>635 49.4</td>
<td>155 12.1</td>
</tr>
<tr>
<td>7</td>
<td>Conflicts with Friends</td>
<td>280 21.8</td>
<td>620 48.2</td>
<td>173 13.5</td>
<td>178 13.9</td>
<td>34 2.6</td>
</tr>
<tr>
<td>8</td>
<td>Conflicts at Work</td>
<td>375 29.2</td>
<td>652 50.7</td>
<td>142 11</td>
<td>99 7.7</td>
<td>18 1.4</td>
</tr>
<tr>
<td>9</td>
<td>Increased Exercise for Escapism</td>
<td>162 12.6</td>
<td>538 41.9</td>
<td>268 20.9</td>
<td>275 21.4</td>
<td>41 3.2</td>
</tr>
<tr>
<td>10</td>
<td>Not Concerned with Weight Loss</td>
<td>194 15.1</td>
<td>526 40.9</td>
<td>208 16.2</td>
<td>258 20.1</td>
<td>100 7.8</td>
</tr>
<tr>
<td>11</td>
<td>Lose Weight for Performance</td>
<td>123 9.6</td>
<td>264 20.5</td>
<td>179 13.9</td>
<td>558 43.4</td>
<td>161 12.5</td>
</tr>
<tr>
<td>12</td>
<td>Fear of Being Fat</td>
<td>227 17.7</td>
<td>395 30.7</td>
<td>201 15.6</td>
<td>348 27.1</td>
<td>114 8.9</td>
</tr>
</tbody>
</table>
Pearson correlations were conducted between each item on the Exercise Addiction Inventory (EAI) and a correlation matrix was created. To investigate if there was a statistically significant relationship between EAI total scores and Items 1-6 from the EAI, Pearson correlations also were conducted. Both the EAI inter-item correlations and the EAI item-total score correlations are presented in Table 9 (see p. 45). There was a positive linear relationship between EAI total scores ($M = 20.82$, $SD = 3.33$) and each of the items contained in the EAI. The direction of the correlations was positive, meaning that as Exercise Addiction scores increased, scores on the following (Items 1-6) also increased: (1) exercise as the most important thing in the triathletes’ lives (salience); (2) conflicts with family/partners (conflict); (3) use of exercise to change mood (mood modification); (4) amount of exercise over time (tolerance); (5) moodiness and irritation as a result of a missed exercise session (withdrawal); and (6) cutting down the amount of exercise and starting again, followed by the immediate return to the previous level of exercise (relapse). Means and Standard Deviations for items 1-6 are presented in Table 10 (see p. 46).

In the current study, a Cronbach’s alpha value of 0.58 was calculated for the EAI items which served as the first six items on the survey. That the calculated Cronbach’s alpha was lower than the 0.84 reported by Terry et al. (2004) in their study indicates that the EAI is not a unidimensional construct; rather it is multidimensional—representing two or more constructs—at least in the large sample of the current study. Results, therefore, should be interpreted with caution, as the reliability of the instrument in this particular case was lower than expected.
Table 9

_EAI Inter-Item Correlations and EAI Item-Total Score Correlations_

<table>
<thead>
<tr>
<th></th>
<th>Exercise is Most Important in Life (1)</th>
<th>Conflict with Family/Partner (2)</th>
<th>Exercise to Change Mood (3)</th>
<th>Increased Exercise Over Time (4)</th>
<th>Moody/Irritable After Missed Session (5)</th>
<th>Resume Exercise After Period of Inactivity (6)</th>
<th>Correlation with EAI Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise is Most Important in Life (1)</td>
<td>---</td>
<td>0.048</td>
<td>0.234(**)</td>
<td>0.141(**)</td>
<td>0.190(**)</td>
<td>0.191(**)</td>
<td>0.54(***</td>
</tr>
<tr>
<td>Conflict with Family/Partner (2)</td>
<td>---</td>
<td>0.142(**)</td>
<td>0.072(*)</td>
<td>0.225(**)</td>
<td>0.087(**)</td>
<td>0.53(***</td>
<td></td>
</tr>
<tr>
<td>Exercise to Change Mood (3)</td>
<td>---</td>
<td>0.238(**)</td>
<td>0.357(**)</td>
<td>0.171(**)</td>
<td>0.61(***</td>
<td></td>
<td>0.61(***</td>
</tr>
<tr>
<td>Increased Exercise Over Time (4)</td>
<td>---</td>
<td>0.244(**)</td>
<td>0.295(**)</td>
<td>0.52(***</td>
<td></td>
<td></td>
<td>0.52(***</td>
</tr>
<tr>
<td>Moody/Irritable After Missed Session (5)</td>
<td>---</td>
<td>0.326(**)</td>
<td>0.68(***</td>
<td></td>
<td></td>
<td></td>
<td>0.68(***</td>
</tr>
<tr>
<td>Resume Exercise After Period of Inactivity (6)</td>
<td>---</td>
<td>0.57(***)</td>
<td>0.57(***</td>
<td></td>
<td></td>
<td></td>
<td>0.57(***</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
*** Correlation is significant at the 0.001 level
Table 10

Means and Standard Deviations for Items 1-6

<table>
<thead>
<tr>
<th>SQ</th>
<th>Item Theme</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exercise Most Important</td>
<td>1</td>
<td>5</td>
<td>2.72</td>
<td>1.03</td>
</tr>
<tr>
<td>2</td>
<td>Conflicts with Family/Partner</td>
<td>1</td>
<td>5</td>
<td>2.99</td>
<td>1.24</td>
</tr>
<tr>
<td>3</td>
<td>Exercise to Change Mood</td>
<td>1</td>
<td>5</td>
<td>3.88</td>
<td>0.88</td>
</tr>
<tr>
<td>4</td>
<td>Increased Amount of Exercise</td>
<td>1</td>
<td>5</td>
<td>4.11</td>
<td>0.81</td>
</tr>
<tr>
<td>5</td>
<td>Moody and Irritable after Missed Session</td>
<td>1</td>
<td>5</td>
<td>3.51</td>
<td>0.99</td>
</tr>
<tr>
<td>6</td>
<td>Cut Down and Start Again</td>
<td>1</td>
<td>5</td>
<td>3.60</td>
<td>0.88</td>
</tr>
</tbody>
</table>

The next analyses addressed whether certain items on the EAI were designed well enough to provide sufficiently robust data. For example, whereas Item 2 (Conflicts with Family/Partner) on the EAI aims to identify conflict between the athlete and family and partners, other types of conflict are not targeted. In order to develop a clearer picture of conflict in the triathlete’s life, therefore, Item 2 was examined in relation to Items 7 (Conflicts with Friends) and 8 (Conflicts at Work). To investigate if there was a statistically significant relationship between Item 2 (Conflicts with Family/Partner) and Item 7, a Pearson correlation was conducted. There was a positive linear relationship between Item 2 ($M = 2.99$, $SD = 1.24$) and Item 7 ($M = 2.27$, $SD = 1.03$), $r (1281) = .351$, $p < .001$. The direction of the correlation was positive, meaning that as Conflicts with Family/Partner scores increased, Conflicts with Friends scores also increased (see Table 11 on p. 47).

To investigate if there was a statistically significant relationship between Item 2 (Conflicts with Family/Partner) and Item 8 (Conflicts at Work), a Pearson correlation was
conducted. There was a positive linear relationship between Item 2 ($M = 2.99$, $SD = 1.24$) and Item 8 ($M = 2.01$, $SD = 0.91$), $r (1281) = .281$, $p < .001$. The direction of the correlation was positive, meaning that as Conflicts with Family/Partner scores increased, Conflicts at Work scores also increased (see Table 11).

Examining if there was a statistically significant relationship between Item 7 (Conflicts with Friends) and Item 8 (Conflicts at Work), a Pearson correlation was conducted. There was a positive linear relationship between Item 7 ($M = 2.27$, $SD = 1.03$) and Item 8 ($M = 2.01$, $SD = 0.91$), $r (1281) = .530$, $p < .001$. The direction of the correlation was positive, meaning that as Conflicts with Friends scores increased, Conflicts at Work scores also increased (see Table 11).

Table 11

*Pearson Correlation on Items 2, 7, and 8*

<table>
<thead>
<tr>
<th>SQ</th>
<th>Item Theme</th>
<th>Item 2</th>
<th>Item 7</th>
<th>Item 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Conflicts with Family/Partner</td>
<td>--</td>
<td>.35***</td>
<td>.28***</td>
</tr>
<tr>
<td>7</td>
<td>Conflicts with Friends</td>
<td>--</td>
<td>--</td>
<td>.53***</td>
</tr>
<tr>
<td>8</td>
<td>Conflicts at Work</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Note. ***$p < .001$***

A dependent samples *t-test* was conducted on Item 2 (Conflicts with Family/Partner) and Item 7 (Conflicts with Friends). Item 2 scores ($M = 2.99$, $SD = 1.24$) were significantly higher than Item 7 scores ($M = 2.27$, $SD = 1.03$), $t (1281) = 19.58$, $p < .001$, meaning that there was a significant difference in the mean scores of Conflicts with Family/Partner and Conflicts with Friends. This analysis seemed to suggest that triathletes had more conflicts with families and partners than they did with friends.
A dependent samples *t*-test was conducted on Item 2 (Conflicts with Family/Partner) and Item 8 (Conflicts at Work). Item 2 scores \((M = 2.99, SD = 1.24)\) were significantly higher than Item 8 scores \((M = 2.01, SD = 0.91)\), \(t(1281) = 26.38, p < .001\), meaning that there was a significant difference in the mean scores of Conflicts with Family/Partner and Conflicts at Work. This seemed to suggest that triathletes had more conflicts with families and partners than they did with bosses and/or co-workers.

Another item on the EAI that seemed to need clarification and elaboration was Item 4, which aims to measure the addiction component Tolerance. Whereas Item 4 on the EAI questions an athlete’s increase of daily exercise over time, the item fails to capture fully the possible motivations behind such an increase. Item 4 assumes that an increase of exercise over time necessarily indicates an exerciser’s quest for escapism or a high. However, like other endurance exercisers, triathletes may have multiple motivations for increasing their exercise. Analyses were conducted to explore this distinction. To investigate if there was a statistically significant relationship between Item 4 (Increased Exercise Amount) and Item 9 (Increased for Escapism), a Pearson correlation was conducted. There was a positive linear relationship between Item 4 \((M = 4.11, SD = 0.81)\) and Item 9 \((M = 2.61, SD = 1.05)\), \(r(1283) = .26, p < .001\). The direction of the correlation was positive, meaning that as scores for Increased Exercise Amount increased, so did scores for Increased for Escapism (see Table 12 on p. 49). Whereas the correlation between Items 4 and 9 was statistically significant, it is important to note that the effect size was modest.
Table 12

Pearson Correlations between Item 4 (Increased Exercise Amount) and Total EAI Score and between Item 9 (Increased for Escapism) and Total EAI Score

<table>
<thead>
<tr>
<th>SQ</th>
<th>Item Theme</th>
<th>Exercise Addiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Increased Exercise Amount</td>
<td>.54***</td>
</tr>
<tr>
<td>9</td>
<td>Increased for Escapism</td>
<td>.53***</td>
</tr>
</tbody>
</table>

Note. ***p < .001

A dependent samples *t*-test was conducted on Item 4 (Increased Exercise Amount) and Item 9 (Increased for Escapism). Item 4 scores ($M = 4.11, SD = 0.81$) were significantly higher than Item 9 scores ($M = 2.61, SD = 1.05$), $t(1283) = 46.72, p < .001$, meaning that there was a significant difference in the mean scores of Increased Exercise Amount and Increased for Escapism.

Preparatory Analyses

In addition to analyzing Items 2 and 4 on the EAI, preparatory analyses were conducted. The assumptions of normality and homogeneity of variance were assessed before performing the two-way analyses of variance (ANOVAs). Normality was assessed using the Kolmogorov-Smirnov One-sample test; homogeneity of variance was assessed using Levene’s test for Equality of Variances.

In conjunction with conducting multiple regression analyses, collinearity statistics were computed to test for multicollinearity. According to Tabachnick and Fidell (2001), the inclusion of interaction terms of independent variables in prediction equations can cause problems of multicollinearity unless they have been centered. Therefore, predictor variables in this study were mean-centered before interactions of predictor variables were created and entered into the regression models. For a given variable, mean-centering
involved subtracting the variable’s mean from each participant’s value on that given variable. Multiple regressions were conducted with mean-centered variables, and significant levels of multicollinearity were eliminated.

Primary Analyses

Hypothesis 1

Hypothesis 1, which posited that more than 50% of all sampled triathletes are at high risk for exercise addiction, as evidenced by a score of 24 or above on the Exercise Addiction Inventory (EAI; Terry et al., 2004), was tested by using Cross-tabulation Chi-square analyses and by examining the frequencies of Low, Medium, and High risk for Exercise Addiction among the different groups of triathletes. As seen in Table 13, 237 triathletes (19.9%) scored within the range of 24-30 on the EAI and thus were identified as being at high risk for exercise addiction. To examine this further, a Chi-square analysis was conducted between High Addiction Level (24-30 on EAI) and Not-High Addiction Level (0-23 on EAI) revealing a significant relationship between the variables, $\chi^2 (1) = 430.8, p < .001$. Hypothesis 1, therefore, was rejected; rather than the proposed 50%, only 19.9% of the sampled triathletes were at high risk for exercise addiction.

Table 13

<table>
<thead>
<tr>
<th>Type</th>
<th>Exercise Addiction Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (0-12)</td>
</tr>
<tr>
<td>Sprint</td>
<td>5</td>
</tr>
<tr>
<td>Olympic</td>
<td>2</td>
</tr>
<tr>
<td>Half-Ironman</td>
<td>1</td>
</tr>
<tr>
<td>Ironman</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>
Further exploring exercise addiction levels among triathletes, a Chi-square analysis was conducted between Triathlete Type (Sprint vs. Olympic vs. Half-Ironman vs. Ironman) and Exercise Addiction Level (Low vs. Medium vs. High). Cross-tabulations are presented in Table 13 (see p. 50). There was a significant pattern relationship between Triathlete Type and Exercise Addiction Level, $\chi^2 (6) = 29.38, p < .001$, such that those with High addiction scores tended to participate in Half-Ironman triathlons. In addition, those with Medium addiction scores tended to participate in Olympic triathlons. Results should be interpreted with caution, however, as four cells (33.0%) had an expected count of five or less.

Additionally, a Chi-square analysis was performed to examine the relationship between Gender and Exercise Addiction Level. Cross-tabulations between Gender and Exercise Addiction Level are presented in Table 14. As can be seen in Table 14, a total of 99 (17.9%) male triathletes and 138 (21.7%) female triathletes scored within the High Addiction Level. There was no significant pattern of relationship between Gender and Exercise Addiction Level, $\chi^2 (2) = 2.601, p = .27$.

Table 14

<table>
<thead>
<tr>
<th>Exercise Addiction Level</th>
<th>Male (552 total)</th>
<th>Female (637 total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (0-12)</td>
<td>5 (0.9%)</td>
<td>5 (0.8%)</td>
</tr>
<tr>
<td>Medium (13-23)</td>
<td>448 (81.2%)</td>
<td>494 (77.6%)</td>
</tr>
<tr>
<td>High (24-30)</td>
<td>99 (17.9%)</td>
<td>138 (21.7%)</td>
</tr>
</tbody>
</table>

*Note.* $\chi^2 (2) = 2.601, p = .27.$
Hypothesis 2

To examine Hypothesis 2, which proposed that there would be significant differences in exercise addiction scores depending on (a) a triathlete’s gender and (b) the distance of the triathlon for which the athlete is training (Triathlete Type), a two-way analysis of variance (ANOVA) was conducted. Part (a) of this hypothesis posited that gender would have a main effect on exercise addiction scores, with male triathletes exhibiting higher exercise addiction scores than female triathletes. It was hypothesized in part (b) that Olympic triathletes would have significantly higher exercise addiction scores than Sprint triathletes, Half-Ironman triathletes higher exercise addiction scores than Sprint and Olympic triathletes, and Ironman triathletes higher exercise addiction scores than Sprint, Olympic, and Half-Ironman triathletes.

A two-way analysis of variance (ANOVA) was conducted on Exercise Addiction by Gender (male vs. female) and Triathlete Type (Sprint vs. Olympic vs. Half-Ironman vs. Ironman). There was no Gender-Triathlete Type interaction, $F(3,1181) = .67, p = .57$ (see Table 15).

Table 15

<table>
<thead>
<tr>
<th>Source</th>
<th>$df$</th>
<th>$F$</th>
<th>$η$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (G)</td>
<td>1</td>
<td>6.81*</td>
<td>.006</td>
<td>.009</td>
</tr>
<tr>
<td>Type (T)</td>
<td>3</td>
<td>10.18**</td>
<td>.02</td>
<td>.001</td>
</tr>
<tr>
<td>G x T</td>
<td>3</td>
<td>.67</td>
<td>.002</td>
<td>.19</td>
</tr>
<tr>
<td>Error</td>
<td>1181</td>
<td>(10.80)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Value enclosed in parentheses represents mean square error. * $p < .01$. ** $p < .001$. *

Means and standard deviations for Exercise Addiction by Gender (male vs. female) and Triathlete Type (Sprint vs. Olympic vs. Half-Ironman vs. Ironman) are
presented in Table 16 (see p. 54). There was a main effect of Gender on Exercise Addiction, $F(1,1181) = 6.81, p = .009$, such that females tended to have higher exercise addiction scores than males. This result may seem discrepant with the results of the Chi-square analysis; however, the ANOVA produces more robust findings. There was also a main effect of Triathlete Type, $F(3,1181) = 10.18, p < .001$. Tukey’s post hoc test revealed that the Sprint triathletes were significantly lower than both the Half-Ironman and Ironman triathletes on exercise addiction scores. Half-Ironman triathletes were also significantly higher than the Olympic triathletes on exercise addiction scores.

Therefore, part (a) of Hypothesis 2 was only partially supported: there was a main effect of Gender on Exercise Addiction, but it was the female, rather than the male, triathletes who exhibited higher exercise addiction scores. Part (b) of Hypothesis 2 also was only partially supported: there was a main effect of Triathlete Type on Exercise Addiction, but exercise addiction scores did not completely follow the pattern of increasing as the length of the races increased. Triathletes who participated in Half-Ironman and Ironman races exhibited significantly higher exercise addiction scores than Sprint triathletes. Additionally, Half-Ironman triathletes also exhibited significantly higher exercise addiction scores than Olympic triathletes. However, there was no significant difference in exercise addiction scores between Sprint and Olympic triathletes, between Olympic and Ironman triathletes, or between Half-Ironman and Ironman triathletes.
Table 16

Means and Standard Deviations for Exercise Addiction by Gender and Triathlete Type

<table>
<thead>
<tr>
<th>Triathlete Type</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprint</td>
<td>19.46</td>
<td>20.37</td>
</tr>
<tr>
<td>Olympic</td>
<td>20.39</td>
<td>20.70</td>
</tr>
<tr>
<td>Half-Ironman</td>
<td>21.14</td>
<td>21.83</td>
</tr>
<tr>
<td>Ironman</td>
<td>20.99</td>
<td>21.16</td>
</tr>
</tbody>
</table>

Regressions

Four multiple regressions were conducted using mean-centered independent variables to test Hypotheses 3 and 4. Mean-centering transformations were performed in order to eliminate multicollinearity among the independent variables. Mean-centered variables were computed by subtracting each variable’s mean from each participant’s value on that given variable.

Hypothesis 3

Hypothesis 3 predicted that a triathlete’s risk for exercise addiction would increase the longer he or she had been participating in the sport. To test this, a multiple regression was conducted using Exercise Addiction as the criterion and Gender, Number of Years, and Gender-Number of Years interaction term as the predictors (see Table 17 on p. 55). Gender, Number of Years, and Gender-Number of Years interaction term were entered simultaneously into the equation predicting Exercise Addiction. The multiple regression model with all three predictors produced $R^2 = .001$, $F(3,1183) = 1.50$, $p = .21$. As can be seen in Table 17, Gender, Number of Years, and Gender-Number of Years interaction term did not make significant contributions to the multiple regression model.
Additionally, very little variance of Exercise Addiction was accounted for by this model. Therefore, Hypothesis 3 was rejected.

Table 17

*Multiple Regression with Gender, Number of Years, and Gender-Number of Years Interaction Term Predicting Exercise Addiction*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.38</td>
<td>0.20</td>
<td>0.06</td>
<td>1.95</td>
<td>0.051</td>
</tr>
<tr>
<td>Number of Years</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.91</td>
<td>0.37</td>
</tr>
<tr>
<td>Gender-Year Interaction</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.01</td>
<td>-0.27</td>
<td>0.79</td>
</tr>
</tbody>
</table>

*Note. Results were not statistically significant.*

**Hypothesis 4**

To examine Hypothesis 4, which posited that a triathlete’s risk for exercise addiction would increase as the total number of his or her weekly training hours increased, a multiple regression was conducted using Exercise Addiction as the criterion and Gender, Weekly Hours, and Gender-Weekly Hours interaction term as the predictors (see Table 18 on p. 56). Gender, Weekly Hours, and Gender-Weekly Hours interaction term were entered simultaneously into the equation predicting Exercise Addiction. The multiple regression model with all three predictors produced $R^2 = .047$, $F (3,1174) = 20.44$, $p < .001$. As can be seen in Table 18, Gender and Weekly Hours had significant positive regression weights and thus were significant predictors of Exercise Addiction. The Gender-Weekly Hours Interaction had a significant negative weight and was thus a significant predictor of Exercise Addiction. To further investigate the interaction of Gender and Weekly Hours as a predictor, separate regression analyses were conducted for males and females using Weekly Hours as the sole predictor of Exercise Addiction (see Tables 19 and 20 on p. 56). The regression model for males produced $R^2 = .077$, $F$
(1,546) = 45.86, p < .001. The regression model for females produced $R^2 = .023$, $F(1,628) = 14.55, p < .001$. As can be seen in Table 19 and Table 20, Weekly Hours better predicted Exercise Addiction for male triathletes than for female triathletes, as evidenced by a steeper slope for males ($\beta = .23$) than for females ($\beta = .15$). Given the above analyses, Hypothesis 4 was supported. However, whereas the model containing Gender, Weekly Hours, and Gender-Weekly Hours Interaction as predictors of Exercise Addiction was statistically significant, the results should be interpreted with caution because only 4.7% of the variance was accounted for by this model.

Table 18

*Multiple Regression with Gender, Weekly Hours, and Gender-Weekly Hours Interaction Term Predicting Exercise Addiction*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.45</td>
<td>0.19</td>
<td>0.07</td>
<td>2.37*</td>
<td>0.02</td>
</tr>
<tr>
<td>Weekly Hours</td>
<td>0.13</td>
<td>0.02</td>
<td>0.22</td>
<td>7.51***</td>
<td>0.001</td>
</tr>
<tr>
<td>Gender-Weekly Hours Interaction</td>
<td>-0.11</td>
<td>0.04</td>
<td>-0.09</td>
<td>-2.96**</td>
<td>0.003</td>
</tr>
</tbody>
</table>

*Note. * $p < .05$, **$p < .01$, ***$p < .001$.*

Table 19

*Regression with Weekly Hours Predicting Exercise Addiction for Male Triathletes*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Hours</td>
<td>0.19</td>
<td>0.03</td>
<td>0.23</td>
<td>6.77*</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*Note. * $p < .001$.*

Table 20

*Regression with Weekly Hours Predicting Exercise Addiction for Female Triathletes*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Hours</td>
<td>0.08</td>
<td>0.02</td>
<td>0.15</td>
<td>3.82*</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*Note. * $p < .001$.*
The findings regarding Hypothesis 4 prompted further investigation of the risk for exercise addiction with regards to time spent training. Thus, frequency of weekly training sessions and average session time were examined.

**Frequency of Weekly Training Sessions**

To explore whether the total number of weekly training sessions contributed to the risk for exercise addiction, a multiple regression was conducted using Exercise Addiction as the criterion and Gender, Number of Weekly Sessions, and Gender-Number of Weekly Sessions interaction term as the predictors (see Table 21). Gender, Number of Weekly Sessions, and Gender-Weekly Sessions interaction term were entered simultaneously into the equation predicting Exercise Addiction. The multiple regression model with all three predictors produced $R^2 = .016$, $F (3,1147) = 7.28$, $p < .001$. As can be seen in Table 21, Gender and Weekly Sessions had significant positive regression weights and were thus significant predictors of Exercise Addiction. The Gender-Weekly Sessions Interaction was not a significant predictor of Exercise Addiction. Whereas there were statistically significant predictors within the model (Gender and Weekly Sessions), it should be noted that the model as a whole accounted for only 1.6% of the variance; thus, the results should be interpreted with caution.

**Table 21**

*Multiple Regression with Gender, Weekly Sessions, and Gender-Weekly Sessions Interaction Term Predicting Exercise Addiction*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.42</td>
<td>0.20</td>
<td>0.06</td>
<td>2.16*</td>
<td>0.03</td>
</tr>
<tr>
<td>Weekly Sessions</td>
<td>0.13</td>
<td>0.03</td>
<td>0.12</td>
<td>4.20***</td>
<td>0.001</td>
</tr>
<tr>
<td>Gender-Weekly Sessions Interaction</td>
<td>-0.05</td>
<td>0.06</td>
<td>-0.02</td>
<td>-0.76</td>
<td>0.45</td>
</tr>
</tbody>
</table>

*Note.* *p < .05, **p < .01, ***p < .001.
Average Session Time

To examine whether training session time contributed to the risk for exercise addiction, a multiple regression was conducted using Exercise Addiction as the criterion and Gender, Average Session Time, and Gender-Average Session Time interaction term as the predictors (see Table 22). Gender, Average Session Time, and Gender-Average Session Time interaction term were entered simultaneously into the equation predicting Exercise Addiction. The multiple regression model with all three predictors produced $R^2 = .003$, $F(3,1136) = 2.26, p = .08$. As can be seen in Table 22, Gender, Average Session Time, and the Gender-Average Session Time Interaction were not significant predictors of Exercise Addiction.

Table 22

Multiple Regression with Gender, Average Session Time, and Gender-Average Session Time Interaction Term Predicting Exercise Addiction

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.32</td>
<td>0.20</td>
<td>0.05</td>
<td>1.65</td>
<td>0.10</td>
</tr>
<tr>
<td>Average Session Time</td>
<td>0.09</td>
<td>0.05</td>
<td>0.06</td>
<td>1.92</td>
<td>0.06</td>
</tr>
<tr>
<td>Gender-Average Session Time Interaction</td>
<td>-0.04</td>
<td>0.09</td>
<td>-0.01</td>
<td>-0.48</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Note. Results were not statistically significant.

As the above results indicated, further investigation of the risk for exercise addiction with regards to frequency of weekly sessions and average session time revealed that frequency of weekly sessions was a significant predictor of exercise addiction, but the length of an average exercise session was not a significant predictor of exercise addiction.
CHAPTER 4: DISCUSSION

The primary purpose of the current study was to examine the risk for exercise addiction among triathletes, a specialized population of extreme endurance exercisers. Much of the previous literature has focused on either a general exercising population or a limited number of particular activities, such as running. Except for one study (Blaydon & Lindner, 2002), triathletes have not received adequate attention in the research literature, though we might have assumed that triathletes would be at a higher risk for exercise addiction than the general population of exercisers. When triathletes have been the focus in the scholarly literature, researchers have not clearly distinguished among triathletes training for events of vastly different distances, each requiring training levels along a continuum of duration and intensity. Hence, clearly understanding the complexion of and the risk for exercise addiction among the participants of different distance triathlons was deemed important. The secondary purpose of this study was to broaden the applicability and scope of the Exercise Addiction Inventory (Terry et al., 2004), an instrument used previously to assess exercise addiction in populations other than triathletes.

Interpretation of Results

In general the risk for exercise addiction among this population of triathletes is much lower than anticipated. Specifically, only about 20% of triathletes are identified as being at high risk for exercise addiction. Whereas this statistic is much higher than the 3-8% found among a general exercising population (Allegre et al., 2006; Warner & Griffiths, 2006), it is still much lower than the 43.3% reported for amateur triathletes in Blaydon and Lindner’s (2002) study. The differences reported in the current study may be attributed to various factors. First, the sample of the present study consisted of
endurance athletes rather than general exercisers. Although general exercisers may be content with a moderate amount of exercise, athletes participating in an endurance sport are likely to have the goal of exercising longer and more frequently because that tactic increases their endurance. Second, Blaydon and Lindner’s (2002) study examined a relatively small sample of 203 triathletes, whom they found at two triathlon events. One triathlon from which they gathered participants was the 1998 World Triathlon Championships, an Olympic-distance event; the distance of the other triathlon was not specified.

The triathlete population as a whole is not uniform because the amount of training required is different when preparing for different distance events; disparate risk levels for exercise addiction accompany different distance races. The present study examined a large and varied sample of 1285 triathletes, likely to be more representative of triathletes in general. Grouping these triathletes by the distance of the longest triathlon for which they were during the current year, the present study had a roughly equal number of triathletes who raced in short events and those who raced in long events. By including triathletes competing in various distance triathlons, this study may have produced statistics more representative of the entire triathlete population.

Surprisingly, the majority of triathletes in the current study are identified as asymptomatic or committed exercisers (as defined by Terry et al., 2004), rather than as addicted exercisers. Terry et al. described committed exercisers as those who display some symptoms of exercise addiction but show limited risk for the disorder. The finding of the current study corroborates Morgan’s (1979) contention that not all endurance athletes are addicted to exercise.
The present study discovered that there is a difference in risk for exercise addiction among triathletes training for different distance events (i.e., Triathlete Type has a main effect on Exercise Addiction). Though the current study initially predicted that the risk for exercise addiction would increase incrementally as the length of the race for which the triathlete was training increased (i.e., from Sprint to Olympic, to Half-Ironman, to Ironman), the results of the study do not follow that pattern precisely. On the one hand, following the predicted pattern those athletes who were training for Half-Ironman and Ironman triathlons do display a significantly higher risk for exercise addiction than do Sprint triathletes; and Half-Ironman triathletes are significantly higher than Olympic triathletes. On the other hand, the results do not conform completely to the anticipated linear progression, in that Ironman triathletes do not display a significantly higher risk than Half-Ironman or Olympic triathletes, even though these races are much shorter. Similarly, Olympic triathletes are not at a significantly higher risk for exercise addiction than Sprint triathletes.

Perhaps the truly meaningful increase in the risk for exercise addiction occurs when a triathlete’s training jumps from preparing for the roughly 16 miles of a Sprint triathlon or the 32 miles of an Olympic triathlon to preparing for the 70.3 miles of a Half-Ironman triathlon. The increased risk for exercise addiction for Half-Ironman triathletes may be explained by the additional effort and time demands of preparing for a Half-Ironman event. Because of the probable increase in training, a Half-Ironman triathlete may experience an intensification of interpersonal conflict, place greater priority on training, or suffer stronger feelings of irritability or depression when an exercise session is missed. Usually these great changes in lifestyle occur when training shifts from
preparing for Sprint or Olympic to preparing for Half-Ironman races. Most triathletes who exercise regularly on a weekly basis would be likely to be able to complete either a Sprint or Olympic race without extra preparation, but to complete the 70.3 miles of a Half-Ironman, a great increase in training is necessary, perhaps bringing with it a greater risk for exercise addiction.

Comparing Sprint to Olympic triathletes and Half-Ironman to Ironman triathletes, no significant increases in risk for exercise addiction exist. The lack of distinction in risk for exercise addiction between Sprint and Olympic triathletes may be explained by the similarity in training regimens; the intensity and duration of their maximum workouts may not be dramatically different. Whereas the lack of difference in risk for exercise addiction between Sprint and Olympic triathletes may be understandable, the lack of distinction in risk between Half-Ironman and Ironman triathletes is more surprising, given that the Ironman triathlon is twice the distance (at 140.6 miles) of the Half-Ironman. Maybe a threshold in risk for exercise addiction is reached once an athlete assumes the augmented training for a Half-Ironman. Or perhaps Ironman triathletes may become more accustomed to the taxing training involved in long races and learn to adapt their lives accordingly. Still another possible explanation is that Ironman triathletes may be in greater denial about their risk for exercise addiction and therefore tend to rationalize their behavior or fail to report their symptoms truthfully.

It is even more perplexing that a significant increase in the risk for exercise addiction is absent when comparing Olympic to Ironman triathletes. One reason for this may be that the triathletes were assigned to groups based on the longest triathlon for which they were training this year, a somewhat artificial categorization in that triathletes
may actually compete in different distance triathlons from year to year, or even within the same year. Therefore, those participants grouped as Olympic triathletes may not have been significantly different from those grouped as Ironman triathletes because they regularly compete in both types of races. Similarly, those grouped as Half-Ironman and Ironman may not have been significantly different from one another because triathletes may routinely alternate participation in these two long distance events.

Though it was posited that male triathletes would exhibit a higher risk for exercise addiction than female triathletes, the study found that female rather than male triathletes are at higher risk for exercise addiction. This finding contradicts the conclusion of Blaydon and Lindner’s (2002) study—that there was no significant difference in exercise addiction rates for male and female triathletes. In the present study, triathletes’ risk for exercise addiction was calculated by adding their scores on the six items included in the Exercise Addiction Inventory (Terry et al., 2004), each of which corresponds to a theoretical component of addiction. Because being a male competitive athlete in our society may be more culturally acceptable than being a female competitive athlete, women may experience more cognitive dissonance and interpersonal conflicts as a result of their participation in triathlon. Another possibility is that women in this study may have felt more comfortable about candidly disclosing some of their symptoms of exercise addiction, whereas male triathletes may have minimized negative aspects of their participation in the sport because of a possible tendency to be more reticent about emotions. Despite possible stereotypical overtones, still another explanation for the discrepancy between male and female triathletes’ risk for exercise addiction may be gender differences in motivation for participating in the sport. For instance, male
triathletes may be driven more by a competitive spirit and females compelled more by body image issues, such as weight loss and an improvement in muscle tone.

The current study found that the number of years a triathlete has been involved in the sport does not significantly contribute to his or her risk for exercise addiction, suggesting that triathletes do not necessarily conform to the pattern described by Pierce et al. (1993) and Masters and Lambert (1989). They found that male runners experienced an increase in exercise addiction the longer they had been doing the sport, which the researchers identified as a habituation effect. In the current study, neither male triathletes nor female triathletes show any indication of a habituation effect with regards to years of experience in the sport of triathlon. Perhaps for triathletes, the priority of training diminishes over the years, or they learn to balance their lives with greater ease. Over many years of participating in the sport, they also may experience fewer intrapsychic and interpersonal conflicts. The absence of a habituation effect among triathletes may indicate that they do not respond exactly as the runners did in the research by Pierce et al. and Masters and Lambert. We cannot assume that triathletes who swim and bike in addition to running react exactly like runners with regards to exercise addiction. Perhaps training for all three sports, instead of just running, mitigates a triathlete’s risk for exercise addiction.

The present study found that the more hours triathletes train in a week, the higher their risk for exercise addiction. Moreover, weekly training hours better predicts exercise addiction scores for males than it does for females. However, weekly training hours should not be considered a strong predictor of the risk for exercise addiction since very little of the variance in scores on the Exercise Addiction Inventory (Terry et al., 2004) is
accounted for by this variable (see also Blaydon & Lindner, 2002). That a greater number of weekly training hours raises the risk for exercise addiction may be explained by any number of things: an increase in the salience of training for the triathlete; a rise in the number of conflicts that occur because of more training; the development of a greater tolerance for the amount of exercise; and a growing dependency on exercise as a means of changing mood.

Similarly, the results showed that as the frequency of training sessions per week increases, so does the risk for exercise addiction. But frequency of training sessions per week also should not be viewed as a strong predictor since very little of the variance in exercise addiction scores is accounted for by this variable. Though the risk for exercise addiction rises with increased training frequency, there are numerous factors that may contribute to the very complex nature of exercise addiction.

Of particular interest is the finding that whereas the total number of weekly hours spent training and the frequency of training both are statistically significant, average session time does not produce statistically significant contributions to the risk for exercise addiction. This perplexing result may be explained partially by a finding in Chapman and De Castro’s (1990) study. These authors concluded that whereas mood enhancement in runners was associated with the duration of running, exercise addiction was associated with high frequency of running. Together with the findings of Chapman and De Castro, the current results suggest that one way of minimizing the risk for exercise addiction may be to decrease the frequency of weekly training sessions, without too much concern for the length of each session.
To provide a robust picture of the risk for exercise addiction among triathletes, this study examined two items of the Exercise Addiction Inventory (Terry et al., 2004): Item 2, which is designed to measure conflict between the exerciser and family and/or partners; and Item 4, which is said to measure the addiction concept of tolerance. Based on the existing literature (e.g., Allegre et al., 2006; De Coverley Veale, 1987; Morgan, 1979; Veale, 1995; Warner & Griffiths, 2006), which argued that addicted exercisers had significant conflict with family, partners, friends, and people at work, Items 7 and 8 were added to the survey in the present study to detect a wider scope of conflict in a triathlete’s life. This study found that triathletes may have more conflict with family and/or partners than with friends or with people at work. Perhaps triathletes befriend other triathletes who share both their interests and lifestyle. They may seek employment opportunities that provide accommodating and flexible environments, such as entrepreneurship or high-level positions within organizations (demographics reveal that about half the triathletes have average incomes of $100,000 or more). Greater conflict may arise with family members and/or partners because they may resent the time that the triathletes spend away from them.

Item 4 of the Exercise Addiction Inventory (Terry et al., 2004) is designed to identify the addiction component of tolerance. It addresses whether over time the exerciser has increased the amount of exercise performed in a day but does not fully address the exerciser’s motivation for doing so. Because it is aligned with the addiction concept of tolerance, the interpretation of Item 4 is predicated on the idea that addicts increase their use of a substance or behavior over time in order to achieve the same sense of escapism or mood modification that was previously achieved from a lesser amount.
However, the motivation of mood modification cannot necessarily be assumed when considering an endurance athlete’s increase in daily exercise over time. Item 9 was added to the current study’s survey, therefore, in order to capture distinctions in motivation for increased daily exercising over time.

Whereas more than 50% of the triathletes in the current study endorse that over time they have increased the amount of exercise they do in a day, only about 24% endorse “escapism or achieving a high” as the reason for doing so. These results suggest that whereas the majority of triathletes do increase their daily exercise over time, it may not necessarily be with the intended goal of escapism or achieving a high. The concept of tolerance may not provide the only explanation. Like other endurance athletes, triathletes may increase their daily exercise over time in order to improve their cardiovascular fitness and/or their athletic performance—without the intended motivation of mood enhancement that the concept of tolerance implies. Perhaps Item 4 of the Exercise Addiction Inventory (Terry et al., 2004) needs rethinking and even revision; Item 9 of the current study may be a more appropriate way of measuring tolerance as it applies to triathletes and other endurance athletes.

Implications for Clinical Practice

Awareness and Diagnosis: Based on the findings of the extant literature, particularly Veale (1995), it is unlikely that individuals who exercise excessively will seek clinical help on their own or be referred for psychological counseling by medical or other practitioners. This may be explained by denial on the part of the exercisers and/or lack of awareness on the part of both exercisers and their doctors. Furthermore, triathletes may conceptualize their addiction as healthy and even brag about it, despite there being
possible negative consequences. The literature reported that when exercise addicts did in fact seek mental health counseling, the presenting issue was something other than exercise addiction, such as depression, anxiety, vocational dysfunction, relationship disharmony, and/or psychosomatic problems. Therefore, psychologists must listen carefully for signs of exercise addiction in order to probe more deeply and to diagnose accurately. They must become knowledgeable about the general presentation and components of exercise addiction in order to recognize the disorder in their patients and prevent further physical and psychological injury (Veale). Using a screening instrument such as the one in the current study, or implementing an oral interview based on the questions of that instrument, clinicians should be able to discern problem-exercising. If an exerciser shows evidence of withdrawal symptoms even after just one day of exercise deprivation, a clinician should be alerted that exercise addiction may be present (Aidman & Woollard, 2003). It would then be important to investigate further the role that exercise plays in the patient’s life.

In settings outside the mental health arena, it is equally important for professionals who come in contact with exercisers to be aware of and recognize excessive exercise as a legitimate problem. Primary practitioners, chiropractors, orthopedists, physical therapists, coaches, and fitness trainers are among the professionals likely to encounter exercise addicts. Therefore, these professionals must be educated about the existence of the disorder and its harmful consequences, particularly since the dominant popular conception is that exercise is completely healthy and that there is a certain valor in exercising through pain, illness, or injury.
Treatment: Adams and Kirkby (1997) contended that whereas diagnosing exercise addiction might be relatively easy, clinical treatment is more complicated and difficult. In fact, for extreme cases of exercise addiction, they recommended that a referral be made to a sport psychologist who specializes in treating addictions. Attention should be devoted to a comprehensive investigation of exercise addiction as a primary clinical/treatment issue with one focus being the determination of how exercise functions as a defense against the patient’s painful or disturbing thoughts and feelings, much as gambling functions to help gamblers escape dysphoric thoughts and feelings.

Roughly one fifth of the sample in the study is identified as being at high risk for exercise addiction, indicating that particular clinical attention should be given to these participants. It would be beneficial to conduct a lengthy interview with high risk triathletes in order to discern their true motivations for participating in the sport. Are they attracted to triathlon because it provides a convenient and socially accepted outlet for a possibly already existing exercise addiction? Are they attracted to the sport because the level of commitment and consistency of training to complete a triathlon suit their compulsive tendencies? Or are they initially attracted to the sport for its healthy lifestyle only to develop a higher risk for exercise addiction because of the increasing amount of exercise that is needed to improve in an endurance sport? The clinician may discover that triathlon is being used to manage body image preoccupations, such as a fear of being fat or a dislike of one’s body shape or composition. Or the clinician may detect that the triathlete is driven to satisfy a perpetual need to achieve and conquer new challenges. Once distinctions are made among various motivations, the clinician is better prepared to design and implement appropriate therapeutic interventions.
Clinical treatment approaches might include psychoeducation, recommending reduced or alternative activities, and/or coping strategies (Adams & Kirkby, 1997). Therapists must educate patients about the health benefits of exercise, while also teaching them to recognize when exercising develops into a compulsive behavior. The ultimate goal in treatment is to help excessive exercisers achieve balance in their lives. Morgan (1979) stated that a solution to the problem of exercise addiction is helping exercisers keep their training programs in “perspective from a vocational, social, biological, and psychological standpoint” (p. 69). Thus, patients also should be counseled to view the role exercise plays within their lives through the lens of multiple personal and social obligations and responsibilities. This may be facilitated through individual and/or group therapy modalities. Attending a program based on the 12-step approach of Alcoholics Anonymous may prove to be a helpful supplement to the clinical regimen of individual and/or group psychotherapy.

Adams and Kirkby (1997) observed, however, that some exercise addicts resist complying with clinical recommendations. Therefore, it is important for the therapist to be highly skilled at resolving sources of resistance to therapeutic intervention. Sometimes it is difficult to treat exercise addiction because patients may fear that by restructuring their exercise regimens, they will lose a valuable coping strategy for depression and anxiety, among other things. The clinical literature clearly states that exercise can limit depression. There needs to be a clear demarcation between people who exercise consistently because it assists in their general, everyday functioning, and those who become seriously addicted to exercise (Cockerill & Riddington, 1996). According to the results of the current study and those in the published literature (Chapman & De Castro,
1990), when recommending an exercise program to treat a disorder such as depression, maybe it would be better for clinicians to prescribe fewer (and perhaps longer) exercise sessions per week in order to improve the patient’s mood without fostering the development of exercise addiction.

Limitations of the Study

A chief limitation of the current study concerns the use of the Exercise Addiction Inventory (EAI; Terry et al., 2004). Because this instrument contains six items only, its ability to identify nuances of exercise addiction may be limited. Whereas the length of the EAI makes it an expedient screening device, its brevity may not do justice to the complex construct of exercise addiction. That the EAI uses only one item to assess each of the six theoretical components of exercise addiction may compromise its validity. Exercise addiction is a disorder requiring a more in-depth and multilayered approach. Several questions designed to address each facet of the syndrome would be more likely to identify discreet differences in responses. For example, asking three different questions about conflict in exercisers’ lives is a more comprehensive and robust method of identifying possible problems that they experience. Moreover, revising some of the items to make them more precise may be advantageous. For instance, replacing Item 4 of the EAI (increase in daily exercise over time) with the more detailed Item 9 of this study’s survey (increase of daily exercise to achieve a sense of escapism or high) would align the item more precisely with the concept of tolerance because it would clarify the exerciser’s motivation.

As with any self-report measure, the responses to the questionnaire used in the present study were examined with the knowledge that the answers may not be entirely
truthful. Evaluation of participants relied on their responses only, without the 
corroborated of other forms of testing or observation. Because the study investigates the 
risk for an addiction, participants may have been reluctant to answer truthfully about their 
actual exercise regimens and any associated problems. On the other hand, participants 
may have exaggerated their level of exercise in an attempt to appear more physically fit 
and committed to the sport, traits highly valued by the triathlon community. Furthermore, 
some responses may represent a misunderstanding of a particular statement or question 
included in the survey.

The current study employed a cross-sectional design, yet exercise patterns of 
triathletes fluctuate depending on several factors, such as distance of the triathlon for 
which they are training, injury, motivation, and family obligations. Athletes in this study 
were grouped according to the longest triathlon for which they were training this year. 
Their attitudes and behaviors, though, may be specific to this particular year’s training 
schedule and may not represent the complete picture of their exercise regimens over time. 
For example, an athlete who is training for an Olympic-distance triathlon this year may 
have completed one or more Ironman-distance races last year and trained accordingly. 
Therefore, the categorical groups in this study are somewhat artificial and may not be 
mutually exclusive.

Another limitation of the design of the current study involves the method of 
capturing a truly representative sample. First, although the survey was disseminated 
through an email newsletter that presumably reached a large population of triathletes 
throughout the United States, it did not ask participants to specify in which geographical 
region they resided; thus, there is no way to determine if the sample is truly nationally
representative. Second, because relatively few respondents indicated that they lived outside the United States, the results of the present study may not be generalizable to the larger population of triathletes around the world.

A growing number of physically challenged athletes are embracing and participating in the sport of triathlon. In the present study, triathletes were not asked to identify themselves as members of this population if it applied. Therefore, included within the age-group categories there may be an unacknowledged sub-group of physically challenged athletes, who may or may not demonstrate their own unique risk for exercise addiction.

A further limitation of this study is that body image issues and eating disorders are not emphasized or discussed. Previous research has suggested that eating disorders may be a condition comorbid with exercise addiction (e.g., Bamber et al., 2003; Hausenblas & Fallon, 2001; Pasman & Thompson, 1988).

A threat to the internal validity of this study is history. At this moment in the United States and elsewhere, physical exercise is viewed positively as a vital component of a healthy lifestyle, one that promotes longevity and cognitive functioning. Furthermore, the sport of triathlon currently is advertised as an enjoyable, social, and challenging physical exercise. Thus, when taking the survey, respondents may have been more focused on the positive effects of exercising while denying or minimizing negative consequences.

That the author of the present study is a triathlete also can be considered a threat to internal validity; his own experience in triathlon possibly may have produced an investigator bias when interpreting the results. But this bias is unlikely to have seriously
weakened the internal validity since the investigator used randomly sampled subjects and repeatedly consulted with non-triathlete colleagues.

Recommendations for Future Research

Because of the complex, multilayered nature of exercise addiction, particularly among triathletes, additional research is needed. Relying on an objective measure alone cannot fully reveal whether triathletes are truly at risk for exercise addiction or rather are deeply dedicated to their endurance sport. Furthermore, research investigating endurance athletes should explore in more detail how it is that some athletes score high on measures of exercise addiction yet nevertheless report that they are living a balanced and highly functional lifestyle. Future studies including qualitative components could discern specifically how triathletes incorporate exercise into their otherwise demanding lives and also illuminate nuances in their motivation for endurance exercise. For these athletes, exercise may serve as a healthy distraction, a temporary escape from problems, a time for meditation, a constructive outlet for aggression and competition, or as a method for achieving physical well-being.

To address the fact that triathletes’ schedules vary from year to year or month to month depending on the race for which they are training, future studies investigating exercise addiction within this population should employ a repeated measures design or at least should inquire about triathletes’ attitudes and behaviors during highest, lowest, and current training levels. Moreover, triathlons of distances different from Sprint, Olympic, Half-Ironman, and Ironman should be investigated.

As the sport of triathlon continues to grow, additional research about triathletes is warranted. Future studies should aim to investigate an international population and
should identify specifically country and geographical region in which the triathlete lives, as this may prove to be a variable of interest. Studies also should investigate the risk for exercise addiction specifically among different sub-groups of triathletes, such as teenagers, particular ethnic or racial groups, and physically challenged athletes. Further research utilizing the Exercise Addiction Inventory (Terry et al., 2004), along with a reliable eating disorder measure, should examine body image issues and potential eating disorders to discern possible comorbidity with exercise addiction.

Research that utilizes the current study’s questionnaire, along with a standardized clinical interview, may generate an even clearer understanding of the attitudes and behaviors of triathletes with regards to exercise. Moreover, it would confirm or refute the effectiveness of the questionnaire as a screening tool for triathletes and demonstrate the instrument’s use in a clinical setting.

When studying addiction it is important to understand the social environment in which the identified addict exists. Therefore, future research on exercise addiction among triathletes should include varying methods of gathering information that might corroborate or contest self-report responses. For example, spouses, co-workers, friends, and family members should also fill out questionnaires and be interviewed to produce a more comprehensive picture of the triathlete’s exercise experience.

**Conclusion**

Only one previous study investigated exercise addiction within a population of triathletes. Given the results of the current study, some triathletes may be at higher risk for exercise addiction than the general exercising population. However, the majority of triathletes seem to be committed exercisers who are able to balance the demands of their
training within the context of their lives. Future research should be aimed at better identifying and treating those triathletes who are at risk for exercise addiction, while also studying the resilience of those who are not.
REFERENCES


**APPENDIX A**

**EXERCISE ADDICTION INVENTORY**  
(Terry et al., 2004)

Instructions: Please answer each of the following items by marking one choice for each numbered statement. There are no “right” or “wrong” answers, so choose the most accurate response for you. Please answer each question carefully. Thank you.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree ▼</th>
<th>Disagree ▼</th>
<th>Neither Agree nor Disagree ▼</th>
<th>Agree ▼</th>
<th>Strongly Agree ▼</th>
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<tbody>
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<td>1</td>
<td></td>
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<td></td>
<td>Exercise is the most important thing in my life.</td>
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<td>Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do.</td>
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<td>3</td>
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<td></td>
<td>I use exercise as a way of changing my mood (e.g. to get a buzz, to escape, etc.).</td>
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<td>Over time I have increased the amount of exercise I do in a day.</td>
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<td>If I have to miss an exercise session I feel moody and irritable.</td>
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<td>6</td>
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<td></td>
<td>If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before.</td>
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**APPENDIX B**

**QUESTIONNAIRE**

**Section 1:**

**Instructions:** Please answer each of the following items by marking one choice for each numbered statement. There are no “right” or “wrong” answers, so choose the most accurate response for you. Please answer each question carefully. Thank you.

<table>
<thead>
<tr>
<th>Exercise is the most important thing in my life.</th>
<th>Strongly Disagree ▼</th>
<th>Disagree ▼</th>
<th>Neither Agree nor Disagree ▼</th>
<th>Agree ▼</th>
<th>Strongly Agree ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do.</td>
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<tr>
<td>I use exercise as a way of changing my mood (e.g. to get a buzz, to escape, etc.).</td>
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<tr>
<td>Over time I have increased the amount of exercise I do in a day.</td>
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<tr>
<td>If I have to miss an exercise session I feel moody and irritable.</td>
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<td>Conflicts have arisen between my friends and me due to the amount of exercise I do.</td>
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<td>Conflicts have arisen between me and my boss or co-workers due to the amount of exercise I do.</td>
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<tr>
<td>Over time I have had to increase the amount of exercise I do in order to experience the same feelings of escapism or natural ‘high’ that I previously had experienced from shorter periods of exercise.</td>
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<td>I am not concerned with losing weight.</td>
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<tr>
<td>I am trying to lose weight in order to improve my athletic performance.</td>
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<tr>
<td>I am trying to lose weight because I have a fear of being fat.</td>
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</table>
Section 2

1. Gender:
   [ ] Male
   [ ] Female

2. Height: _______ feet _______ inches

3. Current Weight: _____________ lbs.

4. Race/Ethnicity:
   [ ] African American
   [ ] Caucasian
   [ ] Caribbean
   [ ] Hispanic
   [ ] Asian
   [ ] Native American
   [ ] Middle Easterner
   [ ] Other (please specify)_____________________

5. Where Do You Live:
   [ ] United States
   [ ] Other (please specify)_____________________

6. Relationship Status:
   [ ] Married
   [ ] Widowed
   [ ] Single
   [ ] Have significant other
   [ ] Divorced/Separated

7. Educational History:
   [ ] Less than high school
   [ ] Graduated from high school or GED
   [ ] Trade/technical training
   [ ] Some college
   [ ] Associate’s degree
   [ ] Bachelor’s degree
   [ ] Master’s degree
   [ ] Doctorate

8. Occupational Status:
   [ ] Employed
   [ ] Self-employed
   [ ] Unemployed
   [ ] Student
   [ ] Homemaker
   [ ] Retired

9. Annual Household Income:
   [ ] $50,000 or less
   [ ] Between $51,000-$60,000
   [ ] Between $61,000-$70,000
   [ ] Between $71,000-$80,000
   [ ] Between $81,000-$90,000
   [ ] Between $91,000-$100,000
   [ ] More than $100,000
10. **Competitor Status:**

- Professional triathlete
- Competitive Age-grouper (regularly wins or places in top 25% of age-group)
- Middle-of-the-pack Age-grouper (regularly finishes roughly in the middle of age-group)
- Recreational/casual Age-grouper (content to just finish the race)

11. **How many years (including this year) have you been competing in triathlons?** __________ year(s)

12. **How many Sprint-distance triathlons have you ever competed in?** __________

13. **How many Olympic-distance triathlons have you ever competed in?** __________

14. **How many Ironman-distance triathlons have you ever competed in?** __________

15. **What is the longest triathlon you have completed during the past two years?**

- Sprint-distance
- Olympic-distance
- Ironman-distance
- Other (please specify) ______________________

16. **What is the longest triathlon for which you are training this year (Jan. 2007- Dec. 2007)?**

- Sprint-distance
- Olympic-distance
- Ironman-distance
- Other (please specify) ______________________

17. **I am not training this year**

18. **How many days per week do you train for triathlon?** __________ days/week

19. **How many separate training sessions per week do you do (e.g., a run in morning, swim at night = 2 sessions)?** __________ sessions/week

20. **Would you like to change the number of hours you train per week?**

- I would like to train for fewer hours
- I would like to train for more hours
- I would like to train for the same number of hours as I currently do (no change)

21. **When is the next triathlon in which you will be competing?**

- 1-3 weeks from today
- 1-2 months from today
- More than 2 months from today