The Learning Pathways of Ironman Triathletes: Case Studies of Age-Group Ironman Triathletes

by

Ari Zelmanow

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ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

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Beth Kania-Gosche	8-15-14
Dr. Beth Kania-Gosche, Dissertation Chair	Date
	8/15/14
Dr. Annie Alameda, Committee Member	Date
Cynthia Schroeder	8/15/14
Dr. Cynthia Schroeder, Committee Member	Date

Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

Full Legal Name: Ari Ben Zelmanow

Signature:  Date: 8/15/14

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Abstract

The Ironman Triathlon is an epic endurance event consisting of a 2.4-mile swim, a 112-mile bike ride, and a 26.2-mile run. There is paucity in the literature relating to how athletes learn how to negotiate this event. This qualitative study was conducted over a 9 month period, to align with the 2013 Ironman training and racing season. Seven athletes were selected for participation in the study. Utilizing a case study approach, the Ironman athletes' learning pathways were examined through in-depth interviews and audio and video content personally captured by the participants.

The learning pathways revealed the athletes initially learned through cognitive means, i.e. social interaction, reading, Internet sources, and the observation of others. As athletes traversed the learning pathway, they subsequently operationalized the knowledge they learned and constructively made it meaningful to their respective personal training and racing situations. At the terminal end of the learning pathway, the athletes operationalized the learned content in an experiential learning cycle. During the entire learning pathway, the athletes practiced the learned content, which is best characterized as behavioral learning. The audio and video content provided by the athletes empirically validated the interviews.

The interviews with the athletes were coded. Some unifying themes emerged from the data independent of cognitive, constructivist, behavioral, or experiential learning theories; e.g. the importance of mental toughness, the understanding of pain during the training and racing process, how success is measured, the importance of training with a power meter, and motivating factors.

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Chapter One: Introduction

Triathlon is an inherently challenging sport consisting of three distinct disciplines – specifically swimming, cycling and running – performed in succession and "separated by transition periods of only a few seconds" (Peeling & Landers, 2009, p. 1079). It is a relatively new athletic endeavor, tracing its roots to southern California in 1974 (USA Triathlon, 2014a). Since that time, the popularity of the sport has skyrocketed. According to USA Triathlon, the governing body for the sport in the United States, "participation in [triathlon in] the United States is at an all-time high, following unprecedented growth over the past decade" (USA Triathlon, 2014b).

To successfully negotiate a triathlon, an athlete must be proficient in each discipline. To be competitive in a triathlon, an athlete must have advanced competency in more than one discipline. This becomes even more important as the triathlon distance increases. Triathlon boasts several 'standard' distances with varying levels of participation at each distance.

Table 1.

Triathlon Distances

	Distance (Metric)			Distance (Imperial)		
Race	Swim	Bike	Run	Swim	Bike	Run
Sprint	500 m	19 km	5 km	546 yd	12 mi	3.1 mi
Olympic	1.5 km	40 km	10 km	1640 yd	24 mi	6.2 mi
Half Ironman	1.9 km	90 km	21 km	1.2 mi	56 mi	13.1 mi
Ironman	3.8 km	180 km	42 km	2.4 mi	112 mi	26.2 mi

Adapted from USA Triathlon, 2013c.

Table 1 summarizes the traditional triathlon race distances with the Sprint distance being shortest, both temporally and by distance, and the Ironman distance being

the longest; with a 2.4-mile swim, a one hundred and twelve mile bike race, and a 26.2-mile run.

The numbers of athletes who participate in the various triathlon distances decrease as the distance increases. Participation in endurance triathlons typically "involves a substantial amount of physical and psychological stress over several hours of continuous activity" (Atkinson, 2008, p. 165).

Table 2 describes the triathlon participation by distance; as the distance increases, the percentage of participants decreases.

Table 2.

Triathlon Participation by Distance

Race	Percentage of Participation
Sprint	78%
Olympic	58%
Half Ironman	39%
Ironman	17%

Adapted from Tribe Group, LLC, 2009.

The Ironman Triathlon, which can take competitors up to 17 hours to complete, is a test of physical and mental limits. Completion requires incredible physical fitness, strong mental tenacity, and meticulous preparation and planning. With "the rise in worldwide popularity of long distance triathlon racing comes with it an increased interest into how to train and prepare optimally for such an event" (Laursen, 2011, p. 248). The information learned from this study could be of interest to athletes, coaches, athletic directors, and any other individuals or groups interested in the athletic learning process (Thomas, French, & Humphries, 1986, p. 260).

Definition of Terms

Age-group athlete: An amateur athlete (18 years of age and older) who competes within a specific age division and is not eligible to win prize money under the USA Triathlon Competitive Rules (Competitive Rules, 2011).

Computrainer: A bicycle and computer interface that "provides the simultaneous measurement and display of watts, speed, distance, time, cadence, and heart rate", and allows the rider/user the ability to adapt a training workout based upon these metrics (Schniepp, Campbell, Powell, & Pincivero, 2002, p 561).

Drafting: "Swimming, biking, or running behind others in order to reduce effort" (Friel, 2009, p. 362). Drafting during the swim is permissible in the Ironman Triathlon. Drafting during the cycling portion of an Ironman is not permissible (World Triathlon Corporation, 2014).

FTP or FTP Test: Functional Threshold Power (FTP) is "the highest power that a rider can maintain in a quasi-steady state without fatiguing for approximately one hour. When power exceeds FTP, fatigue will occur much sooner, whereas power just below FTP can be maintained considerably longer" (Allen & Coggan, 2010, Location 6383).

Learning: Learning is defined as "an enduring change in behavior, or in capacity to behave in a given fashion, which results from practice or other forms of experience" (Schunk, 2012, p. 3). Essentially, it is the manner in which information is absorbed, processed, and retained. "Learning leads to changes in behavior and any analysis of the learning process must give attention to the types of behavior involved and of kinds of changes desired" (Leonhard & House, 1972, p. 132).

Periodization: Periodization is the principle of employing training principles in a methodical fashion toward a specific race or set of races. Essentially, it is "the art of varying the training session, its intensity, its duration, how often it's performed, and how much rest and recovery is performed in between" (Lambert, et al., 2008, as cited in Laursen, 2011, p. 253). By breaking structure training into "periods", this principle is premised upon the concept that "the closer in time you [an athlete] get to the race, the more like the race your [the athletes'] workouts become" (Friel, 2009; Friel, 2010, p. 39). "Periodization is a widely accepted training approach . . . used by nearly every successful athlete in the world, regardless of sport" (Friel, 2010, p. 37).

Power: "The rate of doing work, where work is equal to force times distance" (Allen & Coggan, 2010, Location 6431). On a bike, power is measured in watts.

Power meter: A power meter is a complex electronic device that affixes to a bicycle that measures effort through both a cardiovascular viewpoint (heart rate) and muscular viewpoint (watts). These measurements are conducted through a sensor attached to the athlete (heart rate) and measurements in the cadence and force of pedaling (bicycle). "Simply put, the power meter allows you to quantitatively track your fitness changes, more easily define your weaknesses, and then refocus your training based upon those weak areas" (Allen & Coggan, 2010, Location 340). Power meters are widely recognized as one of the most important training tools available to triathletes; "The power meter is a powerful tool for training, one that can potentially make you fitter and faster than any other piece of equipment you could get for your bike" (Friel, 2012, Location 89).

Ironman Triathlon: For purposes of this study, an endurance event consisting of a 2.4-mile open water swim, a 112-mile bicycle ride, and a 26.2-mile run, that must be completed within a seventeen-hour time period (Diranian, 2011; Friel & Byrn, 2009; Fink, 2010, Location 81; Holland, 2011, Location 214).

Taper: A reduction in training volume immediately preceding a racing competition (Friel, 2009). For example, an athlete will continue to build mileage or time, adding every week until approximately three weeks prior to a race. At this time, the athlete will start decreasing the mileage or time to allow the body to recover from training and rest.

Transition: Transition areas are the periods between disciplines during a race. There is the swim to bike transition and the bike to run transition. In the transition area, an athlete will don and doff equipment, clothing, and supplies (Friel, 2009). The time spent in transition counts toward the overall race time.

Purpose of the Dissertation

This qualitative research study explored the learning progressions of age group triathletes as they negotiated the Ironman Triathlon training and racing process. The study used semi-structured and open-ended interviews accompanied by audio and video footage captured by Ironman triathletes to chart this progression during an Ironman racing season. The study commenced in January of 2013. This aligned with the beginning of the training period for the 2013 triathlon-racing season, which began in the early spring. The study ended in October of 2013, which aligned with the Ironman Triathlon World Championships in Kona, Hawaii. The Ironman Triathlon World Championships effectively concluded the 2013 racing season; races which occurred after

the World Championships in 2013 were potential 'qualifiers' for the 2014 Ironman World Championships.

This study built upon the current body of learning research and applied it to the realm of endurance training and racing, specifically the Ironman Triathlon. Further, it explored the role and importance of experiential learning in the Ironman training and racing process. Ironman triathletes must not only learn proficiency in the mechanics of the individual sport disciplines, specifically swimming, cycling and running; they must also learn how to negotiate the transitional time between the disciplines, nutritional needs, what equipment to use, and how to deal with the myriad of issues that could potentially arise throughout a long day of arduous physical activity. "[Learning progressions] are a useful tool for describing the steps in people's learning regarding an idea in a specific context" (Salinas, 2009, p. 1).

"The training and competition schedules of athletes provide a vast opportunity for gaining experience, yet little emphasis is commonly placed on helping athletes to understand frameworks that facilitate learning from such experiences" (Faull & Cropley, 2009, p. 326). The length of time that Ironman athletes commit to training and racing presents some unique academic opportunities. As an athletic endeavor, Ironman triathletes spend an abundance of time in preparation for a race. This length of time provides ample opportunity to explore the myriad of training issues and methods. This study could assist athletes, athletic directors, coaches, teachers, and others in the position to develop athletes and athletic performance in further understanding the athletic learning process (Thomas, et al., 1986, p. 260).

> As the sport increases in popularity for professional athletes, competitive age-group athletes, and fitness enthusiasts, it is important to know how these individuals prepare for their races. Knowledge and understanding of training regimes can assist exercise science professionals who work with this group. (Dolan, Houston, & Martin, 2011, p. 1020)

Through enhanced understanding of how athletes analyze and synthesize information and experiences, it is plausible to modify future athletic performance and decision-making. For example, if a coach is able to create a situation in training that is likely to occur in a racing situation, the athlete could emulate that experience and knowledge to tackle that problem when it occurs.

Rationale

There was paucity in the literature related to how athletes learn how to train for, and negotiate, an endurance triathlon (Allard & Burnett, 1985, p. 294). Noticeably absent from the current body of research were studies demonstrating how athletes learn to successfully negotiate a specific athletic endeavor, or what methodology was utilized to learn and evaluate successes and failures (Thomas, et al., 1986, p. 260; Higgins, 1991, p.123; Williams & Hodges, 2005, p. 637). In fact, "few recent investigations . . . have addressed the issues of preferred learning styles in sports-related disciplines such as sports studies, sports and exercise science, coaching science, sport and leisure management and outdoor recreation management" (Peters, Jones, & Peters, 2008, 157). In essence, there was limited data studying athletic learning in complex endurance sports (González-Haro, Calleja-González, & Escanero, 2010; Allard & Burnett, 1985, p. 294).

It may be logically inferred that most triathletes begin the sport with a basic knowledge of swimming, cycling, and running. However, the literature failed to reveal how they initially learned these disciplines. Further, the literature failed to reveal how they learned to develop the individual disciplines, or as triathletes, once these disciplines have been combined. "The limited research on triathletes has tended to focus on physical training habits and equipment. For example, weekly and yearly training distances and hours and frequency spent training in each discipline have been examined, as well as pacing strategies" (Dolan, et al., 2011, p. 1019; Baker, Deakin, & Côté, 2005; Gulbin & Gaffney, 1999; O'Toole, 1989). Much of the remaining available research was focused on physiological characteristics and changes during, or after the event (Allard & Burnett, 1985, p. 294). At the time of this writing, there was a limited body of Ironman Triathlon research, none of which focused on learning pathways or learning methodology utilized by Ironman triathletes.

Research Questions

The research presented in this study investigated the learning pathways of Ironman triathletes, including the importance of experiential learning in the Ironman training and racing learning process. The research questions were as follows:

- How does an athlete learn how to successfully negotiate all aspects of an ultra-endurance event, specifically the Ironman Triathlon?
- How does experiential learning enhance understanding of endurance triathlon?

Limitations and Delimitations

There are several limitations to this study. Of interest is the concept of interviewer bias, specifically injecting the researcher's preconceptions into the study

thereby involving excessive subjectivity (Maxwell, 2005, p 108). In a case study, "the researcher has more freedom and, other things being equal, is less controllable than in a quantitative research, and methods that are used may be easily linked to the personality of the researcher" (Verschuren, 2003, p. 133). However, awareness of the potential for bias, and conscious attempts at reducing the influence, are the key task in addressing this threat (Maxwell, 2005, p. 108). These attempts of reducing bias were conducted by consciously not injecting personal opinions and beliefs as interviews were conducted. The researcher made a conscious effort not to opine or provide training guidance or advice.

Interview bias in this study is inextricably linked to the concept of reactivity; "the fact that the researcher is part of the world he or she studies – is a powerful and inescapable influence; what the informant says is always influenced by the interviewer and interview situation" (Maxwell, 2005, p. 134). The researcher in this study was an Ironman triathlete and, "with this background, the interviewer had knowledge about the demands of the sport, subculture and terminology used, which made it easier to gain entry, build rapport, and see the situation from the viewpoint of the respondent" (Gustafsson, et al., 2007, p.392; Eklund, 1993).

Sample size presents another potential limitation. The sample size for this study was limited to ten participants due to the use of extensive interviewing, an in-depth evaluation of digital video and audio obtained by the participants over approximately ten months, and the small sample pool of Ironman triathletes from which to draw. It is a fact; fewer than one out of six triathletes attempt the Ironman distance triathlon (Tribe Group, LLC, 2009). Further, Maxwell (2005) purported that intensive, long-term involvement, the accumulation of 'rich' data, and triangulation are all methods for addressing validity

threats, particularly small sample sizes. According to Miles and Huberman (1994), qualitative research was most robust when it had local groundedness, defined as "data collected in close proximity to a specific situation" (p. 10), had richness and holism, defined as "'thick descriptions' that are vivid, nested in a real context, and has a ring of truth that has a strong impact on the reader" (p. 10), and was collected over a sustained period of time. This study was conducted over a prolonged period of time, lasting approximately ten months, with in-depth interviews conducted every few weeks. Further, 'rich data' and triangulation were addressed through use of audio/visual methods other than the interviews.

The case study methodology could be considered a limitation; "The most frequently heard objection to case study, however, is its low generalizability as a consequence of the fact that only one or two cases are studied" (Verschuren, 2003, p. 122). However, the qualitative case study methodology does not seek to generalize to entire populations, rather the "generalization of case study findings is limited to the case itself or types of cases" (Zucker, 2009, p. 10).

A potential limitation to this study was the heavy use of reference citations older than five years. This is likely the result of several factors. First, there was a limited body of Ironman research, with much written in the 1980s. This increase in interest may have been the result of the dramatic televised appearance of Ironman finisher Julie Moss, as she crawled across the Ironman finish line. Second, the educational theoretical foundations utilized in this study were developed decades prior to this writing and, within the scope of this research, have not been verified as used to investigate endurance sports.

Summary

The sport of triathlon is a relatively new endeavor. Despite its short history, the popularity of the sport was significantly increasing every year. This popularity lends itself to an interest in learning to negotiate all distances of the race. However, there is something almost magical about the Ironman distance. The motivating factors are plentiful, and include the pursuit of one of the most difficult physical challenges to be completed within a 24 hour period, conquering fears, conquering a physical malady, personal satisfaction, and countless other reasons (Steinberg, 2011). Regardless of the motivation, it is an incontrovertible fact; the Ironman Triathlon is an epic undertaking.

There was limited information available demonstrating how people learn to negotiate ultra-endurance events, specifically the Ironman Triathlon. Understanding how athletes learn how to negotiate the process is a worthwhile endeavor for a number of reasons. There was an obesity epidemic in the United States, which was linked to cardiovascular disease, diabetes, and other potentially preventable medical ailments. Physical fitness was a widely accepted method to address obesity and the associated ailments. Endurance training and racing provide a goal-oriented approach to physical fitness.

The costs of attempting an Ironman are great. Athletes register for races up to a year in advance, with some races selling out in seconds. The registration cost for an Ironman race was approximately $650. In addition, there are equipment, travel, nutritional items, and other associated costs. Finally, there is the opportunity costs associated with a training regimen that can have athletes training more than 20 hours a week. To maximize the benefits from the costs, learning how to successfully complete

the Ironman training and racing process is imperative. Developing an understanding of the learning process can potentially help future athletes attempt and complete the Ironman Triathlon.

Chapter Two: The Literature Review

In this study, the researcher qualitatively explored the Ironman training and racing process through an examination of the learning pathways of age-group triathletes as they negotiated the Ironman training and racing season. There was extremely limited information investigating how athletes learn to prepare for this event. This literature review presents four content areas of interest. The first area defines learning progressions and provides a rationale for their use as a framework in this study. The second area identifies and defines the key learning theories utilized to describe how athletic learning was accomplished in this study. The third area is an overview and rationale for the use of the qualitative research methodology and case study research. The fourth and culminating area of this literature review will introduce the author as an endurance athlete and Ironman participant and present an overview of issues central to the Ironman Triathlon including an examination of the training and competition modalities that are commonly utilized.

Learning Progressions

Learning occurs at different rates for different people. Despite the different rates of learning, it "leads to changes in behavior and any analysis of the learning process must give attention to the types of behavior involved and of kinds of changes desired" (as cited in Ugoo-Okonkwo, 2013, p. 311). Mastering techniques and information takes time and repetition. This time and repetition can be described as a progression, where "learning is not viewed as a series of discrete events, but rather as a trajectory of development that connects knowledge, concepts and skills within a domain" (Heritage, 2008, p. 4).

There are a myriad of definitions used to describe learning progressions. Fundamentally, "Learning progressions are descriptions of increasingly sophisticated ways of thinking about or understanding a topic . . ." (Duschl, Schweingruber, & Shouse, 2007, p. 214). Wilson and Bertenthal (2005) defined learning progressions as "words and examples what it means to move over time toward more expert understanding" (p. 3). Masters and Forster (1997) defined learning progressions as sequential maps that delineate progress through "a description of skills understanding and knowledge in the sequence in which they typically develop: a picture of what it means to 'improve' in an area of learning" (p.1). Stevens, Shin, Delgado, Krajcik, and Pellegrino (2002) asserted, "Learning progressions describe how students gain more expertise within a discipline over a period of time" (p. 2). Corcoran, Mosher, and Rogat (2009) defined learning progressions as "hypothesized descriptions of the successively more sophisticated ways student thinking about an important domain of knowledge or practice develops as children learn about and investigate that domain over an appropriate span of time" (p. 37). Popham (2007) described learning progressions as a "carefully sequenced set of building blocks that students must master en route to a more distant curricular aim" (p. 83).

Inherent to all definitions is that "learning is envisioned as a development of progressive sophistication in understanding and skills within a domain" (Heritage, 2008, p. 3). Implicit to the concept of the learning progression is that skills and learning increase over some period of time. Further, the student guides the learning process. The Ironman Triathlon is an inherently complicated event. There are a myriad of factors that

contribute to the success and failure of any given athlete. Learning progressions provide a framework through which to examine the learning process.

Nichols stated there are several key components innate to learning progressions. First, learning progressions are not inevitable; rather they are dependent upon development and instruction. Second, there are multiple pathways to understanding and competence. The individual learning pathway can be influenced by a myriad of factors; including prior instruction, experience, and current learning methods. Further, the path followed can be dependent upon empirical knowledge and experience, quality and type of instruction, and the nature of the current learning task. Third, learning need not occur on a linear pathway; rather, it can occur in 'ecological succession', with skill development and knowledge gains occurring in simultaneous and interconnected ways (Nichols, 2010).

According to Mosher (2011):

> Generally, empirical work on progressions starts with a societally defined learning goal – such as understanding counting, or operations with numbers, or the particle, or the atomic-molecular, models of matter, carbon/energy cycles, or genetics and evolution—and then, rather than simply "back-mapping" logically to necessary prior knowledge, it tries to identify the precursor ideas about these domains that children are likely to bring with them to school. (p. 3)

In the realm of endurance triathlon the learning domains are primarily swimming, cycling, running, fluid and caloric intake, and the transition times between the disciplines. There is no universal, correct pathway.

> Which pathway is taken may be influenced by prior instructional experiences, individual differences, and current instruction. The pathways that individual

> students follow depend on many things, including the knowledge and experience that they bring to the task, the quality of the instruction that supports their learning, and the nature of the specific tasks that are part of the experience (Nichols, 2010, p. 2).

In the Ironman training and racing paradigm, the pathway traversed will be influenced by prior training and racing experience, their personal understandings and beliefs about the Ironman Triathlon, how they have previously learned, and how that learned information has been personally operationalized.

According to Hess (2008), there are four guiding principles of learning progressions:

1. Learning progressions are developed and refined utilizing available research and evidence. This research can be in the form of action research, utilizing both formative and summative assessments;
2. Learning progressions have clear binding threads that articulate the essential core concepts and processes of a discipline. In fact, "Learning progressions should be developed around the big ideas of a domain" (Nichols, 2010, p. 1);
3. Learning progressions articulate movement toward increased understanding;
4. Learning progressions best function with well-designed and aligned assessments (Hess, p. 2).

For learning progressions to be meaningful there must be some form of formative assessment. According to Black, Wilson and Yao (2011), "an assessment activity is

formative if it can help learning by providing information to be used as feedback . . . in assessing themselves . . . to modify the teaching and learning activities in which they are engaged" (p. 74). Formative assessment is simply an ongoing evaluation of a student's, or in this study, an athletes, knowledge and skill development within a particular subject area, i.e. swimming, biking, running, and nutritional considerations.

According to Heritage (2008), formative assessment has several key elements. First, the evaluation should investigate how to close the gap between current performance and desired performance. Second, there should be some sort of feedback offered to the student. Third, students should be involved in the assessment and learning process (p. 5).

There is a lack of research linking learning progressions to triathlon and endurance sport. Despite this fact, learning progressions are playing an increasingly important role in science and mathematics education (Battista, 2011; NRC, 2007; Smith, Wiser, Anderson, & Krajcik, 2006; Salinas, 2009; Stevens, et al., 2002). The obvious parallels between exercise science and science and math education are that the disciplines have scientific underpinnings. It can be logically inferred that learning progressions can be effective tool in endurance triathlon.

Learning in Sport and Learning Theories

Historically, learning to perform a skill in a sport has been associated with "the ability to produce a consistent motor pattern" (Allard & Burnett, 1985, p. 295). This is accomplished through the training process in sport. The athlete is hoping to attain a system where they are "progressively developing a system of principles to constrain the body so that it may ultimately act as a single, harmonious unit, organized with reference to a specific problem" (Higgins, 1991, p. 135).

Learning is a process demanding insight into the task and selective attention to the pertinent sources of information within the self and within the environment that will influence the behavior (Higgins, 1991, p. 136). The learning process essentially begins with discovery, moves toward mastery, and ultimately arrives at generalization. Learning does not necessarily end at technical mastery; continued learning refines and improves existing knowledge. Toward that end, athletes use different learning styles to accomplish their athletic goals. Learning theories "are elaborate and proven hypothesis that describe exactly how this procedure occurs" (Ugoo-Okonkwo, 2013, p. 311).

Behaviorist theory. Behaviorist theory was established based upon the tenets of the theory of connectionism, as presented by prominent United States psychologist Edward Thorndike (1874-1949). The theory of connectionism "postulated that the most fundamental type of learning involves the forming of associations between sensory experiences (perceptions of stimuli or events) and neural impulses (responses) that manifest themselves behaviorally" (Schunk, 2012, p. 73). Essentially, "learning was incremental and that people learned through a trial and error approach" (Ugoo-Okonkwo, 2013, p. 312). Thorndike (1913) predicated his theory upon a central element, the Laws of Effect:

> When a modifiable connection between a situation and a response is made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased: When made and accompanied or followed by an annoying state of affairs, its strength is decreased. (p. 4)

Thorndike originally believed that rewards and punishments were opposite, but equal. Research has demonstrated that this is not the case (Schunk, 2012, p. 76). Rewards did strengthen connections; however, punishment did not necessarily weaken connections.

Fundamentally, the behaviorist theory "views learning as a change in the form or frequency of behavior as a consequence of environmental events" (Schunk, 2012, p. 489). Behaviorist theory is predicated on three key assumptions: First, observable behavior supersedes internal processes when evaluating a behavioral change; second, the environment shapes behavior; and third, "The principles of contiguity (how close in time two events must be for a bond to be formed) and reinforcement (any means of increasing the likelihood that an event will be repeated) are central to explaining the learning process" (Merriam & Caffarella, 1999, p. 126). In essence, learning occurs when some positive or negative stimulus elicits a specific response. According to Ertmer and Newby (1993), "the most critical is the arrangements of stimuli and consequences within the environment" (p. 55).

Modern behaviorism is generally separated into two distinct categories, classic and operant conditioning. Classical conditioning forms an association between two stimuli, generally a naturally occurring stimulus and an environmental stimulus. The most widely recognized example of classical conditioning is the result of experiments conducted by Ivan Pavlov (1849-1936), where he studied the saliva production of dogs in conjunction with food and a paired a sound. In essence, he correlated a dog's saliva production with an external stimulus. In his experiments, he sounded a tone in conjunction with a feeding time. He subsequently removed the tone. He found that the

dogs salivated to the tone sans food. He made a connection between the food, the tone, and saliva response (Schunk, 2012).

B.F. Skinner (1904-1990), arguably the father of modern behaviorism, and widely recognized as the father of operant conditioning, built upon Thorndike's (1913) model with a model predicated on a rewards and punishment system. This model is facilitated through a system of stimuli and reinforcement. He espoused that a stimuli could either elicit a behavior to be repeated (positive reinforcement), a behavior to be stopped (negative reinforcement), or have no effect on a behavior (neutral). In one of his experiments, he placed a hungry rat in a small box with a lever inside, that when activated, released food. The rats learned, through positive reinforcement, to activate the lever. In contrast, Skinner (1938) performed another experiment by introducing the rat into the box with a discomfort causing mild electric current. As the rat moved around the box, it tripped the lever, causing the current to stop. The rat learned, through negative reinforcement, to activate the lever thereby stopping the negative stimulus (Schunk, 2012).

Operant conditioning is predicated on the concept of conditioning, which is "the strengthening of behavior which results from reinforcement" (Skinner, 1953, p. 65). This results from the introduction of an operant, "If the occurrence of an operant is followed by presentation of a reinforcing stimulus, the strength is increased . . . If the occurrence of an operant already strengthened through conditioning is not followed by the reinforcing stimulus, the strength is decreased" (Skinner, 1938 p. 21). He argued that learning was not the result of mental constructs; rather, mental connections are formulated through responses to stimuli.

Behaviorism "has proved useful for the development of some types of skills – especially those that can be learned substantially by rote through reinforcement and practice" (Hammond, Austin, Orcutt, & Rosso, 2001, p. 6). Behavior can be changed by finding the "cues that initiate the action and to practice another response to these cues" (Guthrie, 1952, p. 115). In essence, this is how habits are created.

It should we noted that "operant conditioning fails to take into account the role of inherited and cognitive factors in learning, and thus is an incomplete explanation of the learning process in humans and animals" (Mcleod, 2007). Despite this fact, "behavioral principles can be used to facilitate student learning and achievement" (Schunk, 2012, p. 115). In essence, behavioral principles can explain athletic learning through repetition or positive or negative reinforcement.

Social Cognitive theory. The cognitive theory "views learning as the acquisition of knowledge and cognitive structures due to information processing" (Schunk, 2012, p. 490). Learning incorporates internal processes that involve the use of memory, motivation, thinking, and reflection. In essence, "Learning results from inferences, expectations, and making connections" (Hartley, 1998, p. 18). The acquisition of knowledge occurs when an individual absorbs information through listening, watching, touching, reading or experiencing some situation or content and subsequently processes and remembers the information. Learning is contingent upon an individual's self-efficacy, which is essentially the belief that they can learn or perform a specific task or learning objective at a specific level. Whereas the behaviorist theory stresses the role of the environment and reinforcement, cognitive theories "emphasize the role of learners' thoughts, beliefs, attitudes, and values" (Schunk, 2012, p. 22).

The social learning theory, "stresses the idea that much human learning occurs in a social environment" (Schunk, 2012, p. 118). Bandura (1986), a seminal leader of the cognitive social learning theory, purported that people learn from one another through a variety of methods including observation, imitation, and modeling. Bandura conducted an investigation known as the 'Bobo doll' experiment, where children were shown both positive and passive behavior utilizing dolls. The experiment revealed this observation influenced the manner in which the children subsequently interacted with the dolls. The children who observed violent behavior behaved violently toward the dolls; and the children who observed passive behavior behaved passively toward the dolls. This experiment provided "strong evidence that observation of cues produced by the behavior of others is one effective means of eliciting certain forms of responses" (Bandura, Ross, & Ross, 1961, p. 580). Bandura distinguished three primary functions of modeling: response facilitation, inhibition or disinhibition, and observational learning. Response facilitation consists of the social inducements that elicit others to model the actions. Inhibition or disinhibitions are the expectations from those observing a behavior that they will experience a similar response if they perform the specific action. Observational learning is simply a new pattern of behavior predicated upon modeled behavior.

In the social cognitive theory, "Learning is largely an information processing activity in which information about the structure of behavior and about environmental events is transformed into symbolic representations that serve as guides for action" (Bandura, p. 51). Learning occurs either through performing a behavior (enactive) or through observation of others in performance of the behavior (vicarious) (Schunk, 2012, p. 121). Enactive learning includes learning from the consequences of actions. Good

consequences cause an individual to retain a behavior where negative consequences cause an individual to discard a behavior. Behavioral theorists would argue these consequences act as reinforcement for the behavior. Social cognitive theorists would counter that the consequences "serve as sources of information and motivation" (Schunk, 2012, p. 121).

Bandura (1986) viewed the interaction of human behavior within a framework of three factors, specifically, the personal characteristics, behavior, and the environment. He termed this framework triadic reciprocality (Schunk, 2012, p. 120).

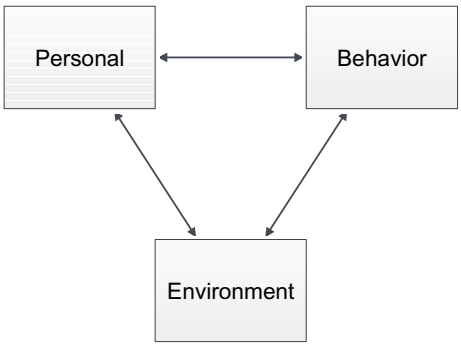

Figure 1. Triadic reciprocality model of causality (Bandura, 1986; Zimmerman, 1989, p. 330).

This model (Figure 1) is demonstrative of the interactive, non-linear relationship involving the complex interactions between the external environment, individual personality, temperament and thoughts, and behavior. Each of these components has an impact on the other. For example, an individual is not simply a product of their environment; rather, the individual impacts and shapes their environment. An individual's behavior directly impacts how others behave and respond to the behavior. This feedback impacts personal behavior and thoughts and beliefs on future behavior.

Consider the example of environmental influences on cognition, i.e. a personal factor. In this example, a coach presents a lesson to an athlete. The athlete absorbs and reflects on the coaches' presentation. Now consider that the athlete might not understand the instruction and asks the coach a question. This is an example of cognition influencing behavior. Finally, the coach answers the athlete's question. This is an example of behavior influencing the environment. The athlete understands the task and goals and continues to work on accomplishing the goals established by the coach with high self-efficacy. This is an example of behavior influencing cognition. The athlete enjoys the continued success and requests to continue working on the task. The coach allows the athlete to continue. This is an example of cognition influencing behavior, which subsequently influences environment. In essence, personal factors, behavior, and environment are interrelated. However, they might not be of equal strength.

The success of the cognitive social learning theory is predicated upon the processing capacity of the learner, the effort expended by the learner during the learning process, and the depth of the processing (Craik & Lockhart, 1972; Craik & Tulving, 1975). "Learning complex skills typically occurs through a combination of observation and performance" (Schunk, 2012, p. 212). In essence, a triathlete would learn by watching other triathletes perform a specific task and subsequently mimic the task.

Constructivist theory. The constructivist theory is premised upon the concept that the learner constructs his or her own knowledge based upon personal experience (Schunk, 2012, p. 491; Piaget, 1929; Dewey, 1938; Light & Wallian, 2008). In essence, "Constructivist perspectives on learning emphasize learning through processes in which learners wrestle with problems, propose solutions, experiment, and carry through ideas"

(Light & Wallian, p. 390). Knowledge and understanding "is not imposed from outside people but rather formed inside them" (Schunk, 2012, p. 274).

The constructivist theory is essentially a branch of cognitive theory; however, it distinguishes itself in a number of ways. "Learners do not transfer knowledge from the external world into their memories; rather they build personal interpretations of the world based on individual experiences and interactions. Thus the internal representation of knowledge is constantly open to change" (Ertmer & Newby, 1993, p. 62). Jean Piaget (1896-1980), a seminal cognitive theorist, purported that learning is a developmental cognitive process, and that students create knowledge rather than receive knowledge from some external source. Russian scientist Vygotsky (1896-1934) further developed Piaget's (1929) theory by introducing the impact of cultural context and social interactions (Ugoo-Okonkwo, 2013, p. 312).

Light and Wallian (2008) conducted a study examining a constructivist-based approach to teaching swimming in both a pool and open-water environment. The study was premised upon "thinking and interaction [are] aspects of swimming that can benefit from constructivist-based pedagogy, beginning with the teaching of technique (p. 393). Essentially, the development of swimming technique is not merely a simple process of the swimmer reproducing standardized movements but also involves his or her interpretation and adaptation of technique to the fluid environment in which the swimmer learns, which is "perhaps the aspect of learning to swim well that is most suited to constructivist informed pedagogy" (p. 393). The study concluded that,

> Swimmers who have conceptual understandings of the dynamics of swimming and who are disposed toward independent problem solving, whether in regard to

> tactics or technique, are surely likely to learn more effectively than the swimmer who passively relies on his or her coach for instruction on every aspect of swimming. (Light and Wallian, 2008, p. 402)

Ultimately, what is important is the personal conceptual understanding of swimming, not simply the cognitive understanding of swimming.

Experiential learning theory. Experiential learning is defined as a "process in which an experience is reflected upon and then translated into concepts which in turn become guidelines for new experiences" (Saddington, 1992, p. 44). "This process is portrayed as an idealized learning cycle or spiral where the learner "touches all the bases"—experiencing, reflecting, thinking, and acting—in a recursive process that is responsive to the learning situation and what is being learned" (Kolb & Kolb, 2005, p. 194; Kolb & Kolb, 2009, p. 298). According to Kolb & Kolb (2005), this theory is built upon six prepositions. First, learning is not best conceived in terms of outcomes, rather it is best viewed as a process. Second, learning is cyclical in nature, with learners constantly developing and refining understanding with new information. Third, learning requires the resolution of conflict and differences, with the learner shifting between opposing modes of reflection and action and feeling and thinking. Fourth, learning is a holistic process of environmental adaptation. It is an all-inclusive sensory approach to understanding, where thinking, feeling, perceiving, and behavior are important components. Fifth, learning is the result of a synergistic relationship between the learner and the environment. Sixth, "learning is a process of creating knowledge" (2005, p. 194). Experiential learning is predicated on a cycle containing four components; concrete

experience, reflective observation, abstract conceptualization, and active experimentation (Figure 2).

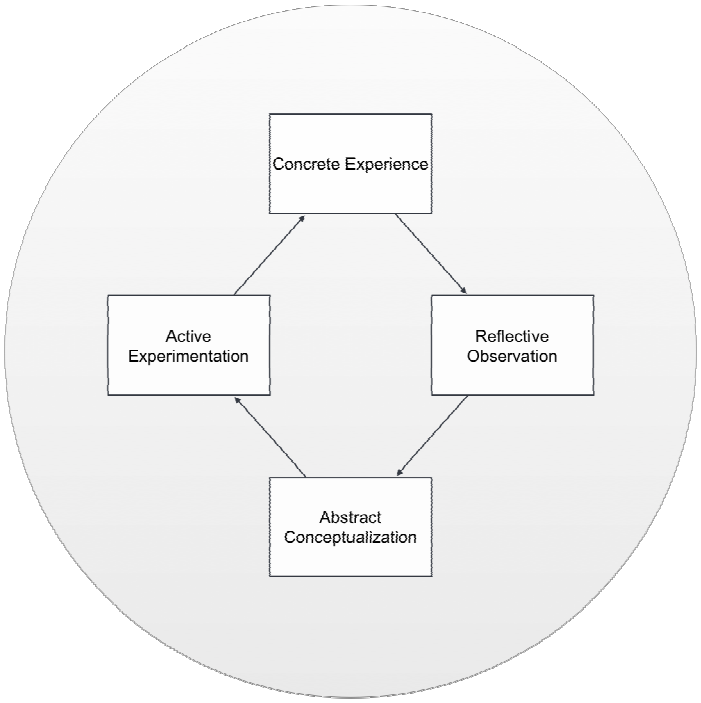

Figure 2. The experiential learning cycle [Extrapolation] (Kolb & Kolb, 2009, p. 299).

Concrete experience is basically defined as performing the activity; according to Kolb's (1984) model, one cannot learn through simple observation, one must actually perform the task. The second stage, reflective observation, is defined as thoughtful review of the concrete experience. The third stage, abstract conceptualization, is the process of evaluating the event in the context of the learner's current body of knowledge. This knowledge may have been previously obtained from textbooks, discussions with others, previous observations, or any other knowledge that they have developed. The final stage of the learning cycle, active experimentation, is when the learner takes the information they learned and puts it into practice (Kolb).

Experiential learning continues to receive strong credence as a theoretical framework (Kolb & Kolb, 2005, p. 196). There has been an increase in experiential learning research and practice, specifically in the fields of education and professional development (Moon, 2004). Despite this increase, little research has been done to connect endurance sports, specifically the Ironman Triathlon, to experiential learning.

Experiential learning relies on reflective practice. To learn from experience requires experiential deliberation; the learner must thoughtfully evaluate what works, and what doesn't. "Reflective learning involves the processing of experience in a variety of ways" (Mann, Gordon, & MacLeod, 2009, p. 697). Dewey (1933) defined reflective practice as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (p. 9). This definition was enhanced by Moon (1999), who defined it as "a form of mental processing with a purpose and/or anticipated outcome that is applied to relatively complex or unstructured ideas for which there is not an obvious solution" (p. 23). Boud, Keogh, and Walker (1985) defined reflection as ''a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to a new understanding and appreciation'' (p. 19). All of the definitions emphasize determined critical analysis of knowledge and experience, in order to achieve deeper meaning and understanding.

By definition, athletes use experiential learning every time they research new training methodologies, every time they employ a race strategy, and every time they train and race under the endless variety of varying conditions. Learning to negotiate the Ironman Triathlon is enhanced by reflective practice because "it appears reflective

practice may encourage athletes to engage in active problem-based learning in an attempt to deal with issues effectively and move on from the experience" (Faull & Cropley, 2009, p. 336). Completing an Ironman is a process that requires participants to rely on past learning and experience and apply those lessons to their current race situation. In essence, the Ironman is one long series of critical thinking problems that must be solved to successfully negotiate and complete the event. An athlete with significant knowledge about sport is better able to select and utilize an appropriate situational response within the context of the sport's goal structure. Further, that athlete can select the appropriate response based on less information, and do so more quickly, than an individual with less knowledge (Thomas, et al., 1986, p. 266). Experiential learning provides the vehicle by which to study this phenomenon.

Research into, and the application of, reflective practice with an athlete population is still in its infancy, but the current case study offers strong support for its implementation, with particular reference to reflection being used as a discourse to assist athletes evaluate performance in an effective manner and become more aware of themselves as athletes (Faull & Cropley, 2009, p. 335).

The Ironman Triathlon

The Ironman Triathlon is a relatively new phenomenon; its origins can be traced back to Hawaii in 1978 when a group of friends were involved in a friendly argument about who was more fit: swimmers, cyclists, or runners. A plan was developed to settle the dispute by combining three major endurance events; the Waikiki Roughwater Swim, which was 2.4-miles in length; the Around-Oahu Bike Race, which was roughly 112-miles in length; and the Honolulu Marathon, which was 26.2-miles in length (McCarville,

2007, p. 160). One of the athletes, Navy Commander Collins, stated, whoever finished first, well, we'd call him the Ironman" (Steinberg, 2011, Location 160), and the Ironman Triathlon was born. The modern Hawaii Ironman Triathlon, held annually in Kona, Hawaii, is an extremely unique racing experience; not only is it the location of the Ironman world championships, it is one of a few athletic events where professional and amateur athletes race side by side on the same course, at the same time.

The Ironman Triathlon is a complicated endeavor, requiring a considerable amount of time and preparation. According to the World Triathlon Corporation (2013), the governing body of Ironman worldwide, it takes a minimum of 15 hours of focused training per week to successfully negotiate the Ironman Triathlon. In fact, it is not unusual for an elite triathlete to perform two or three disciplines in a given day on multiple days (O'Toole, 1989).

As previously stated, the Ironman Triathlon is a sport consisting of three disciplines performed in succession. The impact that each discipline has on successive disciplines is not fully understood (Peeling & Landers, 2009, p.1084). However, a study conducted by Peeling and Landers (2009) found that "Swimming is the initial race discipline during a triathlon, and thus the energy expended during the swim could affect performance throughout the remainder of the event" (p. 1080). Logically, this carries over to successive disciplines, i.e. the cycling portion of the race impacts the run. Further, overall triathlon race performance was dictated by run performance. The time needed for the run was the best predictor of overall triathlon time For example, if an athlete was able to maintain a consistent run pace following a decent cycling and swim performance, they would have a good finishing time. In contrast, if the athlete had an

excellent swim and bike followed by a run marred with poor pacing and walking, they would have a poor finishing time (Dengel, Flynn, Costill, & Kirwan, 1989).

The author as an Ironman. The researcher is the primary instrument in a qualitative inquiry. Therefore, it is important to reveal information about the researcher so that credibility of the findings can be judged (Patton, 2002). In this study, the researcher was a 40-year-old endurance athlete and Ironman triathlete. He had completed numerous endurance events, including several half-marathons, several marathons, several Half Ironman distance triathlons, and an Ironman distance triathlons.

Triathlon is a sport and a subculture. It has a "set of special norms, values, beliefs, styles, moral principles, performance standards, and the like" (Stebbins, 1992, p. 24). The researcher of this study conducted all the interviews. His background in the sport of triathlon, his Ironman racing experience, his intimate knowledge of the sport and respect for the Ironman athletes and training and racing process made it easier to build rapport and elicit information from the participants (Eklund, 1993).

The 'typical' Ironman race. The typical Ironman race begins months prior to the actual race (Steinberg, 2011; Mccarville, 2007). Athletes must register for these races almost a year in advance, with some races 'selling out' in minutes (McCarville, 2007). The training regimen for these races follows a periodization format, which separates the season into and is usually four-to-six months in length (Friel, 2009).

The training regimen sometimes begins during the winter months. For example, if an athlete is racing Ironman Texas, which always occurs in the middle of May, they must begin training in December of the previous year at the absolute latest. This training includes riding a bike. For those who live in cold climates, this presents an interesting

challenge to training, e.g. it is impossible to ride a bike outdoors when there are inches of snow and ice on the ground. Athletes must find alternatives to outdoors bike training, i.e. indoor bike trainers, and Computrainer's. Indoor bike trainers allow an athlete to affix their bike to them and provide some level of athlete controlled rolling resistance. Athletes might get on these devices for hours at a time in the comfort of their own home. Many athletes will watch movies, television, play video games, etc., to break up the boredom of riding an indoor bike trainer.

During training, through active experimentation, athletes typically sample a variety of nutritional supplements and hydration strategies that are necessary to get them through a long day of arduous physical activity. The daily average human caloric needs are approximately 2000 calories a day. Ironman competitors expend somewhere between 7000 to 10000 calories during a race (Friel, 2009, p. 328; World Triathlon Corporation, 2013). It is imperative that athletes replenish calories during the race. This must be done to maximize the caloric intake and minimize gastrointestinal distress (Friel & Byrne, 2009, p. 293). Athletes generally establish a nutritional and hydration routine and strategy long before they arrive at the starting line, with the expectation that deviations from the plan can have disastrous repercussions resulting in the dreaded "DNF", i.e. nausea, vomiting, bloating, and intestinal cramps. (Friel & Byrne, 2009, p. 293). After a period of extensive preparation and training, the much anticipated race day arrives.

The 'typical' Ironman race officially begins at 7:00 am (Steinberg, 2011). In reality, the race actually begins several hours earlier. Depending upon a number of personal factors, athletes wake up as early as 2:00 am to have breakfast and then go back to sleep for several hours (Wellington, 2012). Most athletes will wake up again at around

5:00 am and head out to the transition area to ensure bike tires are inflated, water bottles and nutritional supplies are in place, and other details are attended prior to the official start. At this time, athletes don the official timing chip, which is usually worn as an ankle bracelet. This bracelet tracks athletes along the course and ensures course officials are aware of those athletes out on the course. It is a primary safety method.

Athletes will then line up at the start line. Some races have a 'wave' start, where athletes start in 'waves', sorted by age group. Others start in a 'time-trial' fashion, where athletes line up in no specific order and start every 1 to 2 seconds after the starting gun fires (World Triathlon Corporation, 2013). All Ironman events take place in an open body of water; some races occur in the ocean, and some occur in lakes or rivers.

Once the race begins, athletes clamor for position in the water. Athletes must wear a race issued swim cap. This makes them visible to the lifeguards who are standing by on boats, kayaks, wave runners, etc. along the course. The lifeguards are vigilant for signs of distress and athletes are able to request assistance by raising a hand. If an athlete raises their hand, a lifeguard immediately responds to their location to render aid. If an athlete simply needs a moment to rest, they simply need to hold onto the kayak or boat for support. This is allowed under the USA Triathlon rules and regulations. As long as there is no forward propulsion assistance, the athlete is allowed free from disqualification.

There is generally body-to-body contact, with reports of minor injuries during the swim (McCarville, 2007). Most of the athletes opt to use the front crawl stroke, or freestyle. However, athletes are free to use any stroke they choose. After several minutes

elapse, athletes settle in for a 2.4 mile swim. The swim course is generally marked with brightly colored buoys that athletes must negotiate around.

Upon exiting the swim, athletes enter the 'swim to bike' transition area. In certain races, contingent upon water temperatures, athletes may have been allowed to wear a wetsuit during the swim (USA Triathlon, 2014d). This transition area is where the wetsuit is stripped, along with goggles, and the mandatory swim cap. Volunteers in this area assist the athletes in remove the wetsuit (if worn). Athletes then proceed to a tent where they are handed a bag of equipment that they had packed prior to the commencement of the race. The bag contains the mandatory bicycle helmet, bicycle shoes, eyeglasses, and race number. The athletes leave the tent and don the equipment. The athletes proceed to the location of their bicycle, which is positioned on a numbered bike rack that corresponds with their race number. The athletes mount their respective bicycles, and exit the transition area. Athletes strive to minimize time in transition areas, with many athletes practicing these transitions prior to race day.

The athletes then embark on a 112-mile bicycle ride. Most athletes will begin an intake of some sort of nutritional item at this point in the race (Wellington, 2012). If they are not actually consuming calories, there is most certainly a plan in place delineating when this is to occur. During the bicycle course, there are several opportunities for athletes to grab nutritional supplements, i.e. gel, and Gatorade. These opportunities are staffed aid stations similar to those found in running races, i.e. marathons. As an athlete rides by one of these stations on their bicycle, the volunteers at the station hand them food and drink as they pass by. Approximately half way through the bike course, the athletes have the opportunity to retrieve items that were personally packed and checked

prior to the beginning of the race. This can include socks, food, etc. Upon completion of the bicycle component, athletes enter the 'bike to run' transition area. Here they remove the bicycle helmet and shoes, and are handed a bag containing their running equipment, i.e. running shoes and a visor or hat (if worn). The athletes get dressed in a changing tent and subsequently exit the transition area and begin the marathon.

The final leg of the race is a 26.2-mile run. Again, there are several opportunities, i.e. aid stations (usually placed every mile) for athletes to grab nutritional supplements, i.e. gel, and Gatorade. At the terminal end is the finish line.

Athletes have seventeen hours to negotiate the entire event. There are several cutoff times throughout the day. For example, if they do not complete the swim in two hours and twenty minutes, they are no longer eligible to finish the day and receive the dreaded 'DNF' or 'did not finish'. There are similar cutoffs on the bike and run course (Steinberg, 2011).

Once the race is complete, athletes then evaluate the race, take in some necessary calories, and begin the healing process. It should be noted that if athletes fail to properly hydrate or consume calories, they will likely 'DNF' or 'did not finish' (Friel, 2009).

Identification of attributes for success in the Ironman Triathlon. There are a number of characteristics that are essential to successfully negotiate the Ironman Triathlon, and "from a scientific perspective, someone who attempts such a feat would likely develop unique psychological orientations, strategies, and physical training techniques that could guide others in their quest for success in ultraendurance challenges" (Hollander & Acevedo, 2000, p. 2). Training prepares an athlete for this endeavor through the development of mental toughness, training and racing planning and

strategies, and physical training that specifically prepares the athlete for the swim, bike, and run portions of the race.

Ironman Triathlon training consists of more than simply swimming, cycling and running. "Successful endurance training involves the manipulation of training intensity, duration, and frequency, with the implicit goals of maximizing performance, minimizing risk of negative training outcomes, and timing peak fitness and performances to be achieved when they matter most" (Seiler, 2010, p. 276). Ultimately, the training is purposeful and directed with a specific goal in mind.

Deliberate training practice. Athletic ability may be innate to some degree. However, "It is clear that deliberate training strategies contribute to sport success" (Hollander & Acevedo, 2000, p. 3; Ericsson & Charness, 1994). Deliberate training practice is defined as the ability to train in a deliberate manner to elicit the appropriate physical and mental adaptations necessary to complete the goal (Hollander & Acevedo, 2000, p.11). Regardless of the degree of natural talent, "all participants in sports must hone their abilities, identify their weaknesses, commit movements to muscle memory, learn to coordinate their actions with teammates, and practice [sic] until their responses are automatic" (Ericsson, 2003, p. 177). Improvement in sport at all levels can be achieved through practice.

Fundamentally, "deliberate practice is a highly structured activity, the explicit goal of which is to improve performance" (Ericsson, Krampe, & Tesch-Römer, 1993, p. 368). "Practice is uniformly regarded in the motor learning literature as the variable having the greatest singular influence on skill acquisition" (Côté, Baker, & Abernethy, 2007 p. 184). In fact, it is scientifically established that there is a positive correlation

between practice and proficiency, i.e. the more one practices, the more proficient one becomes (Côté, et al., 2007, p. 185). However, caution must be taken when developing a proficiency in a specific discipline. If an athlete learns a skill in a manner that is detrimental to optimal performance, and practices that skill, the athlete could potentially reinforce a bad skill.

In a seminal work on deliberate practice, Ericsson, et al. (1993), outlined three basic tenets of deliberate practice: First, deliberate practice is undertaken to increase performance, not for enjoyment or extrinsic rewards; second, deliberate practice requires cognitive and/or physical effort; and third, deliberate practice is relevant to the promotion of positive skill development (p. 368). Deliberate practice is premised that expert performance is acquired gradually over time and that effective improvement of performance requires the opportunity to find suitable training tasks that the performer can master sequentially. Deliberate practice seeks to push athletes outside beyond their comfort zone, with the goal of incremental improvements in performance through repetition (Ericsson, 2006, p. 694).

According to Johnson, Tenenbaum, and Edmonds (2006), "Deliberate practice refers to training activities designed to enhance an individual's performance, with explicitly defined parameters, including (1) a well-defined task with appropriate difficulty level, (2) high effort, and (3) opportunities for repetition and error correction" (p. 117). In Ironman Triathlon training, there are a myriad of well-defined tasks to practice. For example, athletes can practice swimming, cycling, running, and the transition periods between each discipline. Further, during practice, athletes have some level of control of the difficulty associated with practicing each individual discipline. An

athlete can enhance the effort by extending the training period, increasing the intensity, or increasing the speed of the activity, i.e. attempting to perform transitions at a faster rate. Finally, inherent to each discipline is the opportunity for repetition and error correction.

Practice is “important in predicting performance” (Hodges, Kerr, Starkes, Weir, & Nananidou, 2004, p. 227). It is not practical for an athlete to practice for an Ironman Triathlon through rote completion of the entire distance. The time required, coupled with the physical demands associated with completing the distance, make selecting more appropriate training methods appropriate. “Researchers examining the application of the theory of deliberate practice to sport (e.g., Baker, Côté, & Abernathy, 2003; Hodge & Deakin, 1998; Starkes, Deakin, Allard, Hodges, & Hayes, 1996) have generally supported the strong positive relationship between hours of high quality training and ultimate achievement” (Baker, Côté, & Deakin, 2005, p. 65). High quality training includes training for the distance through increased time spent swimming, cycling, or running, training in a variety of different weather conditions, and attempting different nutritional fueling strategies in training. Training helped athletes overcome physical and mental barriers (Hollander & Acevedo, 2000, p. 11).

Mental toughness. Research focused on the mental aspect of racing has been overwhelmingly focused on the concept of sport psychology, specifically mental toughness (Connaughton, Hanton, & Jones, 2010; Jones, Hanton, & Connaughton, 2002; Jones, Hanton, & Connaughton, 2007; Bull, Shambrook, James, & Brooks, 2005). However, research has been mired by, "widely-differing definitions [of mental toughness] and resulting operationalization [that] have only served to induce confusion rather than clarity" (Jones, et al., 2002, p. 205). In fact, Bull, et al., (2005), argued that

mental toughness is not only difficult to universally define, but is also difficult to define within the context of each sport. Despite the lack of a unifying definition, "within both scientific and coaching communities, mental toughness is now regarded as one of the most important psychological factors associated with achieving performance excellence in any sport" (Abdelbaky, 2012, p. 67). In a study conducted by Gould, Hodge, Peterson, & Petlichkoff, et al. (1987), 82% of coaches surveyed rated mental toughness as the most important psychological attribute in determining wrestling success (p. 298).

Jones, et al., (2002) addressed these definitional problems in a seminal study on the definition of mental toughness. The study sought to address two fundamental questions: how can mental toughness be defined, and what are the essential attributes required to be a mentally tough performer (Jones, et. al., 2002, p. 213)? Utilizing a three-stage interview process, consisting of a focus group, individual interviews, and individual ranking of specific mental toughness attributes, 10 elite performers contributed to the promulgation of a unifying definition of mental toughness. This definition purported mental toughness is,

> Having the natural or developed psychological edge that enables you to generally cope better than your opponents with the many demands (competition, training, and lifestyle) that sport places on a performer. Specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure" (Jones, et al., 2002, p. 209).

This study of mental toughness also included the identification of 12 essential attributes. These attributes, ranked in order of importance from the study, are:

1. Having an unshakable self-belief in your ability to achieve your competition goals;
2. Bouncing back from performance set-backs as a result of increased determination to succeed;
3. Having an unshakable self-belief that you possess unique qualities and abilities that make you better than your opponents;
4. Bouncing back from performance set-backs as a result of increased determination to succeed;
5. Thriving on the pressure of competition;
6. Accepting that competition anxiety is inevitable and knowing that you can cope with it;
7. Not being adversely affected by others' good and bad performances;
8. Remaining fully-focused in the face of personal life distractions;
9. Switching a sport focus on and off as required;
10. Remaining fully-focused on the task at hand in the face of competition-specific distractions;
11. Pushing back the boundaries of physical and emotional pain, while still maintaining technique and effort under distress (in training and competition);
12. Regaining psychological control following unexpected, uncontrollable events (competition-specific). (Jones, et al., 2002, p. 211)

Jones, et al. (2007) conducted a follow-up study regarding the definition of mental toughness utilizing a different cohort consisting of 'super-elite' athletes. The results verified the definition provided in the original study (p. 260). This study expounded that

"athletes might possess a *natural* mental toughness that was then developed throughout their careers . . . that mental toughness could also fluctuate during the time athletes spent in their respective sports . . . that mental toughness is a component that performers must continually attend to throughout their sporting career (Jones, et al., 2007, p. 261).

The Ironman distance triathlon is a demanding event that pushes the limits of human endurance and requires mental focus and tenacity (Schofield, Dickson, Mummery, & Street, 2002, p. 3). Mental toughness improves chances of successful performance (Goss, 1994). In essence, "mentally tough performers consistently remained more determined, focused, confident, and in control under the pressures and demands that top level sport placed upon them" (Jones, et al., 2002, p. 210). The development and maintenance of mental toughness is not innate; it can, and should be developed (Connaughton, Wadey, Hanton, and Jones, 2008, p. 94).

Self-confidence and Attitude. Research supported high levels of self-confidence are associated with successful athletic performance (Mahoney, Gabriefl & Perkins, 1987; Orlick & Partington, 1988). Further, confidence may facilitate and enhance continued effort, coping with adversity, and strategic control over distractions (Acevedo, et al., 1992; Gould, Eklund & Jackson, 1992). "Throughout many areas of psychological research, a person's attitudes or internal beliefs have been shown to be important predictors of behavior" (Jones, et al., 2001, p. 492). In fact, there was a growing body of research that suggests that an athlete's attitude and beliefs have a profound impact on athletic performance (Daw & Burton, 1994; Gill & Deeter, 1988; Martin & Gill, 1991; Meyers, Whelan, & Murphy, 1995; Smith, Schutz, Smoll, & Ptacek, 1995; Vealey, 1986; Vealey, 1988; as cited in Jones, et al., 2001, p. 492). In a qualitative study examining the

psychological characteristics and reflective meanings of 8 English Channel swimmers, Hollander and Acevedo (2000) found that success was determined by an attitude consistent with "doing whatever it takes", and persistence and tenacity through adversity (p. 11).

Training methodologies. Understanding the different training methodologies employed by athletes is extremely important in evaluating a specific learning pathway. Training can be used to overcome physical and mental barriers (Hollander & Acevedo, 2000, p. 11). Relative to training for a long distance triathlon, there are a myriad of different training methods, each with quantitative and anecdotal reports of success (Laursen, 2010; Maffetone, 2010; Fink, 2010; Fitzgerald, 2011; Friel & Byrn, 2009; Friel, 2010; Friel, 2009; Alexander, 2012; Holland, 2011; Mackenzie, 2012; O'Toole, 1989). In a study conducted by Baker, Côté, and Deakin (2005), the researchers argue "that the relationship between training and performance was not monotonic." This suggests that different training modalities have different impacts on different athletes. Clearly, different athletes employ different techniques depending upon personal beliefs, understandings of training principles, current trends, and temporal considerations.

The commonly accepted basic principles of training included periodization, progressive overload, specificity, frequency, duration, intensity, and recovery (Friel, 2009; Friel, 2010; Friel & Byrn, 2009; Maffetone, 2010). Periodization is defined as the "organization of a training year into different periods to attain different objectives" (Kent, 1994, p. 329). Progressive overload is defined as increasing the length of time in a training session or duration, the intensity of the training session, the frequency of training, and/or the amount of rest and recovery between training sessions. The principle

of specificity states that to become proficient at a specific activity, an athlete must spend time training for and performing that activity. For example, to become a better runner, an athlete must spend time running. Although cycling and swimming fitness will transfer over, it will not improve the running skill. Training frequency is simply the amount of time the athlete spends training. In Ironman training, it is not unusual for an elite triathlete to perform two or three disciplines in a given day on multiple days (O'Toole, 1989; Friel, 2009; Friel, 2010; Friel & Byrn, 2009; Maffetone, 2010; Mackenzie, 2012).

There is not a universal training method that is accepted by all Ironman athletes. However, it is widely accepted that athletes must train in each discipline, i.e. swimming, cycling and running. Primarily, athletes commonly focus training on areas that they feel are deficient. Secondarily, athletes will focus training on areas that they feel will give them the greatest return on their training investment (Friel, 2009; Friel 2010). For example, if an athlete is a strong swimmer, a strong cyclist and a weak runner, they might spend more weekly training time on running and less time on the other disciplines. However, if the athlete had mediocre swim skills, strong cycling skills, and solid running skills, the athlete might not spend substantial time attempting to improve their swim performance when they might only race 5 to 10 minutes faster.

Summary

There is a lack of literature studying athletic learning pathways, specifically in endurance sports. In fact, there are no studies exploring the learning pathways of Ironman triathletes. Further, there is limited literature linking athletic learning to theories of learning. In athletic learning, the behaviorist theory illuminates repetitive practice and reinforcement through operant and classical conditioning. The cognitive theory explains

athletic learning as the absorption of information through listening, watching, touching, reading or experiencing some situation or content and subsequently processing or recalling the information, i.e. watching another athlete swim and emulating their mechanics. The athletic constructivist-learning paradigm is premised upon learning becoming personally meaningful to the athlete. The experiential learning model is predicated upon a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. The Ironman Triathlon is an epic endurance race. Successfully negotiating the race depends upon training and practice, mental toughness, and self-confidence and a positive attitude. Despite the lack of academic research, viewing the Ironman training and racing process in the context of a learning pathway provides a clear look at the athletic learning process as it relates to endurance sports.

Chapter Three: Research Design and Methodology

Research Design

The purpose of this qualitative study was to explore the learning pathways of Ironman triathletes as they prepared for Ironman distance races during the 2013 racing season. A qualitative, case-study approach was utilized because it facilitated an in-depth exploration of personal experiences, and subjective meanings that were inherent to these experiences (Jones, et al., 2002, p. 207; O'Shea, Heilbronner, & Reis, 2010, p. 242; Miles & Huberman, 1994, p. 10). The experiences, viewed at the personal level, may subsequently be extended to achieve "shared understandings of meaningful experiences" (Bain, 1995, p. 241).

Qualitative Research. There was limited academic research concerning all aspects of the Ironman Triathlon therefore, "a qualitative design was employed for this study because qualitative methods focus mainly on understanding participants' experiences and behaviors and are appropriate when asking questions that explore phenomena in natural settings where there has previously been little research conducted" (Ryu & Cervevo, 2011, p. 144; Bogdan & Biklen, 2003; Merriam, 1998). Further, a qualitative investigation was well suited for studying the learning process because it involved, "looking at how something happens rather than or in addition to examining outputs and outcomes" (Patton, 2002, p. 159).

By nature, qualitative inquiry situates itself in the natural world with the focus of interpreting experiences in the terms of the socially constructed meanings that individuals bring to them (Thomas, Nelson, & Silverman, 2005). This method of inquiry allows the researchers to adapt and adjust to learning as they become more knowledgeable about the

social context they are studying, essentially allowing the course of study to guide the depth of inquiry (Lamont & White, 2009, p. 10). According to Miles and Huberman (1994), qualitative research was robust when:

- The fact that the data were collected in close proximity to a specific situation;
- Such data provide 'thick descriptions' that are vivid, nested in real context, and has a ring of truth that has strong impact on the reader;
- The data has been collected over a period of time, rather than a simple 'snapshot' of 'what' or 'how many?' (p. 10)

In a seminal study on mental toughness, the qualitative method was selected due to its probative value, allowing the researchers the ability to fully explore study participants answers and definitions (Jones, et al., 2002). "Such techniques, including interviews . . . are particularly well-suited for examining complex social structures, processes, and interactions that require consideration of numerous dimensions and levels of analysis" (Lamont & White, 2009, p. 10).

Martin and Leberman (2005) conducted a mixed methods research study on the popular outdoor educational program, Outward Bound. Historically, studies on the efficacy of Outward Bound were mainly quantitative in nature. This was due to the need to justify the program's financial existence. The authors found that by primarily focusing on quantitative metrics alone, the "personal nature of learning experiences" gained from outdoor education programs was lost (p. 56). They argued that qualitative data "encapsulated the value and real meaning of the data" (Martin & Leberman, 2005, p. 44). The qualitative data gave insight into the personal meaning behind the experiential learning experience.

Case Study. A case study is, "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1994, p. 23). According to Bromley (1990), a case study is a "systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest" (p. 302). Feagin, Orum, and Sjoberg (1997) purported case studies are "an ideal methodology when a holistic, in-depth investigation is needed" (as cited in Tellis, 1997, p. 1). The case study provides a vehicle to study a phenomenon emphasizing the participant's perspective as central to the process (Zucker, 2009). It is especially useful when 'how' and 'why' questions are asked (Yin, 1994). Stake (1995) posited that the case study academic investigations included posing research questions, gathering data, data analysis, and interpretation.

The Ironman training and racing process is dynamic and complex. Exploration of this process is best conducted over a period of time. It is these factors make the case study an ideal method to study the Ironman triathletes (Patton, 2002). Ultimately, the case study is a 'meaningful design' for the evaluation of experiential programs (Kolb, 1991).

When selecting case studies for research, "cases must be done so as to maximize what can be learned in the period of time available for the study" (Tellis, 1997). Cope and Watts (2000) conducted case study research that explored six case studies utilizing relatively unstructured interviews to develop an understanding of the situation in context. Further, they utilized a method of purposive sampling based upon the "opportunity to learn the most" (as cited in Stake, 1994). Each participant should represent an individual

case that was subsequently analyzed and compared to other participant cases consistent with the hermeneutic circle (Dale, 1996).

Recruitment

Prior to participant recruitment, the researcher received approval through the Lindenwood University IRB for Human Subject's Research (Appendix A). He selected a sample size between two and ten Ironman distance triathlon competitors for this study. Justification for the potentially small sample size was the result of the distinct possibility of a small study population. According to Drake, head of Swim Bike Run Triathlon Club and Bakker, of The Saint Louis Triathlon Club, the population from which the potential sample would be recruited consisted of several hundred people (Drake, S., personal communication, December 20, 2012; Bakker, T., personal communication, December 20, 2012). Out of this pool of candidates, only a small number were likely to race the Ironman distance in the indicated study time period. According to a market research report commissioned by United Stated Triathlon, the sport's governing body, slightly less than 17% of triathletes attempt the Ironman distance (Tribe Group, LLC, 2009). Further, the triathlon community was, and remains, relatively small; anecdotal evidence suggested that there was crossover between clubs, with some people retaining membership in both clubs. Finally, a small sample size was utilized to allow individual experiences to be analyzed in-depth, providing comprehensive 'rich data'.

In recruiting and selecting a sample, the "researcher actively selects the most productive sample to answer the research question" (Marshall, 1996, p. 522). Further, "choosing a study sample is an important step in any research project since it is rarely practical, efficient, or ethical to study whole populations" (Marshall, 1996, p. 522).

Relative to choosing a sample size, Sandelowski (1995) stated:

> An adequate sample size in qualitative research is one that permits – by virtue of not being too large – the deep, case-oriented analysis that is a hallmark of all qualitative inquiry, and that results in – by virtue of not being too small – a new and richly textured understanding of experience. (p. 183)

By "thoroughly examining a small number of cases, the researcher may explore in-depth the contextual dimensions that influence a social phenomenon" (Lamont & White, 2009, p. 11). Purposive sampling can be utilized to maximize information (Patton, 2002).

Crouch and McKenzie (2006) argued that small sample sizes, defined as less than twenty participants in qualitative research "will facilitate the researcher's close association with the respondents, and enhance the validity of fine-grained, in-depth inquiry in naturalistic settings" (p. 483). They argued that interviews, one of the most frequently utilized qualitative methods, were designed to "generate data which give an authentic insight into people's experiences" (Silverman, 1993, p. 91). In an exploratory study on mental toughness, researchers purposefully selected individuals to participate in the study (Weinberg, Butt, & Culp, 2011, p. 159). This method allowed for a more robust understanding of the constructs studied from a particular population; in this study it was NCAA coaches with a minimum of ten years of experience and a 'winning' record.

Qualitative approaches commonly utilized purposive sampling over other methods (Sandelowski, 1995). In this study, purposive sampling was selected because, "the purpose of a qualitative study is to acquire new, more detailed knowledge on a topic [and] selection methods and interviewing styles need to be suited to that purpose" (Lamont & White, 2009, p. 12). Further, "The 'logic and power' of purposeful sampling

used in qualitative research lie primarily in the quality of information obtained per sampling unit, as opposed to their number per se" (Sandelowski, 1995, p. 179). Purposeful sampling was utilized to allow the identification of participants who were living the phenomena being studied (Patton, 2002; O'Shea, et al., 2010, p. 243).

Participants for this study were selected from a purposive sample of Ironman triathlete competitors participating in race(s) during the 2013 triathlon season. The athletes were selected from two USA Triathlon officially sanctioned triathlon clubs in the greater Saint Louis metropolitan area: The Saint Louis Triathlon Club, and the Swim Bike Run Triathlon Club. To initiate recruitment, the researcher attended a Swim Bike Run Triathlon Club meeting, explained the study, and provided a letter of invitation (Appendix B) to all attendees. Simultaneously, he sent a letter of invitation (Appendix B) to prospective Ironman athletes competing during the 2013 Ironman racing season through the Swim Bike Run and Saint Louis Triathlon Club email distribution lists. The potential participants were requested to contact the researcher by email, phone, or in person.

Participants

Nine potential participants contacted the researcher. He verbally interviewed the nine prospective candidates over the phone using a screening questionnaire (Appendix C) to ensure they were participating in an Ironman event within the time parameters set by the study (O'Shea, et al., 2010, p. 243). Two participants were competing in Ironman Arizona in November 2013. This was outside of the temporal parameters set for inclusion into the study. He invited the remaining seven participants to participate in the research study. Subsequent to the initial screening, he obtained written informed consent

(Appendix D). The signed consent forms were filed in a locked and secure location. To protect the identities of the participants the names were changed to correspond with the phonetic letters of the NATO phonetic alphabet; there were seven participants assigned the names Alpha, Bravo, Charlie, Delta, Echo, Foxtrot, and Golf. Name assignment was performed randomly.

Table 3.

Ironman Study Athlete Demographics

Athlete	Gender	Race	Age	Prev. IM
Alpha	Male	White	30	2
Bravo	Male	White	46	1
Charlie	Male	White	40	8
Delta	Male	White	26	2
Echo	Female	White	35	0
Foxtrot	Male	White	50	0
Golf	Female	White	29	2

The time period selected for this study was from January 2013 through October 2013. The first North American Ironman event of the season was Ironman Texas, scheduled to commence on May 18, 2013 (World Triathlon Corporation, 2013). In order to allow athletes who might be competing in this Ironman to participate in the study, and the general training timeframe of four-to-six months, the commencement date for recruitment in January was selected. The Ironman World Championships were held in Kona, Hawaii in early October every year. The terminal end of the study was selected to accommodate those athletes who might qualify to race in this race during the 2013 season.

Instruments

There were no studies that examined the learning pathways of athletes. An interview guide and interview questions were developed based upon the interview questions developed to examine the perceptions of elite swimming coaches (Driska, Kamphoff, & Armentrout, 2012). The interview questions for that study were obtained and used as a framework to construct static interview questions for this study. In addition to the static questions, "a variety of additional probe and elaboration questions were employed where it was appropriate to gain a greater insight into the athlete's personal views . . ." (Thelwell, et al., 2010, p. 173). The questions also helped to elicit further discussion. The semi-structured interview questions were designed to elicit open-ended responses, encouraging the athletes to speak freely (Lamont & Kennelly, 2012).

All interviews with the athletes were digitally recorded using the Olympus Digital Voice Recorder, Model DM-420. The interviews were downloaded to a 13-inch, Apple MacBook Pro. The interviews were transcribed using a 13-inch MacBook Pro on Microsoft Word word-processing software. The researcher performed all transcriptions. The interviews, including the audio interview files and any personal descriptive data, were stored in password-encrypted files.

During the first interview, as an incentive, all participants were provided a Kodak Playsport, Zx5, High Definition (1080p video and 5 megapixel stills), waterproof pocket camera, with a Transcend, 16 gigabyte, Class 10, SDHC, Flash Memory card, and a Kodak Adventure Kit containing a hard cover case for the camera, a tripod, a neck strap, and a Kodak, 4 gigabyte memory card. The photos and video footage obtained from the study participants were downloaded to a 13-inch, Apple MacBook Pro.

Data Collection

There were a myriad of interviewing approaches. This study utilized semi-structured and unstructured interview methods. Semi-structured interviews were:

> Designed so that each informant is asked a set of similar questions. This is particularly important if the goal is to make comparisons across individuals or groups of individuals. The interviewer initiates the conversation, presents each topic by means of specific questions, and decides when the conversation on a topic has satisfied the research objectives. (Lamont & White, 2009, p. 30)

In a study that looked at the construct of mental toughness in soccer, Thelwell, Weston, and Greenlees (2005), interviewed six subjects utilizing a semi-structured interview approach. This allowed them to obtain the same information from all of the participants and subsequently ask follow-up probe questions to elicit additional information.

In a qualitative study on athletic burnout conducted by Gustafsson, et al. (2007), a semi-structured interview format was utilized (Patton, 2002). The researchers used an interview guide to ensure major areas of interest were addressed; however, the format of interviews consisted of asking questions and following up on issues raised by the interviewees, allowing them sufficient opportunity to fully discuss their experiences (Rapley, 2004). In a qualitative study by O'Shea, et al. (2010), a semi-structure and open-ended interview approach was utilized, allowing the researchers an "insider perspective" of the study participants (p. 243). The researcher is an Ironman triathlete. This experience and status "provided access and trust, and . . . a context-specific understanding" (Gardiner, 2009, p. 58). Culver, Gilbert, & Trudel (2003) conducted an

analysis of qualitative interviewing methods and found that excessive rigidity in interviews reduced the examinational robustness of the topic of interest.

All of the interviews were conducted in person, at a location of the participant's choosing. Nearly all of the interviews were conducted at coffee shops and lasted approximately 20 to 75 minutes in length. All interviews were digitally audio-recorded with the permission of the participants.

At the commencement of the study, the researcher conducted semi-structured entrance interviews of selected participants using a list of questions (Appendix E). The list of questions was "developed to elicit relevant data and to facilitate the interview process" (Thelwell, et al., 2010, p. 173). He also provided the participants the digital camera during this meeting. He taught the participants how to properly operate all aspects of the camera, including how to utilize both the photography and video components of the camera. He explained the SD card in the camera contained the digital images and video. The researcher explained that he would download those images and videos at our regular interview meetings. The participants were instructed to document their learning processes and lessons learned throughout the Ironman training and racing process. The participants were informed that the cameras were being offered as an incentive to participate and complete the study.

During the course of the study, the researcher interviewed the participants approximately every three to four weeks, utilizing a semi-structured and open-ended conversational approach (Yaman, 2010, p. 568). These meetings were scheduled via email, and were at the convenience of the athletes. These interviews were guided by a structured set of questions (Appendix F). All interviews were conducted in person, at a

location of the participant's selection. During scheduled interviews with participants, the researcher obtained digital copies of all photos and videos provided by the participants. Participants were afforded the opportunity to retain copies for themselves. The video and photos captured by the participants were used to promote further discussion.

As participants completed Ironman races, the researcher conducted semi-structured exit interviews, utilizing a list of structured questions (Appendix G). If the athletes were scheduled to complete more than one Ironman Triathlon in a season, there were multiple post-race interviews.

Data Analysis

The goal of qualitative analysis was to focus on the meanings behind the data (Esterberg, 2002, p. 158). In a qualitative case study by O'Shea, et al. (2010), the researchers identified general themes that united the individual case studies. "This methodology was used to create meaning from diverse data in order to gain an understanding of the factors that led to high math achievement for these academically talented young women but not to infer generalizability" (O'Shea, et al., 2010, p. 243). In essence, "thematic analysis, first and foremost, is about searching for patterns in data" (Shank, 2006, p. 148).

According to Miles and Huberman (1994), qualitative data analysis was best conducted in three distinct parts. First, there is data reduction, which is "the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field note and transcriptions" (p. 11). Second there is data display, which is simply the decision in how to relay the information that was gathered (p. 11). Finally, there is the step of drawing a conclusion (p. 11).

At the culmination of the interviews, the researcher transcribed the audio and video footage. He subsequently drafted, "a case study summary . . . for each participant" (O'Shea, et al., 2010, p. 246). This case study summary characterized each participant's individual learning progression. The raw data was subsequently coded.

Esterberg (2002) purported the coding process should include open coding, the development of themes, and focused coding. Open coding consisted of working "intensively with your data, line by line, identifying themes and categories that seem of interest" (p. 158). In essence, open coding assigned "tags or labels . . . assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1994, p. 56). The development of themes was essentially the identification of relevant and recurring concepts derived from the codes. Finally, there was focused coding, which "entails going through your data line by line, but this time you focus on those key themes you identified during open coding" (Esterberg, p. 161).

The researcher thematically open and axial coded the audio transcriptions, video footage, and digital photographs of the Ironman participants to create meaning from the data and establish a more robust understanding of the Ironman learning process (Gardiner, 2009, p. 59). He repeatedly compared the data and identifying themes and constructed a matrix "to verify the salience of emergent themes" (Gardiner, p. 59; Corbin & Strauss, 1990; Miles & Huberman, 1994).

Summary

This qualitative research utilized a case study approach in an effort to obtain an in-depth, robust understanding of the Ironman Triathlon training and racing process. Participants were purposively recruited from Saint Louis area triathlon clubs and selected

for participation based upon specific inclusion criteria. All of the participants were provided a digital video camera and instructed how to use the device to document their personal learning journeys. At regular intervals, interviews with the participants were conducted. During the interviews, the data from the cameras was downloaded for research purposes. Subsequent to the interviews, the data was axially and thematically coded.

Chapter Four: Results

How athletes learn to negotiate all aspects of the Ironman Triathlon can be characterized as a linear learning progression. This includes learning how to negotiate each individual discipline, i.e. swimming, cycling, and running; the techniques and procedures associated with the event, i.e. nutrition and hydration intake; and the training and racing cycles in their entirety. The learning progression commences with cognitive learning, i.e. information is accepted and retained by the learner, proceeds through a period where the learner takes the knowledge and makes it personally meaningful, and culminates with an experiential learning process, i.e. the development of personal theories based upon what was learned through experience, observation, conceptualization, and experimentation.

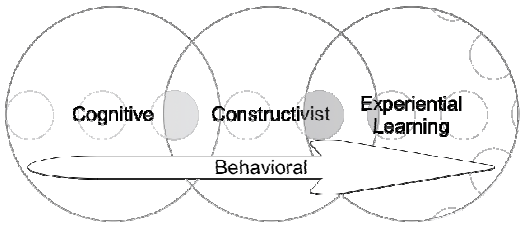

Figure 3. Endurance learning progression. This figure (Zelmanow, 2014) illustrates the learning pathway of the endurance athlete.

There are transition points as learning shifts from cognitive learning to constructivist learning and constructivist learning to experiential learning (Figure 3). The

terminal end of the learning process contains an experiential cycle consisting of concrete experience, reflective observation, conceptualization about what was learned, and experimentation. This experiential learning cycle potentially continues in perpetuity. The entire learning process is reinforced through behavioral learning, i.e. positive or negative reinforcement and repetitive practice of what is learned.

The case study approach provided a robust, in-depth view of the learning process as each athlete traversed it. This was important because the Ironman training and racing experience was different for each athlete. For example, training and racing strategy that might be perfect for one athlete might not be ideal for another athlete. It was this dynamic and complex learning process that made the Ironman Triathlon well suited for exploration over a period of time through a case study methodology (Patton, 2002).

Case One – Learning Progression 'Alpha'

Athlete Alpha was an athletic, Caucasian male, 30 years of age. He described himself as competitive, which manifested in his desire to best his previous race "time and overall place." In fact, when he raced, he consistently tried to earn a "podium spot", i.e. a top three finish in either his age group or overall. He was not married, did not have children, and was a physician by trade. He had competed in two Ironman Triathlons prior to this racing season.

Athlete Alpha characterized himself as a cognitive learner, stating he learned "better if someone tells me how to do it . . . and shows me how to do it." Athlete Alpha did not have a structured triathlon, swim, bike, or run background. Prior to his adult triathlon pursuits, he had minimal structured swim training. He learned to swim through participation in swim lessons; "when I was like 4 or 5, I went lessons, but was never on a

swim team . . . never swam in high school or anything like that." Although he learned to ride a bicycle in his youth, he had no formal bike racing training. Athlete Alpha's running training primarily accompanied his participation in team sports, i.e. basketball and other team sports.

Athlete Alpha took a scientific approach to his training, the methods by which he researched information, and how he ultimately evaluated the information he found. He contended this was likely a result of his background as a scientist. Although he obtained information from the Internet and peers, he was selective in the information he trusted; he tended "to trust people who are faster than me." Athlete Alpha desired an algorithmic design to training; one that "told him what to do to get the best results . . . as long as the information was verified through a reliable source." In essence he wanted "some kind of proven scientific thing that will actually tell me the answer", thereby eliminating "personal trial and error."

Prior to this racing season, Athlete Alpha had been a self-coached athlete, strictly utilizing the structured training regimen from the book *Be Iron Fit: Time-Efficient Training Secrets for Ultimate Fitness*, by Fink (2010). He stated the book was helpful because, "it told me exactly what to do", relating to training each discipline and the time required on successive days. He obtained additional Ironman training information from his swim coach and peers. He qualified this by stating he learned most of his Ironman related information "from other people and their experiences, I would say is number 1 . . . the training plan I got from a book, but everything else, new techniques, I get from other people." This was consistent with cognitive learning.

At the commencement of the 2013 season, Athlete Alpha characterized his adult swim skills as "above average for a non-swimmer", which he attributed primarily to working with a swim coach at the YMCA. He stated the swim coach helped modify his swim mechanics to make him a more efficient swimmer. The swim coach helped him by demonstrating some technique changes, which Athlete Alpha integrated into his swimming stroke, which exemplified cognitive learning. This efficiency translated into faster swim times. The integration of the changes into Athlete Alpha's swim stroke was an example of constructivist learning. Athlete Alpha characterized his bike skills as "slightly above average", and he characterized his running skills as "slightly above [my swimming and cycling skills]."

Athlete Alpha reflected upon his prior race performances; "my time didn't improve significantly in Ironman 2 [from Ironman 1]." He reflected upon the reasons for the lack of improvement and decided he needed to obtain some new training information and methods. He stated, "I realized I needed a little direction . . . because I want to beat my previous time." He researched several options, ultimately choosing *Endurance Nation*, a monthly subscription, online coaching service, that provided athletes a forum to share training and racing information, e-books that provide training and racing instructions and information, online training plans, and access to a "coach" who provided guidance on any topics associated with triathlon. He chose *Endurance Nation* because of positive reviews and feedback from other athletes. He qualified that he researched the athletes who had provided the feedback about *Endurance Nation* and found them to perform at a high level, evidenced by fast race finishes.

Athlete Alpha obtained a training plan from *Endurance Nation*. The training plan was markedly different than the one he previously used from *Be Iron Fit: Time-Efficient Training Secrets for Ultimate Fitness* (Fink, 2010). Although both plans trained on "time" and not distance, *Endurance Nation* was focused on interval training, which is characterized by shorter, intense periods of activity, rather than the traditional long, less-intense, slower endurance training periods proffered by other plans. Despite the differences, he stated he was "doing the plan exactly as it says so that way if I'm not faster, I will know." Constructivist learning encompassed the learner taking information and making it personally meaningful; Athlete Alpha did that when he adopted the new training plan.

Athlete Alpha registered for three Ironman Triathlons during the 2013-racing season, specifically Ironman Texas on May 18, 2013, Ironman France on June 24, 2013, and Ironman Wisconsin on September 8, 2013. His season specific goals were to improve his time and standing in Ironman Texas and Ironman Wisconsin as compared to his previous races. He was racing Ironman France mainly for the experience of travelling and racing in Europe, and with substantially less emphasis on a temporal goal or personal best.

During the triathlon season, Athlete Alpha began working on changing a few aspects of his run technique; "I picked up a few things here and there . . . the biggest thing that changed for me was that I learned how to run with higher cadence and shorter strides." These changes were the result of talking with other athletes who negotiated the Ironman distance and "from watching people." These conversations and observations led him to believe that shorter strides would equate to a more efficient and faster running

technique. He subsequently operationalized what he learned and "realized, yeah, my legs don't get nearly as tired as quickly with these shorter strides." He also noticed, "The form change overall helped a lot and just running more and faster gradually." These changes exhibited initial cognitive learning and a subsequent shift from cognitive learning to constructivist learning.

Also during the triathlon season, Athlete Alpha continued to attend coached swim classes at the YMCA. He stated the time he spent on the swim was "pretty much the same [as previous years]." He stated "every once in a while I get a little nugget from the coach, which I try and fix;" however, he did not spend a substantial amount of time on stroke mechanics or swim technique. This season, he had other athletes and coaches video record him swimming. He was able to observe his swim mechanics and make changes based upon what he observed. He then "felt the benefits" of those changes through "feeling less fatigued for the rest of the race." This observation and advice resulted in cognitive learning. "Feeling the benefits" typified constructivist learning.

As Ironman Texas approached, Athlete Alpha noticed he was swimming considerably faster. He stated, "I'm not sure exactly what changed . . . if it was me watching myself on video or the coach saying something, but all of a sudden I'm a good 10 seconds faster for 100 [yards]." He then stated, "I think it's all about keeping my elbow up much more and I was crossing over a little bit before." He stated that was one of the swim mechanics changes he made subsequent to watching himself on the video.

At Ironman Texas, Athlete Alpha stated, "he felt great going into the race." He characterized the swim portion of the race as "rough"; however, he was satisfied with his time, and it was consistent with what he would have projected. He stated that the bike

portion of the race was "fantastic." He followed the race plan provided to him by his *Endurance Nation* and, "It was exactly sort of what they said would happen and what I trained for, and I felt great until about mile 95 to 100 and then my legs started feeling a little tired but overall it was just great." Athlete Alpha explained that the Ironman Triathlon was a race consisting of three disciplines. An athlete's performance and decisions made during one discipline can have dramatic impacts on subsequent disciplines. For example, not taking in enough calories on the bike portion of the race might not impact the performance on the bike; however, this could have a profound impact on the performance of the run.

Although the bike portion of the race went well, Athlete Alpha stated he made some egregious errors during the cycling portion of the race that impacted the remainder of the race. These errors became readily apparent during the run portion of the race, and during reflection after the race. He stated, "I messed up nutritionally on the bike, and it ended up killing the whole race . . . more specifically, it was hydration more than nutrition." Athlete Alpha stated the ambient temperature was in the 90's. During any race, temperatures in the 90's are noteworthy.

In fact, shorter races have been modified or canceled subsequent to extremely hot temperatures. For example, on July 7, 2012, Ironman Muncie, a Half Ironman race, was "shortened for safety reasons" due to an Excessive Heat Warning issued by the National Weather Service (World Triathlon Corporation, 2013, p.1). Athlete Alpha stated that with the elevation of the ambient temperature, he did not take in enough fluids. He recalled the run portion of the race:

> I was on the verge of collapse and I teetered on the line because I knew once I quit sweating completely, I would be in trouble because I knew I must be super, super hot; to combat this, I would make myself walk and pour water [over my head and body] until I felt a little bit better and I would run again until had this 'I'm about to collapse feeling'.

Athlete Alpha stated his experience as an athlete, combined with his knowledge and experience as a physician, helped him diagnose his heat and fluid related issues. Ultimately, the unintended experiment of not having enough hydration and nutrition during the race reinforced his understandings of the importance of hydration and nutrition during a race. He also stated that, in the future, he must remain attentive to the effects of temperature variations. This understanding and personal beliefs about hydration, coupled with the evaluation of the race, specifically the development of a personal theory about hydration issues, represented constructivist learning with a shift to experiential learning. Developing theories and testing those theories was a fundamental source of experiential learning.

Athlete Alpha stated he reflected upon the race and learned some additional methods and tactics relating to Ironman distance racing and pacing; specifically, he "learned a good way to race; mainly all related to [using a power meter on the bike]." He then stated he "wants another shot at that exact set of conditions because I think it would have gone much better if I just hydrated appropriately." Athlete Alpha had a brief period between Ironman Texas and Ironman France, lasting approximately three weeks. The recovery time after completing an Ironman varied by the individual. Generally, it was accepted practice to have several weeks of reduced training followed by a gradual

increase in training load and intensity following a race. It was rare for an athlete to negotiate multiple Ironman distance races within several weeks of each other the way Athlete Alpha did.

Several weeks later, Athlete Alpha raced Ironman France. He stated he was doing the race for fun. Despite his intentions he stated he prepared differently, which he intended on using in future races. He chose to make these changes because he was less concerned about the impacts those changes would ultimately have on his final performance, i.e. race time in this race. For example, he adjusted the amount of time he "tapered" before racing. He stated that circumstances dictated far fewer workouts than he was accustomed to immediately preceding the race. This led to a start where he felt "very fresh" going into the race.

He stated the swim portion of the race was the "roughest swim that I could ever imagine." The Ironman swim varied dramatically by location. Some of the swim portions of the race were a time-trial start, i.e. one or two athletes starting at a time. Some of the swim portions were a mass start, i.e. waves of hundreds of people starting at the same time. Inherent to the mass start was a substantial amount of body contact. The swim at Ironman France was a mass start. Athlete Alpha stated the amount of body contact, coupled with the tumult of the water caused by the confines of an open water swim in a canal with walls, created what he described as "a very difficult swim." Athlete Alpha stated that upon reflection, there was nothing else that he could have done to prepare for the swim.

Athlete Alpha experienced some difficulty on the bike portion of the course. He dropped his water bottle containing a necessary calorie dense sport drink that he was

accustomed to drinking. Despite his knowledge that eating or drinking something untested and new on race day could have disastrous implications, he modified his race plan for the remainder of the bike and during the run portion; "I alternated Coke and Powerade; which is also brand new for me." Coke and Powerade were available on the course at the volunteer-staffed aid stations. He stated he was able to make these dynamic decisions because of his prior Ironman experience, and "knowing what to expect and how my body would respond." He stated he knew taking in calories that might not be optimal was better than not taking in calories at all. Despite the difficulties, "I finished in 10:46, which was my best time ever, which was very odd given the build up to it, and that I just raced five weeks earlier." Athlete Alpha stated he was unsure why he achieved a personal-best time despite all the difficulties encountered.

The last race of the Ironman season for Athlete Alpha was Ironman Wisconsin, which was approximately two and a half months after Ironman France. The swim portion of the race began with a mass start. Despite the mass start, Athlete Alpha stated the swim went exceptionally well; "I got out at 1:05, which for me is my fastest swim ever and I didn't kick hardly at all . . . I was super fresh, feeling good." Many of the issues experienced during Ironman France were alleviated because the swim was not within the confines of a canal making the water far less tumultuous. The absence of kicking was something that Athlete Alpha incorporated into his swim stroke because, after experimentation, he found that his energy was conserved. This experientially learned knowledge translated into faster bike and run times.

The bike portion of the race introduced some challenges never encountered before. "Everything is going fine and about 10 miles in, all of a sudden it just kind of hits

me that my legs are just dead." Athlete Alpha stated that nothing appreciably changed that would have caused this phenomenon occur; "I don't really know what happened . . . I had no nutritional problems . . . I made sure I hydrated well after Texas' disaster . . . it was a struggle on a bike from really early on, which just hasn't happened before." This difficulty on the bike impacted the run portion of the race. At the commencement of the run portion, when Athlete Alpha realized he would not hit his target time, he "just sort of sauntered around and enjoyed the last Ironman of the year." It ended up being his slowest Ironman to date.

During the triathlon season, Athlete Alpha noticed a profound increase in his bike speed evidenced by a "20% increase in my FTP test, which I take every three to four weeks." He attributed this increase to the interval training and the use of a power meter on his bike, which was also mandated by the *Endurance Nation* coaches. He stated, "training by power is the biggest thing that [*Endurance Nation* has] done for me." He stated, "I will continue to train with power; in my opinion, there is no single piece of equipment that impacts triathlon performance more than the power meter." This belief was grounded in constructivist learning. Although he initially cognitively learned about training and racing with a power meter, he then adopted and made the learned information personally meaningful, which was representative of constructivist learning.

Athlete Alpha attributed the largest improvements in triathlon athletic performance this season to training and racing with a power meter. Athlete Alpha spent a significant amount of time learning how to operate, and effectively utilize, the power meter and felt, "the time investment was well spent." Much of the initial learning occurred cognitively, through reading books and information provided to him by the

Endurance Nation coaches. However, he began to operationalize what he learned and made it useful to his situation. For example, Athlete Alpha read about power zones in Allen and Coggan's (2010) book, *Training and Racing with a Power Meter*. Much of the information learned was reinforced through information learned from the *Endurance Nation* coaches and other athletes. He subsequently used what he learned in races, which ultimately served as reinforcement. He practiced and observed noteworthy gains in his performance, marked by a quantitative change in his FTP, which resulted in a faster bike finishing time. Athlete Alpha stated he planned on experimenting with power zones in upcoming triathlon seasons. Power zones were ranges of power output that were optimal for certain distances. This experimentation and theoretical development was representative of experiential learning.

Athlete Alpha attributed other major gains to using interval training, which he learned from the *Endurance Nation* coaches. For future training, he will continue to train using intervals with some modifications that he believed were best, based upon a combination of his experience with *Endurance Nation* and his personal athletic abilities. Although he felt his running skills were strong, he was going to seek out coaching to determine if there was room for improvement; "I am going to hire this guy in Indianapolis who is a running coach just for one or two sessions, just for form . . . and mechanics"

At the end of the season, Athlete Alpha developed a personal theory about swim improvement. In his experience, he stated he was an average swimmer. He had spent time considering how he could improve his swim time without negatively impacting his overall race time. Historically, the time he spent on swim improvement was mainly

focused on "being more relaxed and trying to be more efficient." Conceptually, he recognized that if he spent more time focusing on improving his swim, he might get "a few minutes faster." However, this few minutes might be to the detriment of the bike or run portions of the race. Instead, he theorized that time spent training on the bike or run portion of the race could equate to a much faster finish. Although he changed some of his swim mechanics, specifically reducing the amount that he kicked, he opted not to change his swim training.

Athlete Alpha initially learned through cognitive methods. He received training information from *Endurance Nation*, his master's swim coach, reading Internet information, and talking to other athletes. From *Endurance Nation* he learned a new way to train, i.e. interval training and utilizing a power meter. He subsequently took that information and incorporated it into his training regimen, thereby making it personally meaningful to him. This was a constructivist approach to learning. Finally, Athlete Alpha took those conceptualizations and experimented with them, which was classified as experiential learning. Throughout the entire learning process, Athlete Alpha learned behaviorally by continuing to practice what he had learned.

Case Two – Learning Progression 'Bravo'

Athlete Bravo was an athletic, Caucasian male, 46 years of age. He was not married, was in a cohabiting relationship, did not have children, and was in business management by trade. He competed in one Ironman Triathlon prior to this racing season. He characterized himself as both a cognitive and constructivist learner, stating, "I learn a lot from other people . . . [but] once I get the basics, I need to do it on my own." Athlete Bravo did not have a structured triathlon, swim, bike, or run background. His prior

athletic experience was grounded in youth baseball and soccer. Athlete Bravo was less concerned with "podium finishes", and classified success as personal improvement in the sport; specifically, he measured triathlete success in terms of time, which he compared to his personal best times in specific distances.

Athlete Bravo obtained his triathlon information from a number of sources, including books, magazine, and other triathletes; however, "once I get the basics, I figure out how it works for me." This exemplified cognitive learning with a transition to constructivist learning. When he began doing long distance triathlon, i.e. the Half Ironman, he obtained information from a number of sources, but operationalized it on his own. However, at the Ironman distance, Athlete Bravo, out of a self-described sense of "fear", used a coach. More specifically, he stated, "like I need discipline, I need a schedule and I need someone to tell me how to be successful at this." He stated that he was comfortable enacting what he was told to do, i.e. operationalizing and making the learned information personally useful to himself, but felt that he needed to obtain information from a source from which he could request clarification and additional information from. To this end, he utilized a coach for the 2013 training season.

Athlete Bravo did not have formal swim training. He stated, "I grew up swimming in lakes, but never knew proper technique." He developed his swim technique after deciding to compete in triathlon by attending classes with a coach and talking with other triathletes and swimmers at the pool. He tried what he cognitively learned from these sources and developed a swim stroke and method that worked for him. Despite the lack of a structured swim background, Athlete Bravo characterized his swim skills as "pretty decent . . . usually finishing in the top 30% [of all swimmers in the race]."

Athlete Bravo stated he had some significant cycling experience before beginning triathlon, "completing some 100 mile rides, and stuff like that, prior to ever getting into triathlons." Athlete Bravo stated he had no formal running training prior to triathlon. His running experience commenced with "jogging just to be healthy . . . morphed into racing the 5K . . . then a 15K . . . and, then I went to a marathon and that was it. It's just like I enjoy running." He stated, "Probably almost everything that I learned [about cycling and running] is usually from other cyclers [sic], or other swimmers . . . I pick up things from just being around and training with other people." Athlete Bravo cognitively learned from others, then constructively operationalized the learned knowledge.

Athlete Bravo raced in one Ironman race during the 2013 season, which was Ironman Lake Placid, on July 28, 2013. Athlete Bravo had never raced Ironman Lake Placid. He stated he obtained his information about the race through the written race materials and "I will listen to others because I know quite a few people who've done Placid." He stated he heard that "Lake Placid has a very brutal [swim] start." Athlete Bravo planned on using the cognitively learned information to enhance his training and race experience.

During the triathlon season, Athlete Bravo worked on changing a few aspects of his swim technique. He stated he wanted to re-evaluate his skills by, "looking at everything; and I know how I tend to learn, which is I just follow other people and I don't have a lot of hands on with my coach and so I started thinking, you know what I'm going to start pushing more to get more hands-on to get feedback." He actively pursued feedback from his coach, who provided him some technical modifications to his stroke, i.e. how he pulled his arm through the water. From this, he made some changes, which

he felt improved his efficiency in the water. As he reflected upon the source of his success, he determined that it was the result of "improving my efficiency . . . [by] concentrating on my form." He was able to constructively operationalize what he had cognitively learned.

During the triathlon-training season, Athlete Bravo continued to evaluate his running skills, "I'm better than I used to be but I know I can improve it, so that's the other thing I want to work on." Athlete Bravo was in an experiential learning cycle relative to his running skill. Evaluating his current skill level while referencing his past skill level was indicative of reflective observation. His recognition that he "knew" he could improve was indicative of personally meaningful and applied knowledge, which was classified as abstract conceptualization. Finally, he attempted to actively experiment throughout the season, "trying to incorporate certain things that other people show me who are good." Subsequent to the learning process, he stated he felt he improved his run through utilization of a "quicker cadence."

At Ironman Lake Placid, Athlete Bravo stated, "he felt ready . . . like I had peaked . . . I was ready physically and mentally." He stated the swim portion of the race "went well." He stated he followed the swim with, "a really good bike [race] . . . I had a really good bike time." He began to develop some problems approximately three miles into the run portion of the race where, "my stomach is turning and I'm getting really sick." The gastrointestinal distress forced him into a "Run, walk, run, walk, run, walk; Then it starts happening when I'm on the walk . . . I started getting dizzy." He knew from previous training and race experience, "what I'm doing right now is not working [and] I've got to figure something out." Although he had not vomited in a race prior, he knew of others

who had and were able to finish the race. Athlete Bravo stated he felt nauseous and allowed himself to "get sick [and vomit]" and that corrected the problem. He was able to "finish the race running." Athlete Bravo did not meet his temporal goal; he attributed the missed goal to the gastrointestinal problems. Athlete Bravo reflected on the race and was unsure what caused the problems; however, he stated he learned how to deal with these problems if they arose in the future. This reflective observation, coupled with the unintentional experimentation, was representative of an experiential learning cycle.

Athlete Bravo contributed a large percentage of cycling improvement to using the Computrainer. He learned of the Computrainer from the reported successes of other athletes. He stated he utilized Computrainer, "last year too but not to the extent that I did this year." When he transitioned from the Computrainer, an indoor cycling trainer, to his outdoor cycling training he commented, "It was like holy crap, this made a huge difference over the winter." Athlete Bravo stated the weather during the 2013 training season precluded him from outdoor bike training for the early part of the training season. He stated using the Computrainer proved a useful strategy in dealing with this issue. In fact, he stated "I would not go a winter without using Computrainer." He described the difference in training as "huge . . . it really pushes you." Despite these gains, he was not sold on utilizing a power meter on his bike; "I'm starting to get convinced . . . I don't have it yet, but I'm getting convinced." This lack of conviction was due to "stressing out on race day looking at [the power meter] rather than focusing on how I feel." This understanding of the benefits of the power meter, coupled with how it was personally meaningful, was representative of a constructivist-learning paradigm.

Athlete Bravo also contributed a large percentage of his success to utilizing a coach. He felt like he needed the cognitive feedback loop, where he was able to obtain information, ask questions, and obtain feedback from the coach. "When I decided to sign up for the Ironman, that's when I signed up for a coach and I just said I don't think I can do this without a coach." He was satisfied with his decision to use a coach and stated he was able to cognitively learn from the coach and constructively operationalized what he was taught.

Case Three – Learning Progression 'Charlie'

Athlete Charlie was an athletic, Caucasian male, 40 years of age. He was not married; however, he was in a cohabiting relationship. His partner was also an endurance athlete who was competing in her first Ironman Triathlon during the 2013 racing season. Athlete Charlie did not have children and was a computer programmer by trade. He competed in eight Ironman Triathlons prior to this racing season. He characterized himself as an experiential, constructivist, and cognitive learner, stating, "learning on my own makes that learning process stick a lot quicker . . . if a coach or someone else tells me . . . I usually will take it with a grain of salt and be like okay I'll try that but if I like experience then it really imprints in me . . . I learn it a lot easier if I do it myself or if I experience it myself or if I solve a problem myself or whatever."

Athlete Charlie was a competitive athlete and measured triathlon success in terms of annual improvement; "I think I take that every year and just make sure I'm improving." Athlete Charlie was concerned with his placement in the race, i.e. seeking podium finishes or a temporal goal of qualification for the Ironman World Championships in Kona, Hawaii. Athlete Charlie began triathlon as a self-coached

athlete. He obtained much of his triathlon information from "just reading a lot books and online forums . . . and once I started hanging out with more triathletes . . . I basically learned from them and just asking them 'hey what are you doing this weekend?'" In essence, Athlete Charlie embodied the endurance-learning pathway. He cognitively obtained information from a myriad of sources. He then constructively operationalized what was cognitively learned. He experimented and developed theories on the constructively learned knowledge, which was representative of the experiential learning cycle.

Athlete Charlie stated, "My ultimate goal is Kona so qualifying for that is fairly difficult." Toward that end, he was utilizing a coach for the 2013-racing season; "I need somebody else to help me get past that hump and to really push a little bit further . . . [to provide] some level of accountability." Athlete Charlie stated accountability included having to report regularly to a coach about training session quality or sessions that were completed or missed. Further, having someone objectively evaluate his performance and provide feedback on areas for improvement was desired. Having a coach also encouraged him not to slack off on his workouts because he did not want to disappoint his coach. Having someone else involved served as a positive motivating factor to perform at his best. Athlete Charlie was registered for three Ironman Triathlons during the 2013-racing season.

Prior to his adult triathlon pursuits, Athlete Charlie had minimal structured swim training; however, he stated he had always been comfortable in the water, "My grandma had a pool growing up so I've always been in the water." At the commencement of this

season, he characterized his adult swim skills as his "least strong discipline." He stated, "I'm not really great at swimming." However, he qualified the statement by adding,

> I kind of take the philosophy that you're only out there in the swim for an hour and twenty minutes [during an Ironman race]. It's basically your warm up. So I think that if I spend like four hours a week, five hours a week in the pool, I could probably get better, but that better means five to ten minutes in the race on race day. If I spent that exact time on the bike or on the run, I think that would translate to more speed overall over the entire race.

He finished by stating he would like to be a better swimmer; however, this improvement should not be at the detriment to the other disciplines. In other words, he felt, "the return on his time investment is better served training for the bike or run." This reflective observation was representative of experiential learning.

Athlete Charlie stated he had some significant cycling experience before beginning triathlon. He stated cycling provided him the most enjoyment; in fact, he biked regularly for leisure and travel. He felt he had made tremendous gains on his bike due to regular training and the use of the Computrainer and felt like he was "getting better at being smart about racing on the bike." This improvement based upon the Computrainer was representative of cognitive, constructivist, and experiential learning. His knowledge of the Computrainer was obtained cognitively; however, his use of the Computrainer had become personally meaningful, representing constructivist learning. Finally, experimenting and developing theories about different ways to use the Computrainer was representative of experiential learning.

Athlete Charlie began his endurance career as a runner, competing in youth track. He stated he was "focused a lot on trying to be a good long distance runner." After completing several marathon distance races, he transitioned to competing in triathlons and became interested in the challenge presented by Ironman distance events. He stated, "I just always assumed that the marathon was the hardest part of Ironman and I guess it kind of is, so once I got a couple of marathons under my belt I was like okay, I can do the marathon part now." He felt comfortable with swimming and had an easy time gaining the necessary skills on the bike.

During the triathlon season, Athlete Charlie began "really trying to focus on being more efficient in the water." Through his coach, his training partner, and "other people", he arrived at the conclusion that "swim training isn't all about fitness; it's mostly about technique so and I think I can probably use some help getting the technique." He received some pointers from his training partner, an advanced competitive swimmer, "about keeping my hands a little bit further apart, wider hand position and then hopefully that's going to translate into a little more efficient swim stroke." He also used the camera provided to him for use in the study. He observed his recorded swim stroke and, with the assistance of his training partner, made some modifications to his swim stroke. This represented cognitive and constructivist learning.

At Ironman Texas, Athlete Charlie finished 16th in his age group. Although objectively, this performance was superior to most age-group athletes, he classified his performance as, "good, not great." He attributed his success to a number of factors. First, this was his second time negotiating Ironman Texas; he raced this course in 2011. He stated his familiarity with the course was an advantage. He stated the course was

inherently challenging; however, the weather conditions were extremely hot. He stated he determined that he was going to have to slow down on the run a little bit in an effort to run the entire course. Athlete Charlie explained that it was mathematically far better to maintain a run pace through the entire run, rather than end up having to walk and run due to heat. For example, it was better the maintain a 15:00 minute/mile for 26 miles than a 12:00 minute/mile for 13 miles and 22:00 minute/mile (walking pace) for 13 miles due to having to slow down. His experience from 2011 better prepared him for these challenges; he stated, "I was a little bit more prepared and knew what to expect and I knew that the run was going to be brutal." Second, in evaluating the race, he stated he would not make any major changes based upon his performance.

At Ironman Tahoe, Athlete Charlie performed well considering some adverse weather conditions. Subsequent to the race, he reflected upon his training and the race. He stated, "Especially the training for this race I definitely would have trained differently." Athlete Charlie stated that the cycling portion of the Tahoe course was "very hilly." He added, "training more for the conditions of the race . . . for example, train on hills if the race has hills . . . For Tahoe, it should have been hills, hills, hills." He explained that training for hills required training on hills, or performing training that simulated riding hills, i.e. Computrainer hill courses. He added that he did not train enough for these conditions; he added, "There is no set algorithm that states you have to train x hours for hills for this race . . . a lot of it is trial and error and experience." This understanding of what was necessary for him to personally succeed was representative of experiential learning.

Athlete Charlie contributed a large percentage seasonal cycling improvement to using the Computrainer. He stated he utilized Computrainer last year, "but didn't focus on the power number (watts)." Rather, he "used it mainly just to maintain fitness . . . Now this year on the bike over the winter, I've been reading a lot about power and how it helps your training and so we're trying integrate a lot with more of those power based workouts." He learned to focus on the power number through experience and from other athletes, books, Internet sources, etc.

Ironman Arizona was temporally beyond the parameters of this study. Despite an exceptional finishing time, 10 hours and 5 minutes, Athlete Charlie did not qualify for Kona this season.

Case Four – Learning Progression 'Delta'

Athlete Delta was a Caucasian male, 26 years of age. He was married, did not have children, and worked for a nonprofit organization. He competed in two Ironman Triathlons prior to this racing season. He characterized himself as a cognitive and constructive learner, stating he learned from "websites, triathlete magazines, and books . . . kind of a collaboration of the last six years of training and kind of picked it up that way." Athlete Delta was a unique triathlete; he had competed at the Ironman World Championships in Kona, Hawaii. He was able to qualify through a unique lottery program that allowed age-group athletes to apply without earning a qualifying time. Annually, there were only 205 of these spots available. Athlete Delta was fortunate enough to have gained one of them.

Relative to measuring success in triathlon, Athlete Delta stated "It used to be all about time, now it's more about feeling good afterwards, [and] staying positive

throughout the whole race." Athlete Delta maintained he raced for personal wellness. He contended the stress of trying to place detracted from the gratification he received from participating in these races. He argued that simply completing the distance was a victory.

Prior to his adult triathlon pursuits, Athlete Delta had minimal structured swim training, "I've always been a swimmer but never any formal training." When he began triathlon, he sought the advice of a swim coach, who dramatically helped him improve his swim stroke. Athlete Delta stated he had no formal bike racing training, and that learning to race on a bicycle was "basically self-taught." Athlete Delta's run training was focused primarily on the running accompanying youth and semi-professional football. He stated that when he began "running long distance, I had no idea what I was doing, it took a couple of hard runs to realize I need to back down and it's all about stride and posture and positioning." His understanding of an effective running technique became personally meaningful, which was representative of the constructivist-learning paradigm.

Athlete Delta was a self-coached athlete. For the 2013 racing season, he developed his own racing plan, "basically taking two training plans from different places and putting them together." He then corroborated his training plan by comparing his training plan with friends who had plans developed by coaches, "I've followed friends who have professional coaches on the side and looked at their training plans to make sure they kind of correspond." His promulgation of a training plan was representative of cognitive learning.

Athlete Delta registered for one Ironman Triathlon during the 2013-racing season, which was Ironman Texas, scheduled for May 18, 2013. Athlete Delta desired a personal best time in this race; however, he was completing the event primarily for enjoyment.

During the triathlon season, Athlete Delta spent time focusing on each individual aspect of the sport. He shifted this focus weekly; one week he would focus primarily on improvement and distance on the bike, one week he would focus on mechanics and distance on the run, and one week he would focus on distance on the swim. He still trained every discipline every week; he just focused on one discipline on each respective week. The amount of time spent training varied by week. At the peak of training, he spent 20-25 hours training.

Athlete Delta stated he did not believe he could improve on the swim, "I really am not going to get that much faster than where I'm at right now." He focused primarily on increasing his distance to "build his endurance." He stated he spent more time running this season than he had in previous seasons because of plans to run a 50-mile ultra-marathon before the Ironman. This left him feeling "stronger in the run than I ever have been before going into an Ironman."

As Ironman Texas approached, Athlete Delta stated he felt his training was deficient and had not properly prepared him for the race. He cited injuries, illness, adverse weather, job responsibilities, and assistance proffered to friends for his lack of preparation. Going into the race he stated, "Mentally, I'm prepared; physically, I could be better." However, Athlete Delta stated he would finish the race "no matter what." He continued, "I have the basic physical fitness necessary to finish the race and I know mentally what it takes to finish; I have both." Athlete Delta stated that an athlete must be committed to push through pain and adversity to finish an Ironman Triathlon. He stated that although finishing an Ironman required a high level of physical fitness, the race also required a mental commitment to finish. In fact, "if you don't have the commitment to

finish, when some major obstacle arises, you have to make a decision while you are hurting, tired, and not feeling great . . . these decisions are best made prior to feeling that way." Athlete Delta believed that ultimately, the mental preparation for the race was as important as the physical preparation for the race.

At Ironman Texas, Athlete Delta stated, he had a good swim despite "a lot of physical contact." He got out of the water, "feeling good; like everything clicked." He began the bike portion of the course feeling strong. He stated he mistakenly deviated from his nutrition plan for the first 40 miles of the bike, eating and drinking more than planned. He stated this mistake was the result of not paying attention and adhering to his race plan. This yielded an upset stomach, nausea, and an inability to take in fluids or calories for the remaining 72 miles. Compounding the situation, Athlete Delta stated the ambient temperature was extremely hot. Relying on past experience and training, specifically training in Saint Louis heat, racing in the heat of Kona, Hawaii, and experience with gastrointestinal distress, Athlete Delta took a short break at an aid station and then finished the bike portion strong. Athlete Delta had nutrition, fluid, and heat related problems through the run. He was able to finish the race, despite concern that physically he would be unable to make it to the finish line. He stated completing the race "was all mental." Athlete Delta stated mental toughness, specifically making the decision to finish the race unless physically unable to do so, was a driving factor in Ironman racing. He stated he developed this mental toughness through racing and training.

His Ironman Texas finishing time of 16 hours and 4 minutes was slower than his Ironman Kona finishing time of 14 hours and 29 minutes. He stated this time differential was due to the number of training issues prior to the race, and all the issues he had on the

course. Subsequent to Ironman Texas, Athlete Delta stated he wanted to become more competitive in subsequent triathlon seasons. He reflected on his seasonal performance and stated he believed with some speed work training, and maybe the assistance of a coach, he could break personal records.

Case Five – Learning Progression 'Echo'

Athlete Echo was an athletic, Caucasian female, 35 years of age. She was not married; however, she was in a cohabiting relationship. She did not have children, and worked as an HR Manager for a manufacturing firm. She never competed in an Ironman Triathlon prior to this racing season. She characterized herself as a cognitive learner, stating she learned better if "someone teaches me." Athlete Echo did not have a structured triathlon or cycling background. Her prior athletic experience was in high school swimming and tennis.

Athlete Echo was competitive and measured triathlon success in terms of completing the race and a time goal. Although she had not competed in an Ironman distance event, she was a competitive runner at the marathon and half marathon distance. Her time goal was triadic; "like what I really want my time to be, what I'm going to be okay with, and what I'm like, 'Yeah, that's okay.'"

At the commencement of this season, Athlete Echo characterized her adult swim skills as very strong. She attributed this to her structured swim training and work with a coach when she began racing triathlons. She characterized her bike skills as "my least favorite event, because I'm not very good at it, so it's my least favorite." She characterized her running skills as very strong; in fact, she is a Boston Marathon qualifier

during this racing season, which required a considerably fast marathon completion time of 3 hours and 40 minutes in a qualifying race (Participant Information, 2014).

While training for her first Ironman, Athlete Echo was also training for the Boston Marathon. She was registered for two Ironman Triathlons during the 2013-racing season, specifically Ironman Texas, which was held on May 18, 2014 and REV3 Sandusky, which was held on September 8, 2013. The Boston Marathon was held in April, which placed it approximately a month prior to Ironman Texas. Although she had never raced at the Ironman distance, she hoped to hit a temporal goal in Ironman Texas and REV3 Sandusky.

This was not the first time she trained for both a triathlon and a marathon; however, she had never trained for an Ironman and a marathon. Athlete Echo was a self-coached athlete and developed her own training plan for the 2013 season. She utilized the "same format that I followed [for my Half Ironman] a couple of years ago . . . it's what I've been using for the last four years and I think my results have showed that it works." This was representative of both cognitive and constructivist learning.

During the triathlon season, Athlete Echo provided video of weight training. She stated she incorporated weight training into her regimen several years ago subsequent to reading about the benefits of weight training. Athlete Echo was the only athlete who touted the benefits of weight training in a triathlon-training program. The initial learning about weight training was cognitive. She stated she lifted weights two days a week because that worked well with her training in swimming, biking, and running. This plan incorporated the cognitive learning and transformed it into a constructive learning experience.

During the triathlon season, Athlete Echo focused on becoming more comfortable on the bike. In a video she provided, she stated she felt she needed to "work on her leg strength, since the bike was her weakest sport." Although this proved difficult as the training season for Ironman Texas began during the winter, she found innovative ways to improve her cycling. For example, she spent a substantial amount of time training indoors on the Computrainer. In addition, she spent some time outdoors mountain biking, when the weather permitted, because she "felt this really helped her build leg strength." She stated she learned about this strategy from her training partner, Athlete Charlie. She found that the strategy improved her leg strength and gave her additional confidence. This learning originated from cognitive sources, and converted to constructivist learning.

In addition to the indoor cycling training, Athlete Echo continued training for the Boston Marathon and going to the pool for swim practice. She did not focus on modifying her technique in any discipline; rather, she focused on increasing her endurance in each discipline.

At Ironman Texas, Athlete Echo stated, "she felt scared, but ready." This fear was grounded in venturing into the unknown, i.e. her first Ironman experience. However, this fear was tempered by a feeling of preparedness that she attributed to racing at a high level in other races. Athlete Echo was an experienced swimmer, and she characterized the swim portion of the race as good. The bike portion of the race was without incident; however, the intense heat during the run portion of the race definitely impacted her ability to run. Athlete Echo stated she had to adopt a run-walk strategy to finish the race. This was an unusual strategy for her; however, her experience racing in heat guided her

decision. This experience was grounded in running in other races in hot conditions. Her knowledge from these races taught her not to overexert at risk of not being able to physically finish the race due to heat related illness. Although she did not meet her temporal goal; under the circumstances, she was not disappointed.

At REV3, Athlete Echo stated she "didn't really change any of her mechanics and had a good race." Athlete Echo stated she relied on her swimming training and prior swim experience from Ironman Texas and finished the swim 6 minutes faster in the REV3 Sandusky event. She stated she felt that her experience in Ironman Texas helped her maintain a good pace on the bike. Finally, she had a good run. She finished 2nd in her age group, thereby earning a coveted podium spot in her 2nd Ironman distance race. In fact, Athlete Echo was the only athlete participant in this study to earn a spot on the podium during an Ironman event this season. This finish reinforced what she had learned prior to, and through, the Ironman racing season.

Athlete Echo stated she planned on racing in future Ironman distance events. She reflected on her race performances, stating she felt good about her swim and run performances, but "I feel like I've kind of hit like a ceiling [on the bike] . . . and I need to figure out what I need to do to go above that." She stated that upon reflection, "I need to use my power data a little bit more and figure out what that means exactly." She stated she would continue to train for races utilizing the training plan that she has used, "I feel like the plan that I have, it's like I don't want to mess with it too much, because it's working for me." This post-race reflection, coupled with a plan for the future, was representative of experiential learning.

Athlete Echo learned cognitively and subsequently operationalized what she learned. In two disciplines, specifically swimming and running, Athlete Echo was already performing at a high level at the commencement of the season. Through constructivist and experiential learning, Athlete Echo integrated these disciplines into the context of racing triathlon.

Case Six – Learning Progression 'Foxtrot'

Athlete Foxtrot was an athletic, Caucasian male, 50 years of age. He was married, had adult children, and was in business management by trade. He had not competed in an Ironman Triathlon prior to this racing season. He characterized himself as both a cognitive and constructivist learner, stating,

> I like it when someone gives me ideas of what to do but I need to actually get out there and do it . . . so I will take what they teach me and . . . try what they say and see if it works for me . . . I've always want to try something and if it works I incorporate it, if it doesn't, it doesn't.

His previous athletic experience was in youth and high school football, competitive racquetball, and weightlifting. Several years ago, he suffered a severe injury weight lifting. His physician gave him instructions to begin running and cycling. Swimming "seemed like the natural progression", and Athlete Foxtrot began competing in triathlons. He initially obtained his knowledge from other athletes, coaches, books, the Internet, and videos.

Athlete Foxtrot's measurement for success shifted since he began competing. Initially, "it used to be how I placed compared to everybody else", now "it's turning to I'm just competing against myself, I don't care what maybe else does anymore, it's me

versus myself." This paradigm shift was the result of race experiences where elite athletes had shown up on race day, thereby decreasing his placement; this "mentally" hurt Athlete Foxtrot's performance. Despite these contentions, Athlete Foxtrot was competitive and strove to "finish on the podium."

At the commencement of the triathlon season, Athlete Foxtrot classified his swimming skills as "probably advanced, but not elite level yet." His background in swimming originated from youth swim lessons. He developed his swim technique after deciding to compete in triathlon by "taking some classes."

Athlete Foxtrot stated he had some significant cycling experience before beginning triathlon; "I was the only kid on my block who got a speeding ticket when I was 16 years old for going 45 in a 25 on my road bike in Little Rock and my mom actually framed it and it's in the house still." He stated he developed a passion for cycling, "I entered mountain bike races all the time because I loved it so much . . . I got 2nd place in one of the first street bike races I ever did, it was the Pepsi challenge, a 150 mile ride up from Carson City up to Lake Tahoe, around Lake Tahoe and back down again." He classified his cycling skills as strong, "I think I'm getting to where I need to be on the bike."

Athlete Foxtrot stated he competed in high school track and classified himself as a "fast runner." During a personal video interview, Athlete Foxtrot provided insight into how he learned running related information. In the video he described learning how to dress for outdoor weather conditions when running,

> It is called the rule of 20 . . . I learned it through other people . . . whatever the temperature is, you add 20 degrees and that's how you dress . . . that accounts for the heat up of the body . . . I have tried it and found the rule to be very effective.

This learning was initially cognitive, with a shift to a constructivist understanding. Athlete Foxtrot continued to explain how he reflected upon the rule, experimented with the rule and found that it did not address "wind chill", and developed his own method for addressing this perceived deficiency in the original rule. This was indicative of experiential learning.

Athlete Foxtrot was racing in one Ironman race during the 2013 season. Athlete Foxtrot began the triathlon season as a self-coached athlete, training with a training partner. He found that by developing his own training plan, coupled with consistent training, yielded excellent results; "if it works, it works." About midway through the season, Athlete Foxtrot hired a coach to help him through his Ironman Triathlon, because "I want to learn to do it the right way the first time." Athlete Foxtrot stated he learned "from other people, when you train for a full, you shouldn't be doing too many long miles either because then you're just wearing your body down." Therefore, he opted to hire a coach to determine the optimal training plan.

During the triathlon season, Athlete Foxtrot "redeveloped his swim stroke, using a high elbow catch." He cognitively learned about the high elbow catch from the book, *Swim Speed Secrets for Swimmers and Triathletes* by Taormina (2012). He incorporated the high elbow catch into his swim stroke and stated he felt this made him a more efficient swimmer, which was constructivist learning. He quantified this feeling by reporting an increase in speed. He also, "redefined how I did my run . . . I was a heel

striker on the run, but I have concentrated and moved it up to a mid-foot strike which is going to save me a ton of pressure on my knees especially in the Ironman distance." He learned about the change in mechanics from other athletes, i.e. cognitive learning. He stated since making those changes, his "times have dropped drastically", i.e. constructivist learning.

At REV 3, Athlete Foxtrot stated, "My swim was great and my bike and run was good." However, Athlete Foxtrot stated, "I don't feel satisfied . . . I didn't hit all my goals; I know I can do this faster." Athlete Foxtrot stated the swim was exactly what he expected from what other athletes had told him. Further, this experience was consistent with his experience with shorter triathlons. He stated he got out of the water, "feeling good and ready to start the bike [portion of the race]." Athlete Foxtrot stated he felt he could go faster on the bike and run. He stated his beliefs were grounded in his race experience from REV3 Sandusky. Athlete Foxtrot stated, "Someone who is a racer is always looking at ways to improve."

Athlete Foxtrot contributed a large percentage of cycling improvement to using the Computrainer. He stated this was his first year using the Computrainer. He stated, "Before Computrainer, I was faster than my training partner. He noted that, "last year, my training partner jumped ahead of me after doing the Computrainer." He cognitively learned, through observation, that the Computrainer provided benefits to his training partner. This served as a catalyst to begin training with the device this year. He noted substantial improvement in his bike speed from use of the Computrainer, which was a result of constructively learning what was initially cognitively learned.

Case Seven – Learning Progression 'Golf'

Athlete Golf was an athletic, competitive, Caucasian female, 46 years of age. She was not married, was not in a cohabiting relationship, did not have children, and was a nurse by trade. She competed in two Ironman Triathlons prior to this racing season. She characterized herself as both a cognitive and constructivist learner, stating, "I like to get advice from other people but I'm more of a 'I have to learn it myself, learn it the hard way' for it to really sink in." Athlete Golf was a competitive swimmer through high school, swimming on a junior elite team. She also ran cross-country in high school. She had no prior cycling background before triathlon.

Athlete Golf was racing in one Ironman race during the 2013 season, specifically Ironman Louisville, scheduled for August 25, 2013. Athlete Golf raced Ironman Louisville two times prior and measured triathlete success in terms of obtaining a personal best time. Athlete Golf obtained her triathlon information from a number of sources, including books, magazine, and other triathletes. She previously used a training plan from a book; however, this year she developed her own training plan based upon what she learned over the past few years.

Athlete Golf characterized her swim skills as "strong compared to most of the other people in triathlon." She was working on better developing her cycling skills through the use of the Computrainer. Athlete Golf removed herself from the study prior to Ironman Louisville; however, it was public knowledge that she successfully completed Ironman Louisville.

Themes

At the culmination of the interviews, the interviews were thematically coded. Several key themes surfaced subsequent to coding. These themes were (a) cognitive learning, (b) constructivist learning, (c) cognitive learning transitioning to constructivist learning, (d) behavioral learning, (e) experiential learning, (f) constructivist learning transitioning to experiential learning, (g) cognitive learning transitioning to constructivist learning transitioning to experiential learning, (h) mental toughness, (i) pain, (j) metrics for success, (k) motivation, and (l) training with power.

Cognitive. Cognitive learning occurs when a person, in this case an Ironman triathlete, absorbs information through listening, watching, touching, reading or experiencing some situation or content and subsequently processes or recalls the information. Social learning, which falls under the cognitive learning umbrella, "stresses the idea that much human learning occurs in a social environment" (Schunk, 2012, p. 118). Cognitive learning was by far the paramount learning method for Ironman triathletes in this study.

Reading. All of the athletes interviewed reported learning from reading. There were a myriad of sources of triathlon information, most with minimal levels of academic rigor. For example, there are books that cite numerous peer-reviewed sources, such as Friel's (2009) *Triathlon Training Bible*. There are magazines that were written based upon anecdotal evidence and conjecture. Most of the athletes were not interested in the rigor of the reading material. Athlete Delta stated most of his information came from "magazine articles, blogs, and online posts." Athlete Golf stated, "I've trained for both [Ironman] races previously with the book that I bought [*Be Iron Fit: Time-Efficient*

Training Secrets for Ultimate Fitness (Fink, 2010)]." Her determination to purchase and use the book was made based upon recommendations on Amazon. Athlete Echo stated her information was mainly obtained from, "Joe Friel's book [*The Triathlete's Training Bible,* (2009)], [triathlete specific] magazines, and online little articles and stuff like that." All of the athletes reported having read, or a familiarity, with Friel, who wrote several seminal triathlon titles.

Several athletes reported considering the source of the information about a specific topic that was learned from reading. Athlete Foxtrot stated, "I learn a lot of it from reading, but then it gets reinforced when I noticed all the elite athletes doing it." Athlete Foxtrot contended that if the professional or elite athletes were doing a specific activity with positive results, it must be beneficial. Athlete Delta stated he obtained information from, "word of mouth, fellow athletes, people who've tried it said it worked for them or didn't work . . . so basically you know what to stay away from when you hear about people you know getting injured doing the same thing." Athlete Alpha reported reviewing research to validate training information, "apparently they've done all these studies, which I looked up and validated; I wanted to understand the science about what I heard about rolling resistance." Athlete Alpha was referring to information learned about cycling tire pressures and rolling resistance. He subsequently stated, "I don't believe something if I only read it one place; essentially, I want evidence . . . I like to verify the information . . . at a minimum I want to see that others have similar thoughts." He then stated, "but in reading all the things [about optimal race weight], it seems like there's no formula, some kind of proven scientific thing that will actually tell me the answer."

Athlete Delta reported developing a training plan based upon information from "*The Triathlete's Training Bible*, other triathlon books, *Triathlete Magazine*, and the Ironman app . . . every place I've looked, every resource I've looked, all the different magazines, all the different books." He stated, "Multiple sources reinforce the parameters of the training plan."

Several athletes reported obtaining some information from a book, but developing technical skill from other athletes, for example, one athlete stated, "I get my training plan from a book but everything else, like new technique things, I get from other people."

Television. A few of the athletes learned from television. Despite the lack of learning from this medium, Athlete Foxtrot reported watching swimming on the Olympics. He stated, "The high elbow catch. I heard about it from different swimmers during the Olympics; I heard them talking about his high elbow catch; it was fantastic talking about [Michael] Phelps." This prompted Athlete Foxtrot to purchase Taormina's (2012), *Swim Speed Secrets for Swimmers and Triathletes*, to learn more about the mechanics of the high elbow catch. Athlete Foxtrot reported believing that since Olympic athletes were utilizing a specific technique, that the technique must be robust. Athlete Foxtrot also observed swimmers warming up in hot tubs rather than swimming laps prior to races. The announcers explained that this technique was used to warm up the muscles without generating fatigue prior to the race. Logically, this made sense to Athlete Foxtrot, so he decided to adopt this into his pre-race repertoire whenever possible.

Athlete Delta reported obtaining Ironman related information from watching the Ironman World Championships on television. However, the interest was less focused on

the mechanics of any discipline, or the training and racing strategy of the athletes, rather "it [was] interesting to see what equipment the athletes use, and how it helps them." This interest served as a motivating factor to continue training for Ironman races.

Internet. Many of the athletes reported using the Internet to obtain triathlon related information. Athlete Charlie stated, "You can find anything on the internet." He continued, "If I am having an issue, all I have to do is look it up; I always find other people having the same issue." Athlete Charlie cognitively learned from other people by reading Internet posts. He subsequently integrated some of what he read into his own training regimen, which was constructivist learning. Athlete Delta also reported perusing triathlon related websites, "I check out BeginnerTriathlete.com, SlowTwitch.com, and some athlete specific blogs for a lot of up-to-date information." He also integrated some of the content into his training and racing repertoire.

Athlete Alpha stated he signed up for an email group to obtain swim tips; "They send you weekly videos with little techniques and then they gave you a webpage to go to download more if you want to get more in detail." Athlete Alpha cognitively learned from watching the videos. He subsequently tried some of the swim techniques and integrated those that he felt improved his swimming skills into his own training regimen, which was constructivist learning. Athlete Foxtrot also reported viewing, "YouTube videos about swimming and style and stuff like that." The Internet provides a forum from which the athletes could cognitively learn a litany of training methods and racing information.

Other Athletes. All of the athletes reported obtaining triathlon training information from other people, specifically, "I've learned throughout the years from

random people, coaches, other athletes, and [triathlon club] members." For example, Athlete Foxtrot stated he sought out specific people to assist in improvement in a specific discipline, "if you want to get better in triathlon, you don't necessarily find a triathlete; you find a runner for running, a swimmer for swimming, or a cyclist for cycling; because those guys know those sports really well." Athlete Bravo stated he sought out faster and more skilled athletes for training and racing information, "I just take pointers here and there from better athletes and keep trying to improve." The athletes were able to cognitively learn from talking to other athletes.

Some of the athletes reported cognitively learning through the observation of others. For example, one athlete stated, "If you watch people run who are not trained to run, they have a lot of bounce and that's a lot of wasted effort." This athlete synthesized the mechanics of another and made comparisons to his own mechanics. Athlete Golf stated, "I volunteer at races and watch how the elite athletes cycle and run." This observation enabled her to observe those faster than her and attempt to emulate some of their mechanics. Athlete Delta reported watching videos of athletes on the Internet to obtain information. The athlete stated, "I take stuff from the videos I think is going to be most effective." Athlete Delta defined effective as faster.

Several of the athletes reported attending group trainings with other triathletes, "I started going to Fleet Feet running seminars and the social runs." Fleet Feet was one of the running stores in Saint Louis that facilitated group runs. These runs were scheduled weekly and were a source of a social running experience and either a structured or semi-structured workout. This social atmosphere contributed to improvement as an athlete because of the ability to collaborate with others about what has worked for them, and

what has not worked for them. Athlete Foxtrot stated he sought out athletic specific support groups; "probably almost everything that I learned either is usually from other runners, cyclers, or swimmers . . . I pick up things from just being around and training with other people." The group atmosphere enabled Athlete Foxtrot the ability to collaborate with others, a cognitive form of learning.

Several athletes reported being "coached" or given guidance by other triathletes. A few of the athletes reported swimming with other triathletes and being offered guidance and suggestions for improvement. Another athlete was attending a cycling-related class with some experienced cyclists. The athlete was given instruction relative to the kinesiology and mechanics of good cycling form during this class; "they would point out, keep a flat foot and the whole thing on how you're supposed to pedal and positioning on a bike." Athlete Bravo stated, "I started doing it, I guess based on recommendations from other people and people at the store just getting me in there to try it." Athlete Foxtrot stated, he learned "from other people, when you train for a full, you shouldn't be doing too many long miles either because then you're just wearing your body down." Athlete Foxtrot stated he was going to try and coach himself before he obtained that advice. Historically, he spent a substantial amount of time training. He planned on continuing that trend until he received the advice to be cautious about the amount of time training, due to the risk of overtraining and injury. This prompted him to seek coaching advice.

Several athletes reported training with a training partner. Athlete Charlie reported, "My training partner and I push each other; we make each other better." Athlete Echo stated she felt like training together was almost synergistic, "the only way

you'll get better is to train with people who are better than you because they'll push you." She then stated, "I definitely learn from [my training partner] on the bike and plus when we do our long rides." This athlete stated she trusted the information from the training partner because of his advanced cycling skill level.

Coach. Athletes hired coaches for different reasons. Athlete Foxtrot stated he felt completely confident in his skills to develop a training plan for shorter distance triathlons. However, he stated he was uncomfortable preparing a training plan for an Ironman distance race. He stated, "I hired a coach . . . she restructured my whole entire training routine." He stated her knowledge, training, and experience as a coach helped him to feel confident in negotiating the distance, "When I decided to sign up for the Ironman, that's when I signed up for a coach; I just didn't think I can do this without a coach." At the culmination of the season, he stated, "I have to give a lot of credit to her because I know I would never have made it through to my first Ironman and finish it without her help."

Several athletes reported using a coach to improve technique. For example, one athlete stated he felt that he plateaued relative to his swim stroke; his coach "showed [him] the benefits of drills . . . to help me develop my stroke." These drills translated to a more efficient stroke, which resulted in a faster swim with less fatigue. The demonstration by the coach was an example of cognitive learning. This should not be confused with how the athlete operationalized what he or she learned, which was an example of constructivist learning. Athlete Bravo stated, "I have heard some people talking about how swim training isn't all about fitness; it's mostly about technique so and I think I can probably use some help getting the technique." He sought assistance from a

coach to improve technique, indirectly improving efficiency, "[the coach] gave me some pointers about keeping my hands a little bit further apart with a wider hand position which will hopefully translate into a little more efficient swim stroke." Receiving information from a coach was cognitive learning; operationalizing the information from the coach was constructivist learning.

Athlete Alpha hired an online coaching service called *Endurance Nation*. He stated the "biggest benefit of *Endurance Nation* is the forums where I can ask other people different stuff." He stated, "*Endurance Nation* has online training plans for different athletes; they have short distance training to Ironman training from beginner to advanced." This athlete reported that he fully immersed himself into their methods for training this season, leading to the purchase of a power meter because "they are all about the power meter for bike training; their plans are dependent upon it." He stated he attempted to corroborate what he learned on the forums and coaches with race finish time that were generally easily located online. He loosely corroborated finish times with success as a triathlete. *Endurance Nation* is primarily a cognitive teaching source. Once the information is proffered, it is incumbent for the athlete to constructively operationalize what they learned. After the information is made meaningful, the athlete could formulate his or her own theories and present them to other athletes as a form of cognitive learning.

Constructivist. In essence, all of the athletes attempted to transform their cognitively learned information into something personally meaningful. As one athlete stated, "what works for one person, might not work for another." This was operationalized in different ways. Athlete Alpha, a physician and scientist by trade,

stated, I "start connecting personal experiences with the science to make it work for me." Athlete Charlie stated, "It's all about trial and error; finding what works for you." It was not enough to simply learn the information and be able to explain a concept; what made the learning meaningful was how it could be used to enhance or improve performance. Athlete Delta stated, "Teach me the basics and then I figure it out how it works for me." Ultimately, the explanation is not enough. The same athlete stated he developed a nutrition plan based upon personal trial and error; "I kind of put my own nutrition plan in place and my own hydration plan in place and that is when I figured out I can't drink Gatorade or Powerade." He found different nutritional hydration options that worked for him.

All of the athletes made their cognitively learned training, skills, and abilities personally meaningful to them. Several athletes reflected on their skills and current training level,

> When I started running long distance, I had no idea what I was doing. It took a couple of hard runs to realize that for me, I need to back down, that it's all about stride and posture and positioning. It was less about speed, and more about efficiency.

Athlete Foxtrot stated he felt deficient in triathlon transitions. He stated, "One of my goals will be practicing transitions so I'm going to make a transition stand for my bike, invite some people who are excellent at transitions, and do some training." Athlete Foxtrot knew what a transition was, and how it was supposed to function. He even knew that the goal was to minimize the time in transition. However, what made transition training personally meaningful was working on it, receiving instruction and pointers, and

operationalizing it to fit his needs. One of the athletes stated that personal utility of each discipline was self-taught; "Cycling is more self-taught than anything else." He explained that everybody had different cycling technique, i.e. foot position, seat position, and hand positions. What worked for one athlete might not work for another. He stated that learning what works for an athlete required that specific athlete to try it and see if it works. In sum, what works and was meaningful to one athlete might not work or be meaningful to another athlete.

It was patently important to some of the athletes to develop personally useful and meaningful techniques. Athlete Foxtrot stated,

> I'm monitoring my technique, more specifically, the mechanics, in all 3 [disciplines]; in my swim, the high elbow catch works best for me, so I make sure I am doing that and pulling correctly; for my run, my body responds best with a midfoot stroke, so I'm making sure I'm landing on the midsole of my shoe and not landing on my heel; for my bike, I am making sure that I am getting the most out of a circular pedal stroke.

Athlete Bravo stated he had been working on a more efficient swim stroke, yielding, "when I get out of the water the end of the swim . . . I feel refreshed . . . I feel like I can go for a run now." What made this learning personally meaningful was that it was within the context of what works best for the individual athlete.

Athlete Echo stated that she paid attention to how her body responded to a particular stimulus, "If it's responding to it and responding well, no reason to change it." Athlete Delta reported, "I'm monitoring my swim technique and I'm making sure on the swim that [form is correct and efficient]; I'm not worrying about speed, just worrying

about that all the mechanics are working correctly." Athlete Delta believed that efficient mechanics translate to speed. Athlete Delta reported doing the same thing for the run, "making sure my technique and mechanics are good; I am not focusing on speed." In essence, the athletes sought to transform what they have learned into something that is personally meaningful to them.

Cognitive – Constructivist. It was apparent that the athletes took information they had cognitively acquired and began to constructively operationalize it. In essence, the athletes took information learned and made it useful to their particular training situation. This was evidenced by the statement, "I try what others say and see if it works for me; if it works I incorporate it, if it doesn't, I don't", or "I like it when someone gives me ideas of what to do, but I need to actually get out there and do it sometimes what works for one person doesn't work for the other." Athlete Bravo stated, "I pick up things training with other people and I see if that would work for me." In essence, the athletes learned cognitively and operationalize constructively.

Several athletes developed training plans based upon a cognitive foundation. They subsequently operationalized the plans and made them personally meaningful to their respective situations. For example, one athlete stated, "I read several training plans and then developed my own based upon what I learned." Another athlete stated, "I was shown how to build a training plan from some books; I used that with my experience with running and my experience with swimming background and built a plan that fit me." Constructive learning occurred within the context of each individual athlete.

All of the athletes cognitively learned about the individual sport disciplines – swimming, cycling, and running – and incorporated some of what they have learned into

developing their own personal technique. Athlete Delta, while discussing improvement in his running skills stated, "I've tried to incorporate certain things that other people show me who are good and I know I've improved my run from what I have learned." Another athlete stated, "I talked to a lot of people but initially I just got in the pool and started swimming." Athlete Foxtrot reported watching the Olympics on television. He stated,

> [The announcers] were talking about why the swimmers were in the hot tub and the benefits of warming up. They don't want to waste their arms so they're warming up in the hot tub. That makes sense; all you're trying to do is get blood in the muscles. So we started sitting in the hot tub to warm up.

Athlete Delta stated he was watching the Ironman World Championships on television. He said he, "wondered why [the athletes on television] looked like they were shuffling their feet and had the appearance of hardly moving." When he began training for his Ironman, he "began to realize the benefit of not taking the normal strides."

One athlete recalled a situation where he ran a race and recalled, "My feet were just bloody with blisters afterwards." He stated one of his training partners told him to "put Vaseline in your socks." The athlete tried the technique and found, "Yes it works and I haven't had a blister since." The athlete adopted the technique for use in all future endurance events.

In contrast, athletes also cognitively learned things that they either constructively knew would not work for them, or subsequently tried and found did not work for them. One athlete stated,

> I've heard several people say you need to take complete time off, no swimming, no biking, no running for a couple of months; my body isn't built that way. It

> won't work. If I take more than two weeks off running, it takes me months to get back into running because for whatever reason my knees jut start binding up and it hurts and I can't get running again.

Athlete Alpha was working with a swim coach. The coach was working on developing the kick associated with a swim stroke Athlete Alpha stated, "He's pretty much told me that my stroke looks great and that the only thing I can do now is kick faster." Athlete Alpha refused the change, stating, "Although [the coach] really likes to kick, I don't think it works with triathlon." In the end, he stated, "I have to do what works for me; if I kick, I will have less [energy] to give the bike and run." Athlete Bravo reported a coach tried to adjust the breathing method between strokes, "[My coach] tried to do bilateral swimming and for me it just doesn't work; I breathe out of one side and that's it." Another athlete stated, "I feel like I'm really good about taking that information from my coach and using it myself later; I customize it for myself for the future." Learning from a coach was cognitive learning; trying what the coach taught and making it work within the context of the situation was constructively learning.

Behavioral. Fundamentally, behavioral learning by definition is positive or negative reinforcement through rote repetition. All of the athletes experienced this reinforcement through training, characterized by one athlete's statement, "repetition, mental effort, and the development of muscle memory." One athlete characterized the importance of repetitive training; "if you don't repeatedly practice . . . your muscle memory goes away."

In this study behavioral learning manifested in conjunction with different learning methodologies. For example, Athlete Foxtrot and his training partner sought to improve

their transition times from swim to bike. The athlete stated, “We must have done 20 iterations of the transition . . . by the end, and all of a sudden I'm zipping in and I'm right back out again.” This transition practice was certainly socially cognitive and constructivist; however, the practice was behavioral.

Another athlete tried a different nutritional strategy, “I changed something in my nutrition before that race and it upset my stomach . . . I tried it two more times and the same thing happened, not as severely, but now I know that I won’t do that again.” The negative reinforcement experienced by this athlete was a form of operant conditioning where a stimulus, i.e. a particular nutritional strategy, resulted in some form of negative feedback, i.e. gastrointestinal distress, resulting in the reinforcement that the particular nutritional strategy was bad.

Experiential. Experiential learning requires the athletes to experience some phenomena, reflect upon the experience, conceptualize what they have learned, and experiment with the new concepts. What separates experiential learning from the other theories examined in this study is that the athletes experiment on their own personal conceptualization of learning. This ultimately results in the development of personal conceptual theories. Athlete Charlie, who was actively involved in races outside of triathlon, i.e. cycling races, provided an illustrative statement about the development and utilizations of personal theories; “I’ll definitely use things that I learned through racing and whether it be marathon races, triathlons or just bike racing or even short races; I like to use all that information as much as I can.” He takes his personal conceptualizations and experiments with them in other contexts and situations. This information was

subsequently used in other contexts and provided the foundation for new theories and experiments.

> Athlete Foxtrot described a story illustrative of the experiential learning process: I find a lot of what I do is trial and error. For me it's just what feels right. I've tried all out on Olympic distance [triathlon] races and end up walking on the run. I've tried going a little bit slower on the bike in the Olympic distance [triathlon] races and ended up coming in way, way in the back. So I really thought about it and found what works for me is to go all out at the beginning and then find a good steady pace until the last four miles and then sprint to the finish line.

In essence, Athlete Foxtrot experimented with several different tactics, conceptualized what he learned, and ultimately developed a method that he used regularly. This was characteristic of the experiential learning model.

Athlete Alpha explained his reasoning for limiting his swim training time. The athlete stated he had completed several Ironman and Half Ironman races and consistently found that his swim performance never drastically changed, regardless of the amount of swim training for the race. He arrived at, “I kind of take the philosophy of you’re only out there in the swim for an hour and twenty minutes during an Ironman race.” He then stated, “I really thought about it and I get a better return on my overall race investment if I spend training time working on the bike or run.” He explained that a better cycling or run time would equate to a much better overall time. He stated, “If I spend like 4 or 5 hours a week in the pool, I could probably get better but that better means five to ten minutes in the race on race day.” However, “if I spend an extra few hours training the run or bike, that could give me more than 30 minutes on race day.”

Another athlete went to several triathlons and found that the primary swim stroke utilized was freestyle. The athlete stated, "So that's how I would train; I would only do free style because that's the only stroke you're going to do in a triathlon so why bother with other strokes?" The athlete reflected on what was learned and applied "the same thing with cycling; like I'm only going to be basically doing long slow rides during the Ironman, so I train for long slow distance basically." Ultimately, experiential learning required the athletes to experience some phenomena, reflect upon the experience, and conceptualize what they had learned. This could also occur with constructivist learning. Experiential learning diverged with the experimenting and development of new concepts.

Constructivist – Experiential. On many occasions, the athletes would take constructively learned things and experientially develop them. One athlete stated, "I think just connecting those dots has been more this year than ever before; I was taking little pieces here and there and putting it together and it's starting to make sense." For example, Athlete Foxtrot stated that he found that drafting on the bicycle was useful to him. The athlete stated,

> I'll try wind angle drafts, you know if the wind is coming from left to right, I'll try to position myself four bike lengths within a shadow because that's the legal limit. So you get four bike lengths but he's cutting that wind for you. I would want to see if that works better than not drafting at all.

Drafting was a technique that Athlete Foxtrot was developing. It was a personally meaningful construct. As he began to reflect upon how to improve his drafting, conceptualize how it could better work, and experiment with his new theories, his constructivist learning paradigm shifted to a more experiential learning paradigm.

Another athlete, who felt his swim sessions were already solid based upon "a good, efficient stroke resulting in solid finish times", recalled some modifications he made to his swim practice sessions. He reflected upon the Ironman Triathlon he had raced and noted that dissimilar to a swimming pool, open water had no walls from which to push off. Wanting to practice in a manner that was consistent with the race, he conceptualized that when practicing in a swimming pool, he would stop pushing off the walls. He began to experiment with his swim practice sessions; "just touch the wall and just basically barely use the wall to push off because there's no walls in any triathlon." He found that this better simulated the race experience and integrated this into his long swim sessions. When he raced another Ironman distance race, he felt better prepared for the race. This was an example of a constructivist-learning paradigm shifting to an experiential learning paradigm.

Cognitive – Constructivist – Experiential. There were illustrative examples of the athletes describing a cognitive learning experience, which they subsequently operationalized and made personally meaningful, followed by an experiential learning cycle. Athlete Foxtrot stated he read the military strategy tome, the *Art of War* by Sun Tzu (n.d.) which was cognitive learning. He stated he learned, "a lot about strategy and how it can be applied to different situations", which was a transition between cognitive and constructivist learning. The athlete reflected upon the Ironman and saw some parallels between the race and a battle. For example, he stated "There are occasions when I know I'm faster than an opponent, but he keeps beating me because of whatever." The athlete then stated, "It suddenly dawned on me that if I applied the strategic principles I learned from the Art of War to the sport of triathlon, I might find some

success", which is an example of constructivist learning. The athlete stated he began experimenting using some of the principles, "So I started doing those things, catching up on the bike and drafting and pulling him back; not only does it give me a little rest, it drains his energy, then I get by him and voilà am victorious", which exemplified the experiential learning experience.

Mental Toughness. A recurring theme in the Ironman training and racing process was the importance of mental toughness. Although every athlete reported mental toughness was a necessary component for the successful negotiation of the Ironman training and racing process, they all reported different definitions. For example, Athlete Bravo defined mental toughness as the "ability to push through pain and work out when you don't want to." He commented that he used positive mental talk as a mental strategy, "So I go into race day and I say to myself 'you did all the work,' now it's just time to execute; trust your training." Athlete Foxtrot defined mental toughness as, "pushing past when your brain is telling you that you should stop, you should slow down, you should quit." Athlete Charlie stated mental toughness was the ability to set aside feelings of grandeur or malaise and "stick with a plan and keep going and be able to work through whatever else is going on . . . If you can push past it because you have done the work, you're mentally tough." Athlete Delta defined mental toughness in terms of how he deals with adversity; "I prepare myself that something is going to go wrong; mental toughness is how I deal with it."

Although all the athletes reported that mental toughness was a necessary component of training for and racing the Ironman, most of the athletes reported that people either had mental toughness or they did not. One athlete believed you could build

and develop mental toughness. Athlete Alpha stated, "Experience from racing is what builds mental toughness." Ultimately, none of the athletes believed that mental toughness could be taught.

Pain. Pain was another recurring theme for all of the athletes. All of the athletes contended pain management was a necessary component for training for, and successfully negotiating, an Ironman Triathlon. Athlete Charlie purported, "most people don't want to put their body in a position where it hurts that much, but it's a necessary outcome on distance sports." Athlete Echo contended, "No pain; no success." Athlete Alpha, a physician, believed, "one thing I think that separates triathletes and athletes of any [other] sport . . . they think of pain differently." He recounted a medical study that was illustrative of his beliefs about pain management. In the study, pain management physicians utilized a heated band around the ankle as a pain stimulus. The band increasingly got hotter until some point where the participants in the study had to remove it due to the pain and discomfort. As in many experiments, there was an experimental group and a control group. The experimental group was provided a distraction activity, i.e. an iPad game. The control group had no distraction stimulus. Ultimately, the researchers found that the distraction allowed people to significantly delay the time of addressing the pain stimulus. He arrived at the conclusion that there was a mental strategy in addressing pain; specifically, "using distraction techniques during times of pain, specifically, doing whatever it takes to take your mind off the fact that it hurts."

All of the athletes argued that you have to accept pain as part of the training and racing process. For example, Athlete Delta stated, "it gets really painful and I ask why the heck am I doing this, but then I'm done I feel like I've accomplished something."

Athlete Foxtrot stated, “You have to embrace pain; I like the pain associated with endurance racing . . . I think you have to like it to be successful in the sport.” Athlete Bravo stated, “You got to learn to accept the pain; [Outside of Ironman training and racing] I’ve never been to the point where I’ve had to learn to accept the pain.” Another athlete stated, “You got to embrace the pain and just push through it; quitting wasn’t an option.”

All of the athletes stated that learning to deal with the pain associated with the Ironman came primarily from experiencing the stimuli. Then, learning to accept the pain came from repeated exposure, which was consistent with the behavioral learning theory. All of the athletes described pain as transient. For example, one athlete stated, “It’ll go away, and it does.” Athlete Echo stated, “You can run through [pain] and you can play through it.” She continued; the pain was transitory, and “in another five minutes you’re not going to be feeling the same way you feel now . . . you can get through it.”

Athlete Alpha reported using pain as a pseudo litmus test for exertion during the race; and stated pain drives athletes to push harder, “This isn’t enough; I want more pain.” He continued, “Once I get to that point where I can’t push anymore and the pain is too much I say, ‘enough, slow down.’” In essence, pain was inevitable during an Ironman Triathlon. Learning to accept the pain, and continue to push through, are necessary components to be successful.

Metrics for Success. The athletes had some variance in how they measured success. The vast majority of the athletes measured success in terms of time. One athlete reported, “I want to break 13 hours for Ironman; actually I just want to be able to finish the Ironman.” Another athlete reported he had done a specific race before and “[wanted]

to beat my previous time." Another athlete who, had competed prior, stated, "I just want to improve." The athlete explained improvement was most easily quantified in terms of time.

All of the athletes wanted to appreciate and enjoy the racing experience. One athlete stated, "I want to enjoy it as much as I enjoyed Wisconsin, that's my primary goal but I'd still love to be able to break 13 hours." Another stated, "It used to be all about time; now it's more about feeling good afterwards, staying positive throughout the whole race, and finishing the race happy." All of the athletes stated there was some intrinsic happiness and appreciation from finishing the race.

A few of the athletes were not only concerned with time, they were concerned with "time and my overall place." In fact, a few of the athletes were interested in qualifying for the Ironman World Championships in Kona, Hawaii. Several of the athletes stated they would continue to pursue this goal in subsequent seasons.

Motivation. There are many things that can motivate a person to attempt an Ironman distance triathlon. For example, all of the athletes were motivated by the epic challenge of negotiating the Ironman distance. One athlete stated, "I enjoy the challenge of doing something that is extremely difficult and few have accomplished." For some, the motivation resided in observing others attempt and successfully negotiate the distance. One athlete stated he saw that others had accomplished the feat, and "I was like, well, if these people can do it so I can do it." Another athlete felt personally challenged because somebody told him, "that there was no way [he] could do an Ironman Triathlon." In contrast, Athlete Bravo was motivated by some friends who encouraged him to attempt the distance, "they told me that I could [finish an Ironman]; they said,

"believe me you can do it." This positive motivation and encouragement helped him through the arduous training and racing process.

Motivation also played a role in training and racing. For example, Athlete Echo felt motivated to be helped by another athlete who had already negotiated the Ironman distance; "So it's kind of motivating to have somebody who's done something like this before say this is the type of workout that you need to do to be able to be ready." Several athletes reported competition with a training partner helped motivated them; "making each of them better athletes overall." Several of the athletes were competitive with a realistic chance of qualifying for the World Ironman Championships at Kona, Hawaii; the chance at qualifying motivated some of the athletes; "I think I've got a shot at qualifying for Kona." For others, "it's the stats and stuff" that quantifies improvement that motivates the athletes. Finally, one of the athletes was profoundly motivated by "helping some other people throughout the race; I'm happy to give out tips sometimes throughout the races and offer motivation." Regardless of what motivated the athlete to compete; motivation drives athletes to compete in different ways.

Training with Power. Nearly all of the athletes reported drastic cycling improvement which they directly related to the use of training with power; either through the use of a power meter, or the use of a Computrainer, or a variety of both. In fact, there was a considerable amount of video footage provided by the athletes with them training on the Computrainer either collectively with other triathletes, or solo. Athlete Echo provided several videos containing early morning training sessions on the Computrainer in her home. She discussed the importance of consistency in training and found that having the Computrainer in her home ensured she was not missing workouts. Further, as

she continued to use the Computrainer, it became more meaningful to her, e.g. she spent more time trying to hit her FTP, understanding watts as it related to cycling, etc.

The importance of the power meter and Computrainer cannot be overstated. Athlete Alpha recalled an interview with Friel; "they asked him what is the single piece of equipment that translates to better speed and performance for triathlon or Ironman training or racing and he replied it was a power meter every time." Another athlete stated, "Training by power is the biggest source of cycling improvement." Another athlete stated he trained with a group of people; "It was funny out of the five people I ride with, three others did Computrainer; The other ones did spin classes, and by the time we hit the spring, they couldn't keep us with us . . . the difference was very noticeable." Another athlete stated, "I dramatically improved my biking so when I hit spring training and got outside, I said wow, it's a huge difference!" Athlete Foxtrot stated, "I would not go a winter without using Computrainer; Computrainer has been the biggest advantage for me because it's built a ton of strength." Those who used Computrainer constructively operationalized what they learned.

A few of the athletes stated that training and racing with a power meter provided an advantage over those who do not utilize one. For example, one athlete stated, "if you have a power meter, that's phenomenal, especially like in a windy course, you can adjust your pace and really look at your power meter [and quantify your effort]." Essentially, the power meter kept the athlete focused on his or her abilities; rather than the abilities of others. Athlete Alpha stated, "by training with a power meter, I knew going into the race what my optimal output was; if I stuck to that, I would be set up for a good run and race." This athlete then stated, "it's about running your race; not the race of the guy next to

you." Using a power meter was the ultimate in the constructivist learning toolbox. Power output was a personally meaningful metric.

Athlete Bravo stated he received large gains from training with a power meter, i.e. Computrainer, "So I trained with a power meter over the winter and liked it, and then last spring when I got out on the road, it was like holy crap, this made a huge difference over the winter." Despite this experience, he stated, "it is not something that I would use in the Ironman quite honestly." He continued by stating, "I don't want to become overly reliant on a piece of technology . . . technology malfunctions." Athlete Charlie, in a video provided during training, stated that although the power meter was extremely useful, "it is a tool that people can train and race without." He expressed concern over an overreliance on technology, stating, "people were racing [and training] without these things a few years ago and were performing fine." Ultimately, the use of a power meter should supplement an athlete's training and racing. Cognitive understanding of the power meter was not enough; constructive understanding, i.e. making the training with the device personally useful and meaningful, was what was important, according to Athlete Charlie.

The decision to try the power meter was generally based upon cognitive recommendations or sources, i.e. social situations, marketing, books, and Internet. In every situation, once a power meter or Computrainer was used, the athletes reported physiological and qualitative benefits, which were functions of constructivist learning.

Summary

Overall, the athletes initially learned predominantly through cognitive methods. However, constructivist and experiential learning played an important role in the Ironman

learning process. The Ironman learning process commenced with cognitive learning. The athlete takes the cognitively learned information and makes it personally meaningful and applicable to his or her particular situation. This was how the information was constructively learned. The athlete subsequently takes the constructively learned information and experiments and develops personal theories. This experiential learning cycle can continue ad infinitum. Throughout the entire process, behavioral learning, manifesting through rote repetition and practice, continued resulting in positive or negative reinforcement.

Athletes did not necessarily need to traverse the entire learning cycle. An athlete can learn cognitively and never constructively operationalize what he or she learned. Similarly, an athlete could take constructively learned information and never enter the experiential learning cycle. The highest level of learning and understanding on a particular topic was achieved in the experiential learning cycle.

All of the athletes believed mental toughness was an important component of the Ironman training and racing process. Despite its importance, there was disagreement over whether mental toughness can be learned, and, if it can, how that is achieved. Another important theme was the concept of pain relating to the Ironman training and racing process. The athletes overwhelmingly purported that a familiarity with pain was a necessity for success in the Ironman; some of the athletes even stated they enjoyed the pain associated with the process. Athletes can constructively learn to deal with pain. Finally, nearly all athletes contended training with a power meter or Computrainer was profoundly beneficial.

Chapter Five: Discussion and Reflection

Overview

This qualitative study, through a case study approach utilizing in-depth interviews and audio and video content provided by the participants, examined the learning pathways of Ironman triathletes as they negotiated the Ironman training and racing process. The study commenced at the beginning of the 2013 triathlon racing season, marked by the initiation of training for the early season Ironman races, i.e. Ironman Texas in May, and culminated at the end of the season, which was marked by the Ironman World Championships in Kona, Hawaii. The athlete's experiences ranged from never having completed an Ironman race prior to the 2013-racing season, to having completed eight races prior to the 2013-racing season.

The participants of this study were interviewed throughout the season. The interviews with the athletes were subsequently coded revealing some unifying themes, i.e. cognitive learning, constructivist learning, behavioral learning, experiential learning, the importance of mental toughness, the understanding of pain during the training and racing process, how success is measured, the importance of training with a power meter, and motivating factors.

All of the athletic learning pathways revealed a linear progression in which the athletes initially learned through cognitive means, i.e. social interaction, reading, Internet sources, and the observation of others. As athletes traversed the learning pathway, they subsequently operationalized the knowledge they learned and constructively made it meaningful to their respective personal training and racing situations. At the terminal end of the learning pathway, the athletes operationalized the learned content in an experiential

learning cycle. During the entire learning pathway, the athletes practiced the learned content, which was best characterized as behavioral learning.

Discussion and Research Questions

The study specifically sought to address two primary research questions:

1. How does an athlete learn how to successfully negotiate all aspects of an ultra-endurance event, specifically the Ironman Triathlon?
2. How does experiential learning enhance understanding of endurance triathlon?

All of the athletes in the study learned principally, and initially, through cognitive methods. These methods included use of books, magazines, email lists, Internet sources, online videos, coaches, other athletes, and observation. Cognitive learning was the predominant form of learning for a number of reasons. Primarily, cognitive learning introduced information to the athlete. This was an inherently necessary step in the learning process. Before information can be made personally meaningful, it must be initially learned.

Cognitive learning provided an avenue for the athletes to examine and evaluate what historically worked for others and consider if the information should be included in their repertoire. Learning how to successfully train and race the Ironman distance was greatly impacted by learning what worked for others, and how an athlete can personally operationalize the information. The initial learning occurred when athletes observed others, talked to other athletes, or learned through reading or the Internet. In measuring and evaluating the success of others, i.e. whether the success was quantitatively based, e.g. a ’good‘ finishing time, or qualitatively based, e.g. feeling good during a specific component of the race, the athletes sought empirical understanding.

It was interesting to note that in most cases, the athletes were not prodigiously concerned about the scientific rigor of the information. In fact, only Athlete Alpha, a physician by trade, and Athlete Charlie, an extremely experienced triathlete, were concerned about the rigor of some of the information they learned, i.e. academically validated, scientific information. Despite the attention to the academic rigor of some of the information, Athlete Alpha and Athlete Charlie also obtained information from sources that were not academically supported. These sources included other athletes who displayed some advanced athletic prowess.

The remaining athletes did not validate information they received from a specific source. When the athletes did attempt to validate the information, anecdotal support was often enough to convince the athlete that something was either positive or negative. This was likely due to the fact that the athletes placed value in the fact that the sources of information had some demonstrable success, i.e. an extremely fast Ironman finish, impressive marathon completion times, and profound success on the bicycle.

Subsequent to the cognitive learning, the athletes attempted to make the cognitively learned information personally meaningful through constructivist learning. The constructivist-learning paradigm was premised upon the learner taking information and making it personally meaningful to their particular situation. In this case, the athletes took the information and began to operationalize it for training and racing purposes. For example, one of the athletes was at a triathlon store and the bike specialist at the store suggested a particular saddle (bike seat) for his bike. The bike specialist touted all the benefits of the new saddle, specifically the comfort level for long distance riding. The athlete purchased the saddle and found that the saddle performed exactly as advertised by

the specialist. This was an example of cognitive to constructive learning; the athlete learned about the benefits of a piece of triathlon related equipment, tried it and found that it worked, and adopted it into the personal repertoire. Conversely, another athlete heard several people state that for optimal athletic performance one must cycle training, i.e. take time off completely swimming, biking, and running for a couple of months every year. This athlete stated, "My body isn't built that way; it won't work." The athlete continued, "If I take more than two weeks off running, it takes me months to get back into running because for whatever reason my knees jut start binding up and it hurts and I can't get running again." Once an athlete makes information personally meaningful, he or she continues to experiment and reflect upon what was learned.

Once an athlete has constructively learned a topic, i.e. made the learning personally meaningful and useful, he or she begins to experiment and refine the learning. This leads to the experiential learning paradigm, where the athlete has an experience, reflects on the experience, conceptualizes the learning, and experiments with the conceptualization. This is a potentially continuous process. For example, an athlete might read that, scientifically, the optimal running cadence is 180-foot strikes per minute. The athlete might run at that cadence and find that it is comfortable and works for him or her. The athlete subsequently conceptualizes that the benefits of that running cadence might include increased efficiency and speed. The athlete experiments with the new cadence in training and races and either finds that the conceptualization is correct, or incorrect. The athlete then accepts the conceptualization or rejects it in an experiential learning cycle.

Consider another illustrative example. A triathlete reads a nutritionally based article in a triathlon magazine about 'bonk training'. The article purports that 'bonk training' is essentially depleting the body of all its readily usable energy. This is done by not taking in calories during an endurance event. This is an example of cognitive learning. The athlete comes to understand, 'bonking is basically depleting your body of everything', leading to a feeling of 'lightheadedness, dizziness, headaches, stomach issues', and general malaise. In essence, bonking is a profound caloric deficit. This is an example of constructivist learning. The triathlete subsequently begins to operationalize bonking. The triathlete finds that his body responds with pain and discomfort similar to what he had read about. The triathlete subsequently takes that experience and reflects upon the personal meanings, and how he can use that knowledge in the future. The triathlete begins experimenting by adjusting his speed, modifying his food and hydration intake, and attempting bonking in different temperatures to see if there are different results. He finds different nutritional items that 'brought him out of the bonk', i.e. coke, and different methods for reducing the malaise, such as reducing speed and walking during the marathon. This is an example of experiential learning.

In essence, the experiential learning cycle includes a concrete experience, reflective observation, conceptualization about what was learned, and experimentation. The athletes take their constructive knowledge, specifically the content gleaned from constructive experience and learning, and reflect upon how it works for them. The athlete conceptualizes how this knowledge fits into his or her own personal 'big picture'. The athlete subsequently experiments with his or her own personal conceptualizations; this either reinforces or rejects the conceptualization. Whether the conceptualization is

rejected or accepted is not empirically important; the experiential learning cycle is continuous.

Throughout the entire learning process the athletes practice what they have learned. This practice yields positive or negative reinforcement. The behavioral learning paradigm is premised upon reinforcement. Sometimes, an athlete will try something and it will not work. They might try the same activity, changing a small component, and it still will not work. This negative reinforcement can result in the athlete getting rid of the activity altogether. Further, even during times of experimentation, the athlete is repeatedly performing a task and receiving either positive or negative reinforcement. This reinforcement ultimately drives future learning and understanding on a topic.

The endurance-learning pathway is linear and unidirectional. The pathway commences with cognitive learning and terminates at a potentially perpetual experiential learning cycle. Rudimentary or fundamental knowledge on a concept can be acquired through cognitive learning methods, which is subsequently constructively processed. However, expert or advanced understanding of a topic or concept is attained through experiential learning.

Mental toughness is an important component in endurance racing, specifically the Ironman Triathlon. All of the athletes touted the importance of the construct. However, similar to the study of mental toughness are other disciplines; there are a wide variety of definitions of the concept. The lack of a unifying definition presents some fundamental issues in understanding the construct. For example, if mental toughness has different meanings for different athletes, developing it could require different approaches. Mental

toughness appeared to be related to the concept of pain and pain management in the Ironman.

Accepting pain and developing pain management strategies are important parts of Ironman training and racing. Every athlete in this study stated that understanding and accepting pain was a necessary component for successfully completing the Ironman. If pain was an inevitable component of the Ironman, and managing pain could assist athletes in completing the task, then preparing and training for pain was important. Pain is a subjective concept; what hurts for one person, might not hurt another. How one person deals with pain, might not work for another. This leaves some broad areas for additional research.

Athletes measure success in different ways. At the competitive level, athletes seek to place overall or win their respective age group. As athletes become less competitive, success is measured in simply completing the distance in the allotted time and receiving enjoyment from the training and racing process. A problem with establishing temporal goals as an age-group athlete which are contingent upon the performance of other athletes is that participating athletes do not necessarily know who their competition is going to be on race day. For example, if an athlete happens to be racing against someone who is much faster, he or she might not hit the goal, despite a substantial amount of training. In fact, an athlete could perform at his or her best and not hit the podium. Goal setting and measuring success should be explored in future research.

The power meter is a seminal piece of equipment in the sport of triathlon. Every athlete that has used the equipment has touted its benefits. Athletes who did not currently

train with a power meter, or did not currently own a power meter, observed the benefits that were received by athletes who did train and race with the device. Essentially, this cognitive learning either translates into the athlete either taking a power meter for a test drive, or rejecting the notion, likely for cost related reasons. The least expensive power meters were about $700. Those who try the power meters either find the new quantitative metrics generated from the device useful and personally meaningful, i.e. constructive learning, or they reject the device, also constructive learning. Ultimately, the athletes who use a power meter; use it in a personally meaningful manner. For example, an elite level athlete might really evaluate the data generated from the power meter and use the data to reconfigure future training. A less competitive athlete might use the power meter to focus training, and never look at the data beyond the basic wattage number.

Implications

There was paucity of information relating learning to endurance sports. Further, there was limited information on mental toughness, pain, and the quality and nature of triathlon, Ironman, and endurance racing sources. This study illuminated and explained how endurance athletes learn. This can be of interest in the field of education, specifically andragogy, exercise and sport science disciplines, and those versed in experiential learning methods. This study revealed that athletes, specifically adult athletes, traverse a learning pathway that ultimately leads to learning through experiential methods.

Athletic coaching is an inexact science. What yields optimal performance in one athlete, might not yield optimal performance in another. Despite these differences, the Ironman learning pathway reveals a method to explore what works for each individual

athlete. Cognitive learning occurs when a skill is demonstrated or displayed. The athlete then takes what is learned and makes it personally meaningful. This is where individual differences begin to manifest. It is at this divergent point that coaches can begin to explore what works for each athlete and why. As the skill develops, the athlete will experiment, draw conclusions, and develop personal theoretical concepts on the skill. Coaches can assist athletes in experimenting and fine-tuning skills in the experiential learning phase. Regardless, coaches should take note that experiential learning in the endurance racing process represents higher level, advanced thinking and understanding of a given topic.

There were few differences between the athletes in this study based upon demographic factors. In fact, differences in training and racing were based upon the goals established for the athlete, i.e. finishing in a specific time. For example, the athletes who wanted a podium finish had a different attitude toward training than those who were simply racing for enjoyment.

Success in the Ironman is the amalgamation of a number of factors. Mental toughness, although ill-defined in endurance racing, was an important construct. Every athlete reported that mental toughness was a necessary component for successful completion of an Ironman. There was overlap between mental toughness and how an athlete dealt with the associated pain from the Ironman. The incontrovertible fact is that racing the Ironman distance is going to hurt. How an athlete deals with that pain is an important component for success. Regardless of how each athlete measured success, there was one fundamental similarity; all of the athletes had a profound desire to finish the race. What drives or motivates an athlete to finish the race is different for each

athlete. For some, it is the personal challenge. For others, it is a desire to win. The motivations of the athletes impacted overall success in the race.

Regardless of athletes' desire to succeed, or their motivations for racing, the Ironman presents some significant challenges. Decisions made at the beginning of the day, i.e. not hydrating properly, can profoundly impact overall success. Small negative decisions are magnified throughout the day. For example, if an athlete does not consume calories during the bike portion of the race, the athlete might not be physically able to finish the race.

The learning pathway provides a method to evaluate how athletes gain a more robust understanding of the Ironman training and racing process. The learning theories; specifically cognitive, constructivist, behavioral, and experiential; define the incremental learning stages that are traversed by each athlete. These learning theories, coupled with mental toughness, pain management, personal motivation and metrics for success, and training with a power meter, elucidate how athletes successfully negotiate the process.

The power meter was arguably the most influential piece of equipment in triathlon training. All of the athletes touted the benefits of the device, regardless of how the athlete chose to use it. The athletes that trained with the device reported substantial improvement in their cycling skills and endurance. Despite how the athletes used the power meter, the learning pathway the athletes traversed was fundamentally similar to the learning pathway traversed during the Ironman training and racing process. The athlete cognitively learned about the power meter from some source. Once the athletes began to use the power meter, they constructively learned how to integrate it into their training and racing plans. Subsequent to the power meter becoming personally meaningful, the

athlete might begin to experiment and develop personal theories on how to further use the device, which is characteristic of experiential learning.

There were several issues that arose during the study, with the cameras being the primary source of some of these issues. The athletes were provided cameras and trained on their use, including instructions that they self-interview about the learning process. The first issue was that all of the athletes were irregular in capturing video and/or sound. Some athletes captured a great deal of video; however, the video was repetitive and contained the same explanation of learning through the entire season. For example, some of the video provided by the athletes was predominantly focused on swimming. The video was iterative throughout the season, without illuminating any new learning information. The second issue originated from a lack of camera usage. Some of the athletes did not use the cameras at all. At the interview meetings, the athletes were reminded about using the cameras. Despite these reminders, some of the athletes did not furnish video. Finally, some of the athletes recorded physical activity with little or no explanation about what was learned. When the athletes were questioned later about the learning, he or she stated that the recording captured 'practice'. Finally, as the season progressed, the amount of video captured by all of the athletes decreased. All of the athletes, with one exception, used the cameras to aid them in training, i.e. recording swim strokes for personal evaluation. Despite the issues with the cameras, they were useful in triangulating the results.

Triangulation of Results

Triangulation is defined as verifying "the credibility of the information" (Guion, Diehl, & McDonald, 2011, p. 3). According to Leech and Onwuegbuzie (2007), "using

more than one type of analysis can strengthen the rigor and trustworthiness of the findings via methodological triangulation" (p. 575). The data in this study was triangulated through several different methods. First, utilizing the case study approach inherently triangulated the data through capturing the data from a number of different sources. Capturing qualitative data from another source other than the interviewer helped to remove bias.

According to Guion, et al. (2011), "Triangulation involves using multiple perspectives to interpret a single set of information." The second method was the use of participant-captured digital images and video. Comparing the themes obtained from the interviews, with the themes observed in the video and digital images, further triangulated the data.

Recommendations for Future Research

There are several areas worthy of consideration for future research. The lack of literature and research on the learning pathways traversed by endurance athletes provides ample opportunities for additional qualitative or quantitative research. This study utilized a qualitative case study approach. A larger scale study, utilizing quantitative and qualitative data, examining a larger sample, would be beneficial in validating the data from this study.

This study revealed another important area for future research. The athletes in this study obtained information from a plethora of sources, i.e. Internet, magazines, books, and other athletes. Prima facie, it appears that the athletes are not particularly selective in where they obtain their initial information, e.g. marketing materials, anecdotal evidence, and Internet sources. Although many of these sources might be

empirically validated, a vast majority of them lack academic rigor. An examination of the sources of athletic information should consist of several components. A content analysis examining the sources of information could prove beneficial. Subsequently, an evaluation of how the information is evaluated and used by triathletes is deserving of additional research.

The current body of knowledge on mental toughness has been wrought with definitional challenges, e.g. difficulty in determining a universally accepted definition. This has been compounded by definitional differences of mental toughness in specific disciplines, i.e. mental toughness in soccer might be different than mental toughness in triathlon. Determining a definition of mental toughness in triathlon is necessary if there is to be additional research on this construct. Any additional research on mental toughness should begin with isolating a unifying definition in the sport.

The Ironman athletes in this study presented a clear dichotomy between pain and mental toughness. In fact, the athletes were very specific in separating the concept of pain from the concept of mental toughness. This presents an interesting opportunity for future research in both the fields of mental toughness in endurance athletes and the concept of pain and how it applies to endurance athletes. One area of research could examine and draw a clearer distinction between mental toughness and pain in endurance athletes. Another area of research could include pain management techniques utilized by athletes.

With the exception of the power meter, this study did not address triathlon equipment. Triathlon equipment plays a major role in the sport. There is empirical evidence in support of this. Attend any Ironman Triathlon and look at the bikes,

equipment, and clothing; an athlete can spend tens of thousands of dollars on equipment. Future studies should seek to address the impact equipment has on triathlon performance and on triathlete perceptions.

Another area for future research is the impact that Ironman training and racing has on family. The financial and temporal commitment to the training process is extensive. Weekly training times can vary, with times exceeding 20 hours a week. This can certainly impact the well-being of a family. A study examining how an athlete manages these variables could prove useful in understanding time management of age-group athletes.

There were some unanswered questions that could be addressed by future research. For example, why do triathletes overwhelmingly measure success in time? What role has the Internet played in disseminating triathlon information? Is there an observable, quantifiable difference between those who train with a power meter and those who do not? The sport of triathlon is a relatively new endeavor. This leaves a plethora of areas for future research.

Conclusion

There are few athletic events that are as challenging as the Ironman. It is a 2.4-mile swim, followed by a 112-mile bike ride, followed by a 26.2 mile run. This must be completed in succession in less than 17 hours. One minute over and, although the distance has been traversed, it is entered as a DNF or "Did not finish." Completing any of those distances alone would be challenging. Combining them is a synergistic experience.

It is a major commitment to attempt an Ironman. Financially, it is expensive. The entry fee alone was approximately $650. The time commitment is intensive; athletes can spend more than 20 hours a week, training for more than 6 months. This time commitment could impact family life. In this study, only Athlete Foxtrot had children. However, the children were young adults and did not live at home making the time commitment to his children essentially a nonissue. In context, the training is a part-time job. With the commitment an athlete must make to the venture, they should be afforded every opportunity for success. Understanding that the endurance learning process proceeds toward an experiential learning cycle can help athletes design a plan on how to accelerate the learning process.

Although athletes learn differently, they follow a similar path. Initial information is learned cognitively, is synthesized constructively, and is ultimately understood experientially. If the trend continues, the sport of triathlon will continue to rise in popularity and participation. Understanding how athletes learn can help a new generation of athletes negotiate an intrinsically challenging venture, the Ironman Triathlon.

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Appendix A

LINDENWOOD

LINDENWOOD UNIVERSITY ST. CHARLES, MISSOURI

DATE:	January 25, 2013
TO:	Ari Zelmanow
FROM:	Lindenwood University Institutional Review Board
STUDY TITLE:	[418259-1] Executing the Ironman Triathlon: Case Studies of Age Group Triathletes and Learning the Metrics for Success.
IRB REFERENCE #:	
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	January 25, 2013
EXPIRATION DATE:	January 24, 2014
REVIEW TYPE:	Expedited Review

Thank you for your submission of New Project materials for this research project. Lindenwood University Institutional Review Board has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the completion/amendment form for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of January 24, 2014.

Please note that all research records must be retained for a minimum of three years.

If you have any questions, please contact Beth Kania-Gosche at (636) 949-4576 or bkania-gosche@lindenwood.edu. Please include your study title and reference number in all correspondence with this office.

If you have any questions, please send them to IRB@lindenwood.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Lindenwood University Institutional Review Board's records.

Appendix B

Recruitment Letter

Dear (*Athletes Name*),

My name is Ari Zelmanow. I am a doctoral student at Lindenwood University in Saint Charles, Missouri, in the School of Education. I am conducting a research study entitled Executing the Ironman Triathlon; Select Case Studies of Age Group Triathletes and Learning the Metrics for Success.

I am contacting you to ask whether you would consider being a participant in my study. Prospective participants are age-group Ironman Triathletes. An age-group athlete is defined as an amateur athlete (18 years of age and older) who competes within a specific age division and is not eligible to win prize money under the USA Triathlon Competitive Rules.

The role of the participant is:

- Participate in an entrance interview (30-45 minutes);
- Take video and photographs during the Ironman training and racing season, documenting what you are learning and how you are learning it (camera is provided);
- Participate in two monthly interviews for the duration of the 2013 Ironman training period (30-45 minutes per interview);
- Participate in a participant group discussion following at the terminal end of the season (30-45 minutes);
- Review the final report for accuracy.

If you are interested in participating or have any questions, please contact me at:

Ari Zelmanow
Contact Email Address Redacted
Contact Phone Number Redacted

Thank you for your consideration to be involved in this study.

Yours in Triathlon,

Ari Zelmanow

ABZ:ms

Appendix C

Initial Screening Questions and Introduction

Purpose of this study

The purpose of this study is to explore how athletes learn to tackle the Ironman Triathlon, commencing with the initial decision to take on the challenge and culminating with post-race evaluation. This will include, but not be limited to, decisions relating to purchasing equipment, training decisions, racing decisions, attitudinal decisions, and strategic planning decisions.

Introduce myself

I am a graduate student in the education program at Lindenwood University in Saint Charles, Missouri. I am also an ultra-endurance athlete and Ironman finisher.

Explain why learning the Ironman is important to me.

Do you have any questions about this study or this interview?

Initial Screening Questions

Are you registered for a full length Ironman race for the 2013 racing season?

Have you ever raced in an Ironman before?

Have you ever competed in a triathlon before?

Are you involved in a cohabiting relationship (spouse or significant other)?

Do you have kids?

Are you training independently or with a coach?

Appendix D

Lindenwood University
School of Education
209 S. Kingshighway
St. Charles, Missouri 63301

Informed Consent for Participation in Research Activities

"Executing the Ironman Triathlon; Select Case Studies of Age Group Triathletes and Learning the Metrics for Success."

Principal Investigator Ari Zelmanow
Telephone: 314-707-5234 E-mail: az778@lionmail.lindenwood.edu

Participant _____ _____ Cont act info _____

_____

1. You are invited to participate in a research study conducted by Ari Zelmanow under the guidance of Dr. Beth Kania-Gosche. The purpose of this research is to explore and understand how athletes learn how to negotiate the Ironman racing process.

2. a) Your participation will involve
   - A brief semi-structured initial interview lasting 30-45 minutes.
   - Reviewing transcriptions of the interviews for accuracy, completeness, and addendum.
   - Being issued a waterproof digital camera and asked to document your journey and the lessons learned throughout the study. The researcher (Ari Zelmanow) will retain copies of the images and video for use in the study; however, you will be afforded the opportunity to retain copies for yourself.
   - Two interviews a month for the duration of the racing and training season. During these interviews, the video and photos captured by the participant will be used to promote discussion. The researcher will download the videos and photos at this time. These interviews will be video and audio-recorded.
   - A brief semi-structured exit interview with all participants of the study.

   b) The amount of time involved in your participation will be four to twelve months, depending upon the length of your 2013 Ironman training and racing season.

   Approximately five subjects will be involved in this research.

3. There are no anticipated risks associated with this research.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about the learning process, the sport of triathlon, and the Ironman triathlon.

5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw.

6. We will do everything we can to protect your privacy. As part of this effort, your identity will not be revealed in any publication or presentation that may result from this study and the information collected will remain in the possession of the investigator in a safe location.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Ari Zelmanow, (314) 707-5234 or the Supervising Faculty, Dr. Beth Kania-Gosche, (636) 949-4576. You may also ask questions of or state concerns regarding your participation to the Lindenwood Institutional Review Board (IRB) through contacting Dr. Jann Weitzel, Vice President for Academic Affairs at 636-949-4846.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my participation in the research described above.

_____ _____
Participant's Signature Date Participant's Printed Name

_____ _____
Signature of Principal Investigator Date Investigator Printed Name

Revised 1-21-2010

Appendix E

Phase One – Pre Training

- Do you learn better if someone teaches you, or self-taught?
- Do you have a coach? If so, why? What do you use the coach for (motivation, information, accountability, training knowledge, etc.)?
- Where do you obtain your Ironman training information?
- Tell me about your current training plan? Did you develop it, or did you obtain it from a third party? How did you find it?
- How will you measure success in your race? Why is this metric important to you?
- How would you classify your swimming skills? Tell me about your previous swimming experience.
- How would you classify your cycling skills? Tell me about your cycling experience.
- How would you classify your running skills? Tell me about your running experience.
- Define mental toughness. Tell me what mental toughness means to you. Do you think mental toughness is necessary to successfully negotiate the Ironman? Do you think mental toughness can be learned? How?
- Tell me about your time management plans for the training and racing period?
- Present athletes with a digital video camera and provide instructions on how it is used.

Appendix F

Phase Two – Training

- How many hours a week do you train? How was that number of hours selected?
- What have you done to train for the swim? Bike? Run? Are you following your training plan? Do you feel as if your skills have improved?
- Tell me about your swimming training. What have you learned? How have you learned it? What experiences have had the most influence on your training?
- Tell me about your cycling training. What have you learned? How have you learned it? What experiences have had the most influence on your training?
- Tell me about your running training. What have you learned? How have you learned it? What experiences have had the most influence on your training?
- Tell me about your time management? What have you learned? How have you learned it? What experiences have had the most influence on your training?
- Tell me about any mental training or preparation you have done? What have you learned? How have you learned it? What experiences have had the most influence on your training?

Appendix G

Phase Three – Racing

- Tell me about your pre-race preparation? How did you plan for it? Did you follow your plan? What experiences have had the most influence on your pre-race preparation?
- Tell me about the swim portion of the race. What experiences have had the most influence on the swim?
- Tell me about the swim to bike transition.
- Tell me about the bike portion of the race. What experiences have had the most influence on the bike?
- Tell me about the bike to run transition.
- Tell me about the run portion of the race. What experiences have had the most influence on the run?
- Tell me about the finish line.

Phase Four – Post-Race

- What have you learned from this experience? How have you learned it? What experiences have had the most influence on the race?

Vitae

Ari Ben Zelmanow

Profile, Skills, and Research Interests

- Instructional Design
- Leadership and Management
- Data Analysis
- ADDIE, SAM, Kirkpatrick
- Applied Ethics
- Project Management
- Adult Learning/Andragogy
- Curriculum Development
- Organizational Development
- Learning Pathways
- Creative Problem Solving
- Dynamic Presentation Skills
- Public Policy and Economics
- Research Methods
- Technologically Innovative
- Educational Assessment
- School Violence and Safety
- Experiential Learning

Education

Doctor of Education
Instructional Leadership and Higher Education Administration
Lindenwood University – Saint Charles, Missouri
2012 to Present

Master of Science
Criminal Justice
University of Central Missouri – Warrensburg, Missouri
Degree conferred 2010

Graduate Study
Health Administration and Policy
Saint Louis University – Saint Louis, Missouri
2001 to 2005

Bachelor of Arts
Liberal Arts
Colorado State University – Fort Collins, Colorado
Degree conferred 1998

Publications

Zelmanow, A. B. (2014). *Learning pathways of endurance athletes: Case studies of age-group Ironman triathletes* (Unpublished doctoral dissertation). Lindenwood University: Saint Charles, Missouri.

Zelmanow, A.B. (2010). *An evaluation of the effectiveness and a cost-benefit analysis of towing vehicles for driving without maintaining financial responsibility*

(Unpublished terminal project). University of Central Missouri: Warrensburg, Missouri.

Presentations

Right Now: School Violence Prevention Project. Presented at Ameren UE at a special meeting for Saint Louis regional educators and educational leadership in Saint Louis, Missouri in 2013.

Requiem of Violence: A Workplace Violence Prevention Project. Presented at Ameren UE at a special meeting for Saint Louis regional educators and educational leadership in Saint Louis, Missouri in 2013.

Right Now: School Violence Prevention Project. Presented at the Saint Louis Public Schools in Saint Louis, Missouri in 2013.

Resolve to Run: An Introduction to the Biomechanics and Kinesiology of Natural Running. Presented at the YMCA in Saint Louis, Missouri in 2012.

Child Neglect Investigations. Presented at the National District Attorneys' Association Conference in Denver, Colorado in September of 2011.

Interview and Interrogation of Child Abuse Suspects. Presented at the National District Attorneys' Association Conference in Denver, Colorado in September of 2011.

Commanders Workplace Violence Colloquium: Administrative and Command Level Prevention and Response to Workplace Violence. Presented at the Saint Louis Metropolitan Police Department, Saint Louis, Missouri in 2009.

Employment Experience

Instructional Designer
Edward Jones – Saint Louis, Missouri
2014 to Present

- Produce performance-based, interactive learning experiences to meet the business needs of the division and firm.
- Design and develop content, define measurement strategies, and assess the effectiveness of learning programs.
- Select and recommend appropriate media and delivery methods for coursework.
- Collaborate with subject matter experts (SME) throughout the firm to analyze needs, develop appropriate learning objectives, and gather/maintain information.

Adjunct Professor of Criminal Justice
Saint Louis Community College – Saint Louis, Missouri
2014 to Present

Adjunct Professor of Criminal Justice
Columbia College – Saint Louis, Missouri
2014 to Present

Education, Training, and Leadership Consultant
Freelance Consultant – Saint Louis, Missouri
2009 to Present

- Developed and presented innovative world-class training programs and audio-visual presentations using cutting edge technology (Final Cut, iMovie, Adobe, MS Project, MS Office Suite, Camtasia, Articulate, etc.).
- Developed leadership development programs for individuals and organizations.
- Project manager for various complex, short and long-term projects.
- Analyzed and assessed quantitative and qualitative metrics and utilized the results in the administrative decision-making process.

Police Officer and Relief Sergeant (Supervisor)
Saint Louis Metropolitan Police Department – Saint Louis, Missouri
2005 to Present

- Intermittently supervise six employees, motivate positive behavior, provide leadership and guidance and ensure adherence to departmental regulations, ordinances of the City of Saint Louis, state statutes, and Federal law.
- Use technology and critical thinking to investigate complex criminal events using data-driven strategies.
- Collaborate with Departmental leadership, businesses, residents, and governmental entities to develop long-term solutions to crime problems.
- Adjunct instructor at Saint Louis Metropolitan Police Academy.

Emergency Medical Services Instructor and Advisor
IHM Health Studies Center – Saint Louis, Missouri
2001 to 2002

- Developed US Department of Transportation approved curricula for paramedic education coursework.
- My adult-learner students had a 100% pass rate on the national paramedic boards.
- Designed and implemented a student-advising program allowing for classes to be transferred into IHM.
- Developed the school's progressive discipline program.