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A Comparison of Motivational Differences Among Older Marathon Runners and Their Injury Status

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This is to certify that the doctoral dissertation by

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Abstract

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MS, United States Sports Academy, 2001

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Abstract

Despite the high occurrence of running-related injuries, master level runners, those aged 40 years and older, account for 50% of all marathon finishers. What is not known is the common motive sustaining participation, especially among this age demographic. The self-determination theory was the theoretical framework to support how behavior is regulated by the individual. The purpose of this quantitative research was to identify a difference in the motives (psychological, physical, social, and achievement) and their subcategorical motives (health orientation, weight concern, affiliation, recognition, psychological coping, life meaning, self-esteem, competition, and personal goals) via the Motivations of Marathoners Scales by master level runners according to their injury status and gender. Two hundred and twenty-five master level runners from social media marathon running groups completed the online survey. The responses were analyzed using an independent-samples *t* test and an ANOVA. The results showed female master level runners statistically significant in psychological coping, life meaning, self-esteem, health orientation, weight concern, and affiliation which contributed to psychological, physical, and social motives while male master level runners were statistically significant only in the subcategory of competition. The implications for positive social change include a better understanding of motivation, its sustainment, and the adherence of physical activity behaviors to improve the positive influence among the current beliefs about aging and activity for better health of individuals and their communities.

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Chapter 1: Introduction to the Study

Running remains a versatile and universal form of exercise. There are a growing number of adults striving for improved health and fitness through long-distance running events. The most recognized is the marathon, a 26.2-mile race of historical worthiness (Association of International Marathons and Distance Races, 2018). Over the previous 10 years, participation by marathon runners has increased by 30% (Running USA, 2018a). It is estimated that 50% of all marathon finishes are by runners aged 40 years and older (Running USA, 2018a). While running itself is evidence-based to the benefits of physical health and fitness (U.S. Department of Health and Human Services [USDHHS], 2008), there are considerable risks of related injuries.

It is believed the high rate and occurrence of injuries from running would deter continuance. To the contrary, there are several studies demonstrating when a runner is injured, more than half do not modify training, nor do they obtain medical advice (Arlis-Mayor, 2012; Christensen & Ogles, 2017; Masters & Ogles, 1998). Suggested explanations indicate the psychological and social benefits from participation. What is not known is the motive that sustains the ongoing behavior of training for and involving one's self in such a physically demanding activity, especially when experiencing an injury. Of special interest is the high level of physical activity by this age group of runners when compared to the same demographic in the general population displaying a known and steady decline in exercise participation (USDHHS, 2008). As a reflection of positive social change, understanding these increased levels of running gives an insight into the underlying motives which may differ from those directly observed. Physical benefits are synonymous with all forms of physical activity. However, they may not be

the primary motive which explains continuity. By identifying the differences in motivation, the opportunity for exercise adherence increases resulting in health and wellness improvements for individuals and the communities in which they live.

This chapter provides the background information to explore the differences found in the motivation among older marathon runners and injury status. While the risk of injuries is recognized, this study addressed the gap in the literature surrounding the motivational reasoning for the ongoing participation by marathon runners, specifically age 40 years and older, among those running without injuries in comparison to those continuing to run with injuries.

In Chapter 1, I offer the background, problem statement, and purpose of the study. A brief overview of the self-determination theory (SDT) as the theoretical foundation along with the nature of the study, key definitions, assumptions, limitations as well as the scope and delimitations accompany the research questions and hypotheses. The significance of the study conveys the implications for social change. A summary of the main points transitions into Chapter 2.

Background

Marathon running is the focus of many research inquiries. No other athletic event requires such physical endurance and commitment to increasing the probability of achievement (Sancho & Ruiz-Juan, 2011). Participation levels are changing the observed demographic of the marathon runner. According to the 2017 Marathon Report by Running USA (2018a), the average age of a male runner is 40 years and for women it is 37 years. These runners become categorically recognized as master level amateur athletes upon reaching the age of 40 (USA Track & Field, 2017). Fifty percent of all marathon

finishers are runners age 40 and older (Running USA, 2018a). Participation has remained constant since 2015 with 10% of all runners surveyed in the 2018 National Runner Survey stating they intend to run a marathon in the next year (Running USA, 2018c).

The Benefits and Risks of Marathon Running

The known benefits of running itself creates an attraction. As a form of physical activity, the evidence to improved physical health and fitness performance is well-recognized among the general recommendations stated in the 2008 Physical Activity Guidelines for Americans (USDHHS, 2008). Running is known for its reduction in cardiovascular disease (CVD) as documented through the Aerobic Center Longitudinal Study and the Copenhagen City Heart Study that demonstrated a decreased mortality rate through its efficient manner of vigorous exercise (Aguib & Al Suwaidi, 2015; Lee et al., 2014). Lee at al. (2017) have also shown a 25% to 40% reduction in mortality with an additional life expectancy of three years whereas O'Keefe et al. (2012) estimated increased longevity of seven years. Running does make the heart healthy extending a person's life. At a minimum, this information ignites an interest in participation for those seeking heart-healthy changes.

The difference in marathon running versus a recreational or long-distance runner is the adoption of lifestyle behaviors. O'Keefe, O'Keefe, and Lavie (2018) stated a marathon runner usually has better health. This position is partially attributed to the inclusion of improved psychological outlook and a social support system centered on the engagement of running (Christensen & Ogles, 2017; Shipway & Holloway, 2010; Zach et al., 2015). The perception of effort with the ability to focus the needed attention eventually leads to feelings of enjoyment and continued pursuit (Emad, Neumann, &

Abel, 2017; Yeh, Lin, & Huang, 2017). Hooker and Masters (2016) determined the experiences guide a greater fulfillment and higher self-efficacy.

Conversely, the risks of marathon running are equally realized. There is an agreement to the high rate of injury. Running USA (2018b) reported 75% of runners were injured in the previous 12 months. Christensen and Ogles (2017) observed an 80% rate of injuries while Timm, Kamphoff, Galli, and Gonzalez (2017) found the highest rate of injury occurrence at 92%. Unlike other sports, running does not have a specified classification of injury. In 2015, a panel of 38 experts convened with a presumptive definition (Yamato, Saragiotto, & Lopes, 2015). Notwithstanding, there is a considerable variance to what defines an injury leading to an even weightier effect on continued training.

The argument of high injury rates initially points to the cause-effect relationship of musculoskeletal injuries related to running. Damsted, Parner, Sørensen, Malisoux, and Nielsen (2017) preceded this indication with their position that several individual variations such as age, gender, body mass, and previous injury status are causes. Chalabaev et al. (2017) disagreed with that perspective and emphasized the factors related to subsequent training errors such as frequency and distance are the source of liability. Messier et al. (2018) conducted the Runners and Injury Longitudinal Study (TRAILS) and supported the view of experience which forms the personal threshold to injury causation. Of interest, age as a cause of injury was found to be statistically significant in only a few studies (Taunton et al., 2002; Van Gent et al., 2007). The foregoing perception is running long-distance may not be advantageous to the aging

runner (Christensen & Ogles, 2017; Rasmussen, Nielsen, Juul, & Rasmussen, 2013). The integration of these confounding variables lacks any certainty to state a direct association.

Not to be overlooked are the cardiovascular concerns indicating a potential injury. There is debated speculation to cardiac overuse. Excessive endurance exercise (EEE) as portrayed by marathon running contributes to sudden death. This occurs at a rate of one in every 200,000 participants (Lavie, O'Keefe, & Sallis, 2015) with 94% of all incidences in runners over the age of 35 (Burkule, 2016). In their findings, O'Keefe et al. (2018) determined as many as 75% of runners had calcified coronary plaque levels higher than normal leading to the risk of atherosclerosis. Other heart issues revolve around changes in cardiac structure thought to increase atrial fibrillation or a-fib (Lavie et al., 2015), and elevate troponin levels (Predel, 2014). Age again is mentioned as a risk factor which cannot be separated from the accumulation of lifestyle habits, often not ideal prior to acquiring the lifestyle of a marathon runner (Pressler et al., 2017; Schwellnus, 2017). What is agreed upon is the lack of an identified threshold where risk overtakes the benefits of participation (Burkule, 2016; Lee et al., 2017; Schnohr et al., 2015). Until evidence is established, the decision to participate in marathon running continues at a personal willingness to train for such events.

The risk of physical injuries due to marathon running overshadows its undeniable psychological and social advantages. Though intentions are to maintain health, an injury is possible even when vaguely defined. Navigating and managing any injury, running-related or not, poses a conflict to maintaining a positive outlook on emotional, mental, and social well-being (Yeh et al., 2017). This aspect becomes even more difficult when medical treatments only manage the rehabilitation of injuries (Arlis-Mayor, 2012). This

common practice by health care providers may be one of the rationales where less than half of all injured runners obtain guidance for a suspected injury (Christensen & Ogles, 2017; Masters & Ogles, 1998; Running USA, 2018b). To distinguish what motivates marathon runners to sustain running when challenged by the changes brought on by age and potential injury reason a discernment. In turn, which may reduce the negative perception and even stereotype that running always leads to injuries. As circumstances change, so may motivational reasoning which yields to a need for a greater purpose and coping mechanisms (Heazlewood, Walsh, & Climstein, 2018). These positive associations present deeper clarification in understanding the motivation of these runners.

The Motivations of Marathoners Scales

Previous attempts to explain the motivation to marathon running required a stable tool of measurement. Masters, Ogles, and Jolton (1993) conducted a quantitative survey titled Motivations of Marathoners Scales (MOMS). The researchers defined four overarching categories of motivation to be psychological, physical, social, and achievement, supported by nine subcategories. Since its inception, their survey has shown psychometric properties of internal consistency and reliability with minimal negative effects of social desirability. Studies outside of marathon running have used the MOMS survey to assess motives among sport-specific athletes (Hanson, Madaras, Dicke, & Buckworth, 2015; Heazlewood et al., 2018). Its usage to investigate the motivation among marathon running remains popular as the profile of the marathon runner is shifting toward an older demographic not yet exclusively studied.

The use of the MOMS survey throughout a variety of studies displays common agreements when considering an expansive age demographic such as older versus

younger runners (Masters & Ogles, 1995; Ogles & Masters, 2000, 2003). However, most outcomes were internal comparisons within larger populations (Ruiz-Juan & Sancho, 2011; Zach et al., 2015). All of these researchers used their own classification of age ranges, none of which were consistent. Loughran, Hamilton, and McGinley (2013) included only marathon runners over the age of 40 years. Their assumptions predicted a relationship of psychological coping to perceived benefits of running, not the type of motivation nor any mention of injuries.

Due to the prevalence of injuries connected to marathon running, the MOMS survey has been used to levy motivation for their underlying causes. Training volume comparisons by Masters, Ogles, and Richardson (1995) had no statistical significance. Christensen and Ogles (2017) confirmed the works of Masters and Ogles (1998) where motivation through association and dissociation does not predict injuries. Besomi et al. (2017) along with Goodsell, Harris, and Bailey (2013) stated while motivation can change, it does not reduce injuries. What remains is an unsupported belief that motivation could contribute to injuries.

The Justification for the Study

The motivation of marathon runners, though highly researched in a variety of settings and groups, has yet to find a common motive. What is of greater interest is the increasing population of these runners, age 40 and older, that does not have a study exclusive to their age demographic to portray motivational reasoning for continued participation; especially with the occurrence of running-related injuries (RRI). These runners are an already established group with their status recognized by the USA Track & Field Association as master level amateur athletes (USA Track & Field, 2017). For this

study, the reference to these master level runners (MLR) is the nomenclature to describe this specific population. This term is constructed and modified from the USA Track & Field literature.

The participation in marathons by this group of MLR is steady. As the adult population continues to progressively get older (U.S. Census Bureau, 2017) the potential for a continual increase in marathon racing is possible. Because of the growing need to maintain good health as one gets older, which includes improvements to the behaviors and lifestyle to endorse such, the necessity for more information has become apparent. To reduce the gap in knowledge, this study provides an insight into the underlying motives by these MLR which may differ from those directly observed according to injury status. What is not known is the motive that sustains the ongoing behavior of training for such a physically demanding activity and the difference, if any, when continuing to run while experiencing injuries. These reasons may be vital to overall health.

The need for this study on the motivation of these MLR participating in marathons offered a perspective to adherence which is guided by motives leading to better health. A person changes with age and so does their respective attitude and values towards being healthy. This shift may create strong connections with peers. Habits and behaviors for long-term engagement, especially for health, requires strategies endorsed by community development (Besomi et al., 2017). Masters and Ogles (1995) suggested an immediate inclusion to the awareness of the psychological benefit accompanying exercise to enhance continuance. The lifestyle of a marathon runner offers an example of how the accumulation of personal behaviors is negotiated to find a sense of balance between all aspects of health.

Despite the occurrence of injuries, running has supported reasonings that merit participation and further understanding. The adverse perceptions, usually held by nonrunning participants, do not align with current evidence which supports no direct association (Esculier, Krowchuk, Li, Taunton, & Hunt, 2018). Extending the rationale for motives as stated by the MOMS survey of those running and the difference, if any, to those continuing to run with injuries reinforces what may be a collective experience extending the benefits while expanding the boundaries to what supports a positive health outlook.

Problem Statement

For any runner, there is an increase in injuries from running when training for specific events. As high as 80% to 92% of marathon runners experience injuries due to running (Christensen & Ogles, 2017; Damsted et al., 2017; Messier et al., 2018; Timm et al., 2017). Most are self-reported. Only 25% to 41% of runners include the guidance of a health care provider to confirm a suspected injury with as many as 50% to 70% making no changes to their running routine (Christensen & Ogles, 2017; Running USA, 2018b). Although this display shares consistency in the response to injuries, what lacked is an explanation for continuance.

For the older runner, injuries can expose underlying age-related conditions (Arlis-Mayor, 2012). Approximately 37% report chronic health-related issues (Hollander, Baumann, Zech, & Verhagen, 2018). This statistic is not limited to repeated overuse of joint-specific pains. Long-distance running creates undue physiological stress resulting in cardiac issues (O'Keefe et al., 2012; Schwellnus, 2017). An explanation was necessary to

understand what motivates these runners to adhere to marathon running despite the recognized impact of physical adversities creating risk.

A common motive for marathon running was not yet identified. Masters et al. (1993) validated a quantitative measurement tool known as the MOMS survey. Their findings introduced four overarching categories (physical, achievement, social, and psychological) to best describe the types of motivational reasoning. The motivation exhibited by these MLR, categorized as such due to their age of 40 years and older, is not known. While Ogles and Masters (2000) found general health and affiliation among men age 50 years and older, their study did not include women or mention injuries. In mixed-gender studies, Heazlewood et al. (2018) noted psychological coping, a subcategory of the psychological motive, and Zach et al. (2015) determined life meaning and goal achievement which demonstrated psychological and achievement as primary motives. Though some comparisons exist, no study agreed on what motivates these MLR participating in marathons, both with and without RRI, or provided a congruent definition of a mature runner that aligns with other running organizations.

The lack of literature on what motivates these runners to continue marathon running, when the occurrence of the injury itself does not deter training, demonstrated reasoning not directly observed apart from the physical benefits. More information was needed to identify the type of categorical motivation which sustains a commitment to running and the difference, if any, when continuing to run with injuries. What remains problematic is the overlooked psychological and social benefits contributing to the motivation required for all physical activity leading to adherence for comprehensive health improvements.

Purpose of Study

The purpose of this quantitative inquiry was to identify a difference in categorical motives as stated by the MOMS survey (physical, achievement, social, and psychological), if any, among MLR running without injuries when compared to MLR continuing to run with injuries. The possibility existed that psychological or social motives are the contributions sustaining adherence in marathon running of the MLR regardless of injury status. Further, with this study, I intended to identify a difference in motives, if any, when comparing male MLR runners to female MLR runners according to their injury status.

The categories of motivation are displayed by the MOMS survey (physical, achievement, social, and psychological). The subset classifications of the questions from the MOMS survey are included for a total of nine distinct motives, each representing a dependent variable. These motives are psychological coping, self-esteem, life meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement. The independent variables consisted of the MLR described as age 40 and older who identify as marathon runners, categorized as running marathons either with or without injuries. For purposes of this study, an injury was a result of running, also known as running-related injuries (RRI), occurring within the previous 12 months requiring a change in running behaviors. Gender was also included as an independent variable.

The motivational differences between groups involved the acknowledgment of known characteristics. For this study, these features consisted of age, the number of marathons completed, and training status as reported by the number of years of running experience and the weekly average of miles run. These descriptive statistics detailed the

sample population attained. The findings of this study were to minimize the gap in the literature by identifying categorical differences of the motivation in marathon running among MLR, specifically both male and female MLR age 40 years and older, if any, between those running without RRI when compared to those continuing to run with RRI. This population has not been a primary focus of interest in previous studies.

With the higher increase in frequency and participation by this group of MLR, there was a demonstrated need. The intent was to identify a difference, if any, to the motivation which included the continuance of running despite the occurrence of injuries necessary for personal benefit and adherence. The maintenance of and training for marathon running despite RRI displays motives often overlooked. Notably, which may be the psychological and social benefits which are not as observable as physical motives, especially in the presence of RRI which would appear to contradict a positive physical motivational reasoning. These reasons indicate the acceptance of a negative consequence such as injury being a lesser detriment than the risk of not preserving the overall quality and satisfaction in life. Thus, demonstrating any person participating in a physical activity or exercise program can choose the behavior for reasons which impact on health and social consequences later in life.

Research Questions and Hypotheses

Research Question 1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without injuries and master level runners with injuries when separated by gender?

$H_0$1: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is no statistically significant difference in the motivational score of continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries.

$H_1$1: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is a statistically significant difference in the motivational score of continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries.

$H_0$2: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is no statistically significant difference in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries when separated by gender.

$H_1$2: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is a statistically significant difference in continued marathon running between master level runners

without running-related injuries and master level runners with running-related injuries when separated by gender.

Theoretical Foundation

The theoretical foundation for this study was the self-determination theory (SDT). Autonomy, relatedness, and competence are the three psychological needs to explain the motivation for purpose in an activity (Deci & Ryan, 2008). The SDT supports the relationship a person demonstrates when intentions mediate behavior. Behavior is then maintained or regulated as the individual determines what is best for the circumstances. This is especially true for the motivation exhibited by marathon MLR when participation remains physically demanding regardless of injury status. The injury itself may create a required deviation regardless of favored choice.

Marathon running requires consistent and ongoing training producing a variety of experiences which favor certain conditions. These include the number of marathons completed, the number of years of running, and the weekly average of miles run. The status of injuries affecting performance was also considered. Motivation, consequently, is a result of these favorable experiences. With the SDT, autonomy shows the selection of choice among available options (Deci & Ryan, 2008). The perseverance of one's self is displayed with competence while the social cognition through relatedness predicts sustainment (Fortier, Sweet, O'Sullivan, & Williams, 2007). When in agreement, motivation favors intended action. Thus, marathon running is dependent on the presence of motivation which requires clarification as to the specific type. The ensuing actions to run come only after careful decision-making about what strengthens ability and identity (Brown & Neporent, 2015). Though not to be discounted, the inclusion of extrinsic and

intrinsic motivation as a functional continuum of self-regulation is discussed in Chapter 2.

The rationale for the SDT in this study aligned to the type of self-motivation necessary for marathon running. As stated, when all three psychological needs of autonomy, relatedness, and competence are met, the behavior is determined (Deci & Ryan, 2008). The motives for marathon running are explained by the categories of the MOMS survey where psychological, physical, social, and achievement are the identified categorical predictors of reason (Masters et al., 1993). While all three constructs of the SDT are psychological needs, physical health is specific to autonomy, achievement measures competence, and social is the relatedness in behavior support (Zach et al., 2015). The research questions were constructed to identify a difference, if any, among those MLR continuing to run marathons with injuries as compared to without injuries as supported through the SDT while conveying the four categories of the MOMS survey (physical, achievement, social, and psychological).

Nature of the Study

The research methodology and design for this inquiry on the identification of a difference, if any, to the type of motive for continued marathon running by MLR, with or without injuries, was quantitative. An independent-samples *t* test would identify a difference, if any, in the motivational score between the group of MLR continuing to run marathons without RRI compared to the group of MLR continuing to run with RRI. To minimize the probability of a Type I error due to the inclusion of gender as a third categorical grouping, an analysis of variance (ANOVA) would determine a difference, if

any, between the group of MLR continuing to run marathons without RRI and those continuing to run with RRI when separated by gender.

For testing purposes, the dependent variables were the nine subcategories of the motives stated in the MOMS survey (psychological coping, self-esteem, life meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement). The independent variables were MLR described as age 40 and older who identify as marathon runners, organized into groups of either running marathons without RRI or running with RRI. For this study, the distinction of running with RRI was self-reported to have occurred within the previous 12 months and required a change in running behavior. Gender was the third independent variable. Lastly, demographic information such as age, number of marathons completed, and training status as reported by the number of years of running experience and the weekly average of miles run are collected for descriptive statistics.

Utilizing an established survey was one manner of controlling validity and reliability. The use of the MOMS survey developed by Masters et al. (1993) provided the questionnaire for establishing the relationships. The survey consisted of 56 questions formatted on a seven-point Likert-type scale. Each response is ranked according to importance within the subcategory. The subcategories then correspond to the overarching motivational category signifying the reported reason for running.

Definitions

Cardiovascular disease (CVD): Cardiovascular health in relation to a combined endpoint that includes coronary heart disease, heart failure, and stroke resulting of four

risk factors consisting of high blood pressure, high cholesterol, diabetes, and smoking (American College of Cardiology, 2011).

Excessive endurance exercise (EEE): Exercise training greater than 60 to 90 minutes (O'Keefe et al., 2018).

Long-distance runner: Runners competing in races longer than 10km but shorter than a marathon (Kluitenberg, Diercks, van der Worp, & van Middelkoop, 2011).

Marathon runner: Runner competing in a long-distance running race of 26.2 miles (Association of International Marathons and Distance Races, 2018).

Master level amateur athlete: Recognition of athletes, to include runners, upon the age of 40 for fair competition against younger athletes (USA Track & Field, 2017).

Master level runner (MLR): The term utilized to describe the specific population of runners for this study, modified from the Master Level Amateur Athlete title designated by the USA Track & Field Association which denotes all athlete runners age 40 and older (USA Track & Field, 2017).

Motivations of marathoners scales (MOMS): The first quantitative measure of specific categorical motives of marathon runners (physical, achievement, social, and psychological). The Likert-type scale responses to the 56 questions indicate the relationship between variables of conceptual relevance (Masters et al., 1993).

Osteoarthritis (OA): A degenerative joint condition characterized by progressive loss of articular cartilage (Arthritis Foundation, 2019).

Recreational runner: Non-competitive runner or running participation in road races shorter than 10km (Kluitenberg et al., 2011).

Running-related injuries (RRI): Musculoskeletal pain in the lower extremities associated with running causing a restriction of or stopping of running; or requires consultation with a health care professional (Yamato et al., 2015).

Self-determination theory (SDT): A formal theory that defines intrinsic and varied extrinsic sources of motivation, and a description of the respective roles of intrinsic and types of extrinsic motivation in cognitive and social development and in individual differences (Center for Self-Determination Theory, 2019).

Assumptions

A major assumption of the study are truthful responses that reflect an adequate representation of this age demographic of marathon runners. A relatively equal number of participants are attained to represent the MLR running without RRI compared to those running with RRI as well as the male and female gender. Normal distribution of similarity was anticipated. As the information requested was not sensitive in nature, respondents would find value in this study and answer the questions accordingly. The questions produced the appropriate replies as they are a standard reproduction of the MOMS survey. Lastly, as the researcher, I was optimistic participation via the selected sampling strategy and affiliations attained sufficient response which increased the likelihood of adequate sample size.

The findings of this study identified the differences, if any, to the type of motivation for continued marathon running by MLR, with and without RRI. The ongoing participation assumed a level of adherence. This reasoning was necessary as assumptions build the research study from truths that are self-evident. Therefore, it was safe to restate

the well-recognized benefits leading to participation depicted positive beliefs about the variables of interest, regardless of lesser risk.

Scope and Delimitations

The scope of participation in this study was limited to the population of interest defined as the MLR, both men and women, who self-recognize with the identity of a marathon runner. Additionally, these participants may be experiencing the onset of RRI. The study was delimitated to the investigation into the identification of a difference, if any, among MLR running without RRI when compared to those continuing to run with RRI according to the motives set forth in the MOMS survey. Motivation via the MOMS survey was measured on a Likert-type scale designed specifically for the proposed study.

An underlying premise of the SDT states people are naturally active at a primary level of motivation. While personal reasonings are important, they reflect a heterogeneous nature and were not considered. Of the sample, the results of the study sought a common categorical motive that differentiated between MLR running without RRI compared to those continuing to run with RRI, which was generalizable to the population of marathon runners between both genders.

Limitations

There are inherent limitations of self-reported responses in the study. A threat to internal validity was participant selection through the recruitment strategy of purposeful sampling via social networking and affiliations with running groups. Also, a lack of sufficient sample size would not identify statistically significant relationships within the data set. The degree of control for population validity reduced generalizability for external validity. Though recognized as confounders, the number of marathons

completed, and training, which consisted of years of experience of running and the average weekly mileage, was utilized as descriptive characteristics. The use of the MOMS survey to measure motivation offered an operational definition to the construct validity reflecting theoretical meaning.

The concerns regarding honest and thorough answers to the MOMS survey presented a bias. Participation was limited to runners that self-ascribed to the identity of a marathon runner. Thus, there was no verification or a stated number of marathon completions for such recognition or belief of identity. This response bias may overestimate or underestimate the scaled rate of survey answers. Given that participants are anonymous, some bias was minimized. Further, selection bias due to purposeful sampling and geographical location was mentioned. These biases were controlled using the data collection instrument that contained specific questions to the demographic profile.

Decisions to address the limitations were intentional. The use of the original MOMS survey was retained due to consistent reliability and validity. Zach et al. (2015) suggested an updated and expanded survey though not extensively tested. The survey instrument for the data collection was from an online link specifically created to alleviate missing or vague responses. This action prevented data from expulsion in the analysis process. The description of a current injury was related to running that occurred in the previous 12 months. These actions were to minimize the reduction in sample size which affected the duration of the data collection process.

The length of data collection of the MOMS survey remained open to ensure adequate sample size reflecting the magnitude of relevance and the statistical

significance, if any, to the categorical type of motivation to marathon running. The quantity of time, as well as the direct recruiting from diverse subgroups potentially, minimizes such bias. Even with presumed subjectivity, the data collected contributed to the gap in the literature which has not been entirely researched for this behavior and of the MLR population. Therefore, considerable attention was given to a representative sample and investigational procedure.

Significance

The intention of the study filled in the gap by reducing the misinterpretation of motivation by participants, observers, and those who may be interested in marathon running to improve personal health. Recognizing the categorical motives of MLR participating in marathons despite the occurrence of injury demonstrated that a potentially negative experience does not inhibit a person from reasonings of greater importance. The evidence of physical health and fitness benefits emerges from a biomedical and pathophysiological perspective (Hulme & Finch, 2016); often not considered in the engagement of physical activity.

Many of these benefits continue only during the sustainment of activity. Running for some people fulfills a psychological need or social health aspect (Brown & Neporent, 2015). To cease the experience creates the potential for other concerning health issues especially when it is a central focus to lifestyle. Moreover, motivation may change upon injury. As the identity of a marathon runner developed as part of the considerable amount of time devoted to such training, the participation gives additional cause for managing personal health.

The lifestyle adoption of a marathon runner represents a potential model for health prevention and community wellness. The need for social change to incorporate healthy habits as a means of health management on a continual basis persists and requires a proactive response of preparedness due to the increasing age of the population. According to the U.S. Census Bureau (2017), the median adult age of 37.9 years, showed an increase of 8% or 2.6 years since 2000. The growth of marathon running by these MLR implies a determination to accept a prevailing benefit system giving greater value regardless of the potential onset of the injury. During a phase in life where physical activity tends to decline (USDHHS, 2008), this age demographic of runners offers a display of the potential attitudes where people any age can live active and vital lives minimizing the societal beliefs that with aging comes limitations.

The approach to motivation contributes to adherence reflecting an alternative or more holistic balance of the physical to psychological advantages allowing for further positive social change. This approach has the potential to promote the treatment of injuries in health care where the provider recognizes the role of the injury to the overall well-being of the person (Arlis-Mayor, 2012). This application is permissible in other forms of physical exercise allowing for substantial enhancements in community health.

Summary

Marathon running among adults recognized as MLR is increasing to where 50% of all marathon finishers are by this demographic (Running USA, 2018a). There is a plethora of evidence asserting the benefits of continued participation. Improved cardiovascular health is the most recognized as displayed in the 2008 Physical Activity Guidelines for Americans, the Aerobic Center Longitudinal Study, and the Copenhagen

City Heart Study (Aguib & Al Suwaidi, 2015; Lee et al., 2014; USDHHS, 2008). Psychological and social are also known benefits with lesser recognition despite greater levels of satisfaction and self-efficacy (Christensen & Ogles, 2017; Emad et al., 2017; Shipway & Holloway, 2010; Zach et al., 2015). Therefore, participation appears to be reasonable.

The risks associated with marathon running, especially as a person ages, are also clear. There is agreement that musculoskeletal injuries and CVD issues have high rates of occurrence and severity (Burkule, 2016; Christensen & Ogles, 2017; Lavie et al., 2015; O'Keefe et al., 2018; Predel, 2014; Timm et al., 2017). Several factors are not clear in establishing an associated causal-effect relationship of these potential risks (Chalabaev et al., 2017; Damsted et al., 2017; Messier et al., 2018). Age was found to be statistically significant, though only in certain studies (Christensen & Ogles, 2017; Taunton et al., 2002; Van Gent et al., 2007). This lack of clarity suggested the continuance of more research until better understood.

A common motive of these MLR participating in marathons was not known. The purpose of this study was to minimize the gap in the literature where the explanation of motivation among MLR with respect to the status of RRI lacked ample awareness and understanding. The MOMS survey, developed by Masters et al. (1993), was utilized in a quantitative inquiry with statistical testing via independent-samples *t* tests and an ANOVA to identify a difference, if any, among MLR running without RRI compared to those running with RRI according to the four categorical motives (psychology, physical, social, and achievement) offered by the MOMS survey. The research questions

emphasized the differences in motivation between injured and non-injured runners, both male and female MLR.

In the following chapter, a deeper examination of the types of risks and benefits experienced by marathon runner is presented. The role of aging, as an influence on the occurrence of RRI among these MLR, gave insight guiding the unknown appreciation for their pursuit of better general health. The findings of the MOMS survey discussed address the current perspective of this population while pursuing substantial reasoning to promote better adherence to future physical activity programs for positive social change.

Chapter 2: Literature Review

The purpose of this study was to identify from the categorical motives (physical, achievement, social, and psychological) as stated by the MOMS survey a difference in motives, in any, of marathon running by MLR continuing to run despite RRI when compared to noninjured MLR. Motivation has been suggested to be an underlying mechanism to endure prolonged activities. This is particularly indicative of long-distance running and more so when experiencing injuries. The intention was to contribute to the body of literature regarding the increasing participation of this specific population of runners. Despite the extensive knowledge on marathon running, there remains a significant gap in the existence of information to acknowledge the sustained motivation for this group of MLR. Further, to contribute information recognizing the existence of injuries which accompanying behavior in pursuit of overall health.

This chapter describes the details regarding the methodology used to differentiate among the existing literature on the topic of the motivation in marathon running towards these runners of a mature demographic. Whereas many studies on running do include middle and older runners, they are not the focus, especially with the high risk and probability of RRI. The following is a literature review of the key concepts that include motivation as described by the SDT, marathon running, and the presence of RRI as the result of running and the aging process. This review provides a synthesis of existing information including attention to the areas such as the physical benefits and risks, as well as the psychological and social reasoning of behavior lacking consent or agreement to the continuance.

Literature Search Strategy

The literature presented in this review was obtained through several health sciences and scholarly databases: CINAHL Plus, MEDLINE Plus, ProQuest Nursing & Allied Health, PubMed, and Google Scholar. Additional databases were sought to incorporate the sports psychology of injuries within the medical and social sciences utilizing ScienceDirect, EMBASE, and Scopus. The keywords in the search were *marathon running, motivation, injuries, Motivations of Marathoners Scales,* and *SDT or self-determination theory*.

An initial search was conducted without restrictions to publication dates in examining the historical context on the motivation of marathon running. Specifically, this action was to incorporate the development of the MOMS survey which categorized motivation in quantifiable terms. It also allowed the theoretical alignment to the SDT. The high number of articles recognized, along with the large display of information, required an update to the existing search of keywords in Boolean Operator phrases. The secondary keywords added were *older runners* and *aging athletes*. Limiting the search to peer-reviewed journal articles within the previous five years also improved the alignment to the scope of the inquiry. A list of search terms and results appears in Table 1.

Table 1

Key Search Terms and Results

Search term	CINAHL Plus	MEDLINE Plus	PubMed	ProQuest Nursing & Allied Health	Google Scholar
MR	103	385	731	1238	20,900
MR and motivation	3	8	13	185	15,900
MR and injuries	8	59	109	638	13,400
Motivations of Marathoners Scale	0	1	0	20	3,850
MR and self-determination theory	0	0	0	60	17,500
Older runners	139	59	93	1209	18,700
MR and older runners	16	6	40	298	16,300
Aging athletes	26	55	403	2390	22,800
MR and aging athletes	0	0	14	225	14,100

Note. MR = marathon running.

These databases were imperative in locating the applicable information. The linking of keyword combinations allowed article retrieval for evaluation of the article abstracts and contributions to the literature review. Three major topics emerged to comprise the literature review: motivation and adherence in marathon running, the Motivations of Marathoners Scales, and injuries related to running and aging. Each is necessary for a collective understanding of how marathon running is vital to the overall health, wellness, and quality of life in relationships among this growing segment of the population.

Theoretical Foundation

The application of the SDT for this study provided the theoretical foundation to address the key variables. As a humanistic motivation theory developed by Deci and Ryan (2008), the premise is the relationship a person demonstrates when intentions negotiate behavior through the type of motivation rather than the quantity. Autonomy,

relatedness, and competence are the three psychological needs controlling for motivation to find purpose in an activity (Deci & Ryan, 2008). Behavior is then maintained or regulated when an individual determines what is best for their situation or circumstances.

The SDT proposes a collective interaction between autonomy, relatedness, and competence among an individual's perception to support positive decision-making within their environment. While autonomy represents the selection and availability of choice (Deci & Ryan, 2008), it lies in opposition to the external demands or controlled choices which may create limitations or even cessation of activity. Relatedness is the social context where connectedness may equate to adaptive behavior patterns; often reflected in the common characteristics of a group which later define an individual. Edmunds, Ntoumanis, and Duda (2006) found the support of others may override one's perceived controls. Lastly, competence displays the ability to obtain a goal or accept a challenge as demonstrated in achievement. As the mastery of a skill, competence navigates self-regulation between extrinsic and intrinsic motivation (Deci & Ryan, 2008). When all three are met with satisfaction, motivation heightens a person's belief system resulting in sustained behavior.

The decision-making process to engage in the behavior is furthered by the quality of motivation in terms of intrinsic or extrinsic persuasion. For optimal performance, especially of physical activity, continuance is the regulation of choice and control towards a consequence (Fortier, Duda, Guerin, & Teixeira, 2012). When of one's choice or autonomous in nature, the motivation is intrinsic to which there are self-interest and enjoyment. Deci and Ryan (2008) state autonomy as critical to withstand the external pressures that may result in the abandonment of behaviors. Further, the onset of

experience via choice and positive accomplishments influences the belief system strengthening identity and resilience (Brown & Neporent, 2015). The result is a personal and meaningful rationale for the selected behavior.

On the other hand, extrinsic motivation identifies a consequence separable from a person's internal frame of reference. In their rationale of motivation as a continuum, Deci and Ryan (2008) described extrinsic motivation as uniquely positioned between amotivation or lack of self-determined behavior and intrinsic which also referred to as self-determined. Extrinsic motivation is a regulator of behavior delineated to the subcategories of introjected, identified, or integrated. Figure 1 shows these concepts in their sequence. As a predictor of the outcome, the greater the levels of intrinsic motivation, the better the adherence.

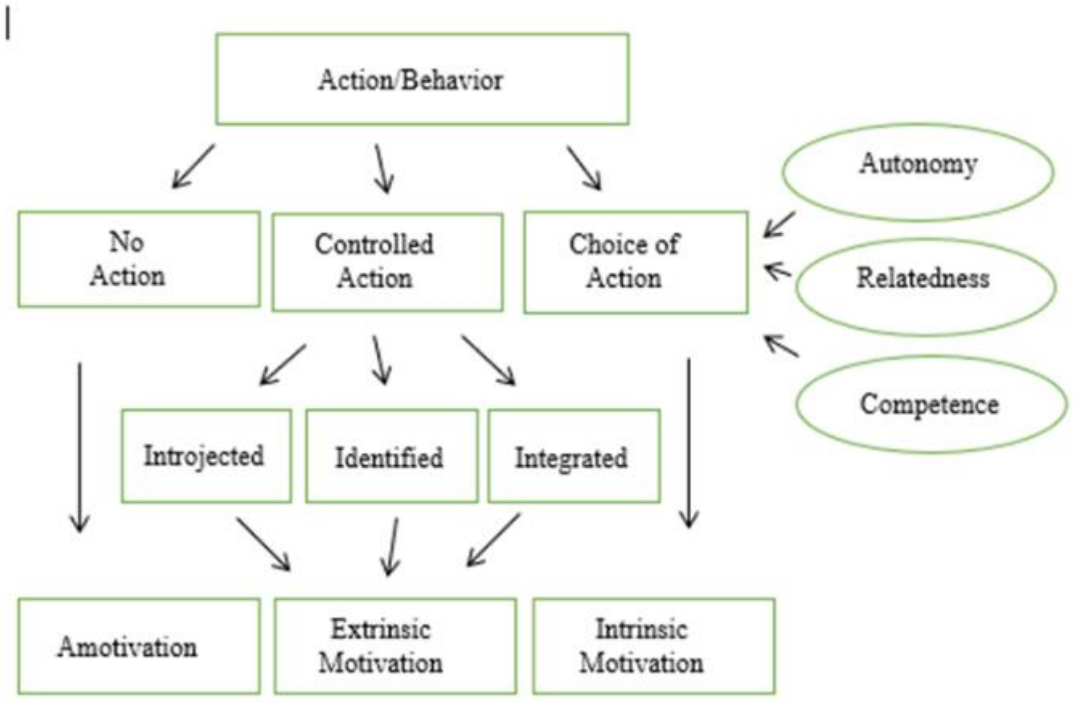

Figure 1. Characteristics of the Self-Determination Theory.

There are underlying assumptions of the SDT. The first is people are naturally active through a primary level of self-motivation (Deci & Ryan, 2008). This assessment mediates the ongoing participation required for physical activity as well as marathon running. The second assumption is that intentional behavior functions as a continuum with a continual shift towards intrinsic motivation. Between internal desires and external pressures exists the extrinsic motivation in the forms of introjected and identified which lack a strong yet personal affiliation towards expected behavior. Instead, integration, though categorized as extrinsic, is more like intrinsic while remaining under the consideration of external rewards or reinforcements (Deci & Ryan, 2008). Support and a social climate of encouragement may induce a positive experience and movement towards intrinsic (Deci & Ryan, 2008). However, it can also alienate future decisions towards action. Teixeira, Carraça, Markland, Silva, and Ryan (2012) counter the support of an individual's needs associated with participatory reasoning shows considerable differences from person to person. Though prediction is reasonable with the SDT, it may not include all conditions for behavior change.

The SDT is the theoretical foundation of several physical activity health interventions to improve participation through various types of motivation. In their systematic review, Fortier et al. (2012) found autonomous and controlled motives mediated the relationship between competence and continuance of behavior with social environments known for their encouragement to be predictors regardless of the duration of the intervention. Patrick and Canevello (2011) discerned support of choice versus control included a meaningful justification for behavior emphasis. Comparatively, Miquelon, Chamberland, and Castonguay (2017) predicted intention and behavior in

motivational regulators among 1092 active adults to be higher with autonomous levels associated with the self-determined, intrinsic exercisers. Equally compelling is the concept of intrinsic motivation as determined by Sullivan and Strode (2010) which must accompany self-efficacy to maintain a greater level of autonomy over the challenge for the individual. Together, the autonomous choice of behavior elevates the necessary motivation for self-determination and ensuing activity.

The results of these studies validated several basic tenets of the SDT. Deci and Ryan (2008) stated continuous actions create sustainment and eventually become part of one's identity. Actions leading to character attributes are precipitated by thoughts and attitudes. Behavioral control among these activities was increased when autonomous motives accompanied a person's intentions to change (Fortier, Kowal, Lemyre, & Orpana, 2009). Patrick and Canevello (2011) also agreed the individuality of determination contributes to elevated levels of motivation. Regarding the applicability of the SDT's psychological needs as universal for all populations (Deci & Ryan, 2008), Fortier et al. (2012) observed no difference due to cultural distinction or geographical location to the impact of lasting behavior change.

Developing the theory of self-determined motivation towards sports, specifically the maintenance of long-distance running, shares parallels to physical activity. The achievement of desired performance in any sport requires continuous engagement. Through the utility of the SDT, the findings of Inoue, Wegner, Jordan, and Funk (2015) suggested running promoted emotional well-being with higher self-motivation leading to greater self-efficacy. Of 41 female runners with an average age of 40 years, Guérin and Fortier (2012) identified where controlled motivation gave immediate emotional relief,

more so in the reduction of guilt; yet, autonomous motivation increased positivity across self-regulation influencing intensity, pleasure, and adherence. Fortier et al. (2007) concluded that continual training for marathons required perseverance of social cognition supporting competence. Like any consistently desired activity reinforced by self-regulated motivation, emotional well-being plays a supporting role in outcomes.

As the SDT is a universal theory of motivation, motives cannot be assumed to be predictable across age demographics. This statement is especially important with an aging population where the activity is essential for well-being without substantial health care expenses (Ferrand, Nasarre, Hautier, & Bonnefoy, 2012). Kirkland, Karlin, Stellino, and Pulos (2011) correlated moderate amounts of physical activity via self-determined extrinsic and intrinsic motivation to the management of fitness, social, emotional, and stress. Sheehy and Hodge (2015) contended aging brings socialization of behavior opportunities when mid-life and older adults participate in sports. Though runners have the option to run alone, this social persuasion may exhibit greater collective engagement leading to greater intrinsic motivational rewards.

As social behavior is positively associated with autonomous motivation (Deci & Ryan, 2008), the older athletes reciprocate the connections of relatedness through shared interests (Sheehy & Hodge, 2015). This idea builds on the findings of Dacey, Baltzell, and Zaichkowsky (2008) where enjoyment was identified as the result of direct experience increasing both intrinsic and self-regulated external motivation. Even with motives determined by the individual, optimal social and sport-endorsed environments have an influence which dictates behavior and adherence.

The rationale for the choice of the SDT is in its efficacy to predict positive increases in the estimation of physical activity behaviors. There is an extensive display in the literature where the SDT supports the identification of the type of motivation towards managing the individual and environmental variances. Following the basic psychological needs of autonomy, relatedness, and competence as authenticated by Deci and Ryan (2008), the usage across gender, age, culture, and life domain allows for reliability and consistency when determining the outcomes of a distinctive behavior such as marathon running.

To address the purpose of this study, the SDT serves as primary logic to the categories of motivation (physical, achievement, social, and psychological) validated in the MOMS survey developed by Masters et al. (1993). As previously stated by Deci and Ryan (2008), all three psychological needs, autonomy, relatedness, and competence, must be negotiated and included for self-determined levels of motivation. Although each runner has a unique and personal explanation for participation, the type of motivation must be self-determined. The quantitative measurement tool of the MOMS survey assesses the broad range of motives as an extension of the SDT to quantify the understanding of the involvement of these mid-life and older marathon runners. Where this study seeks the differences in the categorical motives by the MOMS survey (physical, achievement, social, and psychological), among those MLR running without RRI compare to MLR with RRI, the motivation to what regulates behavior is critical.

Marathon Running

The historical context of marathon running originates from Greek culture displaying the fortitude of human determination and perseverance. In his run from

Marathon to Athens, the messenger Pheidippides shared news of battle victory before collapsing to his death. Today, the marathon with an official distance of 26.2 miles (Association of International Marathons and Distance Races, 2018) attracts runners of all ages to challenge their physical and psychological capabilities. No other single competitive event requires such a high-level of consistent physical training and commitment to achieve personal success (Sancho & Ruiz-Juan, 2011). No longer reserved for the elite athlete, participation is now available to anyone willing to train.

The visibility of these amateur runners has created significant interest and change to the perception of marathon running. According to Running USA (2018a) from 2004 to 2014 there was a 29.9% increase in participation reaching an all-time high of 541,000 finishers in 1,100 certified races. Despite a decrease of 8% from 2014 to 2015, the number of finishers remains constant with less than a half percent decrease in overall finishes (Running USA, 2018a). The ongoing continuance of the successful completion by these athletes observes behaviors appreciating the benefits and achievements of this competitive yet social environment.

A more distinct display of participation by older runners is represented by age. While the median age for female marathon runners is 37, for males it is 40 showing a stronger presence to the master level of amateur athletes (Running USA, 2018a). Upon reaching the age of 40, all runners become recognized as a master level amateur athlete for fair competition against the younger-aged runners (USA Track & Field, 2017). MLR now comprise 50% of all marathon finishes, up 47% in the past 10 years and more than doubling since the 1980s (Running USA, 2018a). Participation among this age

demographic shows the remaining physically active should not be minimized solely based on age.

Many runners, specifically these MLR, seek involvement with marathon running as a versatile and convenient form of exercise. Loughran et al. (2013) along with Lee et al. (2017) agreed the endeavor has a broad demographic appeal due to the minimal barriers preventing participation. Further, the rationale for involvement is met with sufficient challenge inducing a training routine of discipline necessary for improved endurance capacity and cardiovascular health (Hulme & Finch, 2016). Although appearing of a trend, this mid-life stage may signify the higher importance of behaviors to health and personal life satisfaction.

Benefits of Marathon Running

To understand why marathon running is increasing is to acknowledge the physical, psychological, and social benefits unique to such a challenging athletic event. Among adult runners, this subgroup of MLR is participating in marathons at a frequency greater than required for health and fitness benefits. Whereas physical activity declines with age (USDHHS, 2008), these runners have adopted a lifestyle that supports their continuous activity needs. Evidence documents the many physical, psychological, and social benefits of participation becoming a focal point in the life of a marathon runner (Christensen & Ogles, 2017; Shipway & Holloway, 2010; Zach et al., 2015). The preparation for races becomes paramount in maintaining health and activity along with the ability to sustain the arduous physical demands of running competitively.

In general, the recognized physical benefits of running pertain to cardiovascular health with specific mention to the reductions to hypertension and resting heart rate,

improved lipid panels, and glucose monitoring (O'Keefe et al., 2012). As a form of exercise demonstrating a range of intensity options from moderate to vigorous (USDHHS, 2008), the potential for variety is adapted for individuals running solo as well as social groups training for and entering designated races. The Aerobic Center Longitudinal Study, a 15-year prospective study of 55,137 runners and nonrunners with a mean age of 44, showed a 30% lower all-cause mortality rate and CVD mortality reduced by 45% among runners regardless of abilities (Lee et al., 2014). These findings were consistent to the Copenhagen City Heart Study, a series of studies from 1975 to 2003 with 23,891 participants stating the lowest mortality rate was achieved with runners when compared to non-runners (Aguib & Al Suwaidi, 2015).

In a meta-analysis of 49 studies, all randomized and controlled with over 2,000 participants, Lee et al. (2017) noticed running had the same all-cause mortality reduced by 30-45%; in turn, increasing longevity by three years. O'Keefe et al. (2012) remarked a life expectancy greater than seven years when compared to nonrunners for longevity. Lee et al. (2017) went on to be more specific that running was better providing a 27% reduction when compared to the 12% of other forms of physical activities. However, if a person performs a combination of both running and other exercises, a 43% reduction is achieved. Meanwhile, low-to-moderate and continuous is the amount of activity determined by Paolucci, Loukov, Bowdish, and Heisz (2018) to be perceived as less psychologically stressful for heart health improvements. Thus, the frequency of marathon running as a lifestyle creates an appeal to remain heart healthy over time (Schnohr et al., 2015).

Often overlooked are the psychological benefits to exercise, and more so to the activity of running. With the improved physical state of health, factors such as mood, anxiety, depression, and self-esteem are evidenced by positive associations. Mikkelsen, Stojanovska, Polenakovic, Bosevski, and Apostolopoulos (2017) concluded these outcomes in a systematic review of general exercise which also assessed the role of physiological changes in various hormone levels and their role in the aging process. Zach et al. (2015) added that psychological influence is modifiable with the potential for change. These insights sponsor the physical and mental health reasoning where the occurrence of running offers frequency and variability of intensity through both the training for and competing in races.

What is necessary to the understanding of psychology in marathon running is where perceived satisfaction between intention and outcome is not always mutual. Shipway and Holloway (2010) confirmed the desire for physical and mental health is equal with discipline and challenge being the key elements leading to positive lifestyle choices. Marathon running does require training along with a variety of other supporting behaviors to which most runners adhere (Running USA, 2018b). It is the perception between a runner's intention and goal to be what Loughran et al. (2013) argued critical for success. Samson (2014) stated past performance increases self-efficacy and mastery which is mediated by the experience. As such, poor performance can either lead to cessation or be the catalyst for return due to the increase in knowledge from familiarity.

The appeal in marathon running is one that develops over time. Yeh et al. (2017) reasoned the physical, spiritual, and cognitive elements influence satisfaction which premediates the reoccurrence of running and racing. However, any physically enduring

event requires attentional focus where Emad et al. (2017) determined a variety of these methods useful for monitoring perceived exertion toward satisfaction and eventually enjoyment. Samson, Otten, and Crivello (2015) offered a different suggestion of where the completion of any marathon, successful or not, fosters mental toughness. As the ability to overcome the demands of environmental stressors due to physical fatigue and discomfort, one's mental toughness develops a perceived control becoming a psychological coping resource to overcome challenges in other areas of life. Hooker and Masters (2016) referred to the accumulation of behaviors as the foundation for improving the odds of continued participation.

Several viewpoints mutually share how achieving satisfaction requires social support. According to the 2017 National Runner Survey, 50% of runners prefer to run alone, 30% run with others, and the remaining 20% state no preference (Running USA, 2018b). Supporting behavior comes through a variety of exposures. Whether training together or meeting for a race, agreed upon was the verbal persuasion through social interaction which increases adherence, particularly as one becomes older (Koronios, Psiloutsikou, & Kriemadis, 2018; Samson, 2014). Samson (2014) broadened the view that running groups also purport the vicarious experiences or modeling of behaviors contributing to the positive reinforcement of a runners' self-perception. When of a constructive and encouraging experience, rather than someone who runs marathons, the person becomes the marathon runner.

This identity of a marathon runner continually evolves through self and community. Malchrowicz-Mośko and Poczta (2018) expressed how running has the ability to establish social relationships which purport the feelings of being connected to

others. Shipway and Holloway (2010) recognized marathon running as an equal social contributor to a runner's sense of self and affiliation within a community. Brown and Neporent (2015) understood the social aspect and its facilitation to instill an audience effect whereas performance does increase. The result is empowerment, confidence, and the pursuit of sustained running. Membership in running clubs offers reinforcement to this behavior (Ogles & Masters, 2003).

The relationship to the behavior and identity of marathon running can become more pronounced. The simple act of wearing a t-shirt promotes an anticipated connection. In their initial study, Adam and Galinsky (2012) indicated a plausible outcome to the effect of psychological and behavioral consequences when wearing apparel of a symbolic nature. The wearing of running apparel, even with or without a particular distinction such as an event name, is a selective attention filter generating an explanation of the profound importance of unity. This demonstration was never more evident than in the aftermath of the 2013 Boston Marathon bombings where the resiliency was encouraged by the social support that marathon runners really never run alone (Timm et al., 2017). Regardless of geographical location, marathon runners are their own social community.

With marathon running being such a time-intensive endeavor in a runner's lifestyle, the athletic identity of the runner has been suggested to be a caveat. The notion of over-commitment and thus, overtraining are perceived as highly frequent to non-runners. Horton and Mack (2000) noticed no neglect to the other professional or personal roles especially most evident among MLR where tasks may be interdependent and not adversely isolated. In their meta-study of 108 empirical reviews of athletic identity, Ronkainen, Kavoura, and Ryba (2016) denounced any stable and measurable patterns due

to the variations of the expectations assigned to roles. As with the inclusion of any activity, the interpretation of balance is best known by the individual.

Risks Associated with Marathon Running

The influence of an active lifestyle focusing on marathon running is perceived with risk. According to the 2008 Physical Activity Guidelines for Americans, while the health benefits outweigh the risk for any activity, adverse outcomes have a potential for injuries (USDHHS, 2008). From an intervention standpoint, what is not known in the understanding of the complementary and casual causes become even more problematic when determining the most favorable recommendation supporting physical health, psychological outlook, and even social relationships. Though multifaceted in occurrence, exploring the certain risks leading to injuries is essential.

Musculoskeletal Injuries

Many running enthusiasts cross over from a recreational runner to a goal-oriented nature of performance. Sixty-two percent of runners categorize themselves at fitness or competitive levels (Running USA, 2018b). The increase in the physical demands due to the changes in the training variables such as frequency, duration, and intensity create a gap between the usual and new activities leading to overload. Described as a threshold, when demands exceed capacity, the risk of injury increases (USDHHS, 2008). Factors creating individual variations include age, gender, body mass index (BMI), and previous injury status (Damsted et al., 2017). Like fitness ability, this threshold does increase over time due to consistent training. Unfortunately, surpassing the limitations is usually not recognized until the signs and symptoms of injury are present.

From a running perspective, the consequences of overload are injuries known as running-related injuries (RRI). They are most evident of the musculoskeletal demands subsequent of training errors (Chalabaev et al., 2017). The result is a consistently high agreement of RRI occurrence. In their 2017 National Running Survey of over 6,800 runners, Running USA (2018b) reported 75% of runners were injured in the previous 12-month period. From the findings of Christensen and Ogles (2017), their rate of occurrence was 80% with a 90% rate of injuries by Damsted et al. (2017) and an even higher 92% by Timm et al. (2017). Lopes, Hespanhol, Yeung, and Costa (2012) confirmed this same percentage in a systematic review. The implication is that RRI can and will happen with probable setbacks in training.

The extent to which risk becomes a valid RRI is varied. The typical classification is overuse or chronic injury observed of running with only an indirect confirmation assessment. Hollander et al. (2018) stated their definition of an injury to be an issue resulting from training becoming a sustained problem regardless if training time is lost. De Araujo, Baeza, Zalada, Alves, and de Mattos (2015) included abrasions and blisters in addition to sprains, strains, and tendinitis as part of the 83% occurrence of RRI in amateur runners. Small and Relph (2017) utilized the same measures of inclusion to observe an 89% rate of injuries proportionally extending that number to say the current injuries to be as high as four in the average marathon runner. Via the results of a panel of 38 experts, Yamato et al. (2015) developed a criterion to state occurrence is only in the lower body, restricts running for seven days, or requires physician consultation. The lack of categorization combined with the need to label the cause of the RRI itself creates problems (Nielsen, Nohr, Rasmussen, & Sørensen, 2013). Without an agreement on what

describes these RRI, these high response rates of incidence should be reserved for further clarification.

In seeking to identify a potential cause-effect relationship towards RRI, the training error of intensity or pace is commonly suspected. As intensity is indicated to be scaled from moderate to vigorous, it is of substantial benefit in the physical activity guidelines (USDHHS, 2008). Many people share the view of faster is better which inadvertently leads to the threshold of overload, risk, and resulting injury. The findings of Small and Relph (2017) in observing marathon runners in consecutive multi-day performances indicated an inverse relationship where faster race times equated to higher levels of injury. Nielsen et al. (2013) argued pace is a concern as it is dependent on volume and duration while volume is only partially independent. While the cause-effect relationship remains unknown due to the assumptions conveyed by self-reports of behavioral indicators, there is very little evidence to the specific parameters of running and RRI even with a reliable diagnosis of medical practitioners (Jungmalm, Grau, Desai, Karlson, & Ostergaard Nielson, 2018). Thus, a misconception and even misperception from a lack of guidance in the proper execution of training requires more evaluation.

The experience of a runner as described by years of training and frequency is also believed to have a moderating effect on injuries. In their two-year prospective cohort study of overuse running injuries, The Runners and Injury Longitudinal Study (TRAILS), Messier et al. (2018) supported the earlier findings of Satterthwaite, Norton, Larmer, & Robinson (1999) acknowledging frequency, distance, and experience are influential with the existence of a runner's personal threshold to injury. Even greater outcomes with significant values presented by Rasmussen et al. (2013) were in the relationship of injury

due to lack of experience, younger age of runner, and lack of experience. The continuance of running may be the medium to not only improve fitness; but, to recognize boundaries preceding potential RRI.

Cardiovascular Issues

Like the musculoskeletal concerns of marathon running, there exists the debate in risk among the benefits of cardiovascular health and decreased cardiovascular disease (CVD). The demographic profile of what constitutes a marathon runner is changing (Predel, 2014). Where previously only young supervised elite runners ran, now 50% of all participants are over the age of 40 (Running USA, 2018a). This shift potentially shapes the speculation of marathon running related to the occurrence of sudden cardiac death. Though the rate of incidence equates to one in every 200,000 participants (Lavie et al., 2015), 94% occurs in runners over the age of 35 (Burkule, 2016). Other associated adverse responses or cardiotoxicity include CVD of malignant ventricular arrhythmias, and atrial fibrillation or a-fib (Lavie et al., 2015). With increasing participation rates, especially by MLR, the need to identify a logic to the exact dose of marathon running through evidence rather than observation lacks agreement.

Maintaining heart health is essential. The positive benefits of cardiovascular exercise are achievable at the established guidelines of up to 150 minutes of moderate to vigorous activity most days of the week (USDHHS, 2008). The identification of risks due to overload in frequency, intensity, and duration are not. These concerns are modifiable with consistent activity. Several non-modifiable risk factors measure the status of cardiovascular health. Several of these include gender, age, and chronic disease which is not limited only to the known but the unknown, the presence of CVD risk factors before

to such diagnosis, and the symptoms (Schwellnus, 2017). As risk factors can change, they should be discussed with a health care provider before beginning any fitness program.

Overall, marathon runners have better health. Many have a lower risk profile of CVD and better compliance with consistent activity engagement (O'Keefe et al., 2018). Yet, people do have health issues and seek a lifestyle change leading to the numerous benefits of marathon running. What should not be overlooked is that age itself, over 35 years, is identified as a risk (Schwellnus, 2017). This risk is then inevitable for all MLR regardless of health status.

There is literature supporting the adverse concerns of physical activity and exercise to heart health. O'Keefe et al. (2018) reviewed several longitudinal cardiovascular studies focusing on EEE. The results showed cardiac overuse causing irreversible damage to the heart in the form of electrical and morphological responses. These structural changes are sometimes referred to as the athlete's heart. However, their findings were confounded by the contributions of behavior and lifestyle as a negative factor to existing heart issues. As many as 75% of runners have calcified coronary plaque as indicated by CT scans increasing the susceptibility to atherosclerosis. This occurrence is a universal health risk in MLR. Smeets (2018) shared the opinion prolonged endurance exercise is probable for this cardiac remodeling; yet, also countered the role of genetics and increasing age could not be overlooked. Where running may have an adverse effect, individual health should be medically reviewed to confirm its impact.

There is a collective agreement of exercise and heart health referred to as the J-Curve Theory. Lavie et al. (2015) stated the relationship between exercise and benefits is initially positive and linear. The Copenhagen City Heart Study and the Aerobic Center

Longitudinal Study confirm any amount of exercise, even if only moderate or a vigorous five minutes of running, has greater benefits than remaining sedentary (Aguib & Al Suwaidi, 2015; Lee et al., 2014). As the amount or dose of exercise increases, even to the point of EEE, the results become curvilinear with further exercise less beneficial; perhaps even unsafe dependent upon existing risk factors (Burkule, 2016; Lee et al., 2017; Schnohr et al., 2015). This exercise paradox as described by Burkule (2016) is the vague upper limit that is more relative than absolute in defining risk. In effect, the overload of activity reaches the threshold of training where risk could lead to injury; although not as apparent with musculoskeletal injuries.

Due to the cumulative repetition of required training which identifies with EEE, marathon runners were the focus of several inquiries. Of 42 male marathon runners with a mean age of 45 having run at least six marathons, Wilhelm et al. (2012) concluded there are structural changes to the heart, most noticeably an enlargement to the right atrial chamber (60%) and the left atrial (74%). However, there was no effect on function or alter performance concluding that participation is an independent predictor of cardiac remodeling. Meanwhile, Pressler et al. (2017) had similar findings in their study with the same demographic profile among 97 marathoners, each with a low-risk profile having completed a detailed clinical analysis prior to the study. Their outcome indicated age, not repeated exposure to strenuous exercise, is the most significant independent factor in any form of cardiac remodeling. Regardless of prediction, there remains no definite link.

There is discussion regarding any acute changes affecting heart function. During strenuous endurance exercise, troponin, a cardio biomarker is elevated indicating potential cardiac damage. Predel (2014) suggested this could be an indicator of sudden

cardiac death, although its presence is frequent during marathon running. Troponin levels decrease after 24 hours of exercise cessation and as such are temporary. In a systematic review and meta-analysis of 939 marathon finishers, the findings of Regwan et al. (2010) revealed 579 post-race elevations with only six at higher levels during pre-race measures. Thus, troponin is higher though explanation to reasoning is only hypothesized for potential dehydration or inflammatory changes occurring from strenuous exercise. The debate towards lasting negative impact remains controversial due to the lack of proof.

With no evidence to predict the pivotal point where the risks of cardiac issues outweigh the benefits of exercise, there is an observed consensus. Caution should be applied to the findings of self-reported measures. Lee et al. (2017) and Smeets (2018) agreed the reasoning for participation should include individual capabilities. Until there is a significant understanding based on scientific evidence or an expert agreement, Predel (2014) acknowledged the need for prudent actions which include medical evaluations to confirm pre-existing or undiagnosed conditions. Especially for the older long-distance runner, Dores, de Araújo Gonçalves, Cardim, and Neuparth, (2018) stated a pre-participation screening should not be disregarded.

The level of physical fitness should also be considered. Though Lavie et al. (2015) suggested vigorous training should avoid EEE behaviors by not exceeding 60 minutes per day up to five days a week, O'Keefe et al. (2012) made allowances for certain populations balancing weight maintenance with health issues. Ultimately, the risk of any activity, to include marathon running, must be assessed between a person and their health care provider in the best interest of the current as well as the future concerns for positive and manageable general health.

Motivation and Marathon Running

Motivation is a factor for participating in any physical activity. The running of a marathon is no different. The requisite training, as well as the event itself, are shaped by various motives and the degree to which performance continues. People with a high level of motivation are said to have meaningful goals reflecting compatibility between known constraints and commitments (Segar, Taber, Patrick, Thai, & Oh, 2017). The age demographic of marathon runners is changing to display a greater diversity among attitudes and abilities. What remains is the need for understanding what motivates a person to adhere to a selection of healthy behaviors and lifestyle through the risk of possible injuries.

Current Studies

The SDT was introduced as a theory of human motivation. Upon contingency of autonomy, relatedness, and competence, according to Deci and Ryan (2008), a continuity of actions guides a person's intentions. Exercise motives, in part, are versatile displays where choice and group cohesion persuade a person's expectation of achievement. Koronios et al. (2018) proposed motivation serves to negotiate between internal intentions with external support systems as a catalyst for change. However, it is the sense of belonging that Stenseng, Forest, and Curran (2015) suggested as vital to the positive emotions recreational sports and leisure activities bring to an individual.

Two recent studies on marathon runners were explicit in utilizing the SDT. Positive associations of autonomy and competence to the health and safety of runners were statistically significant from the findings of Jordalen and Lemyre (2015). Zach et al. (2015) detailed the description of a runner's categorical motives to run, represented the

three needs postulated by SDT. The need for autonomy is conveyed through physiology where health seeks to reduce disease and maintain functional capabilities. Competence exists of achievement with the psychological means to cope with life. Lastly, relatedness is the affiliation and recognition of the identity as a runner, often enhanced by a club affiliation.

Other recent literature attempts to describe the motivation of marathon runners from various perspectives. A qualitative inquiry by Shipway and Holloway (2010) sought to better community health policies through the experiences of runners. Their study found themes of self-esteem and physical capabilities with secondary concepts of identity and social aspects as supporting. In a qualitative longitudinal study, Samson (2014) added physical feelings toward self and social support increase led to higher self-efficacy allowing for a continuance. Little (2017) showed a relationship of running to self-discipline in health from the experiences of women runners age 40 and older. While collectively these motives support marathon running for health, qualitative studies do not maintain consistency. Thus, the justification by Masters et al. (1993) to establish the MOMS survey for an instrumental of measure generalizability for larger populations.

The Motivations of Marathoners Scales

Where only qualitative studies previously existed, a comprehensive attempt to quantify the motivation of marathon runners was developed by Masters et al. (1993) to support a systematic measurement. Known as the Motivations of Marathoners Scales (MOMS), their findings introduced four overarching motives to be psychological, physical, social, and achievement best describing the type of motivational reasoning from nine specific subcategories. Psychological motives consist of three subcategories which

are psychological coping, self-esteem, and life meaning. Physical, also known as physical health motives, encompasses the two subcategories of health orientation and weight concerns. Social motives, with two subcategories, consist of affiliation and recognition. Lastly, achievement is the result of competition and personal goal achievement, another two separate subcategories. A comprehensive list of categories and subcategories listed with brief explanations of the questions is in Table 2.

Table 2

Categories, Subcategories, and Explanations for Motivations of Marathoners Scales

Categories/Subcategories	Explanations
Psychological motives	
Psychological coping	Less anxiousness and depression, a distraction from worries; better mood, concentration, and problem-solving; time away from life routine
Self-esteem	Improve self-esteem; greater confidence and self-worth; experience positive emotions; feel proud, sense of achievement and winning; mental control of body
Life meaning	Meaning, purpose, and sense of wholeness; connection with nature, alone time, feeling peaceful
Physical motives	
Health orientation	Better health, fitness, conditioning, and longevity; reduce risk of heart attack and prevent illness
Weight concern	Control or reduce weight, look leaner, and stay physically attractive
Social motives	
Affiliation	Socialize with runners of common interest, meet new people, share a group identity; participate and visit with family and friends
Recognition	Respect of peers and people in general, have family and friends be proud of me, people look up to me; earn recognition and compliments from others
Achievement motives	
Competition	Compete with others, earn a high placement in races, get a faster time than my friends, run faster than someone never beaten
Personal goal achievement	Better and faster running speed, self-competition; beat a specific time, extended current limits, improved performance

The purpose of the MOMS survey was to go beyond the outward explanation of individual responses. Masters et al. (1993) agreed on the motives for running vary and are personal. With the continued growth of running for sport and leisure, an all-encompassing evaluation could integrate theories for the characterized patterns of behavior. Developing the survey required the quantified motivational data to be specific for running a marathon. Initial categorization was created from six previous studies. Preliminary investigations conducted reduced ambiguity and improved validity in conjunction with five other psychological scales for detection of deviant responses and social desirability. The result was a 56-item questionnaire with selected answers assigned to a seven-point Likert-type scale of 1 (strongly not a reason) to 7 (strongly an important reason) with summary evaluations for group outcomes.

According to Masters et al. (1993), the psychometric properties stated the Cronbach's Alpha coefficients based on the final questionnaire ranged from .80 to .92 demonstrating adequate internal consistency. The reliability among the categories and subcategories were from .71 to .90, and factorial validity of scales was confirmed. Specific to each subcategory, the test for reliability was as follows: health orientation (.81), weight concern (.87), psychological coping (.84), life meaning (.86), self-esteem (.71), affiliation (.81), recognition (.87), competition (.90), and personal goal achievement (.82). The appearance of social desirability was minimal to subjectivity by the discriminate validity ranging from 4% to .004%.

Since its inception, the MOMS survey has been tested extensively. Age is a recognized descriptive variable to the explanation of the motivation for large populations of runners (Masters & Ogles, 1995; Ogles & Masters, 2000, 2003). A runner's

experience, although associated with age, was found by Masters and Ogles (1995) to reveal social identity with reasoning extended to competition and health aspects among the veteran runners or those age 40 and older. Their evidence was fostered by the depth of the social network of runners where these veteran runners knew 19.52 other marathoners while rookies knew of five. In a later study, Ogles and Masters (2000) considered only age as the independent variable among male runners. There was a statistically significant difference between the two groups, where older runners, age 50 and older, were concerned about broad health orientation while younger runners, those under 30, sought personal goal achievement. With the intention to seek a group typology of motives, Ogles and Masters (2003) again found older runners, average age 40.9 years, as running enthusiasts that preferred to run in groups and endorsed all motives with competition and achievement the preference of the younger generations.

Though in conjunction with other tools of measurement, only one study utilizing the MOMS survey was inclusive of only runners age 40 and older. Hypothesized to show a predictive relationship of psychological coping as a perceived benefit, Loughran et al. (2013) confirmed marathon running does enhance perceived benefits to psychological, physical, and social health which is similar to previous studies (Masters et al., 1993; Ogles & Masters, 2000, 2003). With the increase in adults over 40 years of age participating in physically demanding events such as marathons, a more profound insight must be investigated to the relationship of motivation versus other factors of reasoning.

The MOMS survey was also tested for generalizability to non-marathon running events and cultural influences of other countries. Hanson et al. (2015) compared the marathon to other long-distance running events. Their findings agreed with Havenar and

Lochbaum (2007) that marathon runners rate the category of physical health motives highest followed by achievement and psychological. Ruiz-Juan and Sancho (2011) translated the MOMS survey into a Spanish version displaying the same internal consistency to Masters et al. (1993) with clear distinction of motives between gender and age. Zach et al. (2015) verified the validity with a homogenous Hebrew culture; yet, expanded the scale to eleven due to a better fit with the demographics of a changing society reflecting social trends of marathon runners.

At the 2009 World Masters Games, Heazlewood et al. (2018) administered the MOMS survey to 4950 athletes (mean age 49.39 for women and 53.72 for men) where their findings were inconsistent in part to the variations within sporting motives such as with team sports. However, they did confirm Ruiz-Juan and Sancho (2011) and Zach et al. (2015) for cultural variations. While all agree with adherence to exercise as a model of motivation and discipline is unique to each person, their conclusions were not generalizable for culture or non-runner characteristics.

Within the sport of marathon running, the MOMS survey was applied to the investigation of the high occurrence of RRI. In their prediction, Ogles, Masters, and Richardson (1995) compared leisure versus obligatory, running 45 miles or more a week, to the presence of injury. No association prevailed to show cause for injuries via any of the motivational categories; notwithstanding, their study endorsed that striving for recognizable success can maintain well-being. In another analysis, association and dissociation towards injury occurrence via stated motives of the MOMS survey by Christensen and Ogles (2017) confirmed the earlier results of Masters and Ogles (1998) to no prediction of injuries. They noticed though association may be preferred when a

competitive nature is combined with goal orientation, caution is urged as 70% of the 41% of injured runners continued to run.

Injury awareness became the unexpected outcome of another study. Though seeking the type of motivation to sustain running programs, Besomi et al. (2017) utilized the MOMS survey among 241 runners, 35 of which self-reported to be marathoners. Where their findings show both genders had health-orientation, the meaning of life, and self-esteem dimensions rated highly, RRI was 54.4%. Overall, these results were consistent with other studies where motivation does change (Goodsell et al., 2013) and RRI comprise a high rate of occurrence (Christensen & Ogles, 2017; Damsted et al., 2017; Timm et al., 2017). The outcome remains motivation is only speculative for RRI.

The Association of Motivation in Master Level Runners

A common motive for marathon running among MLR remains to be recognized. While Ogles and Masters (2000) found general health and affiliation among men age 50 and over, their study did not include women. In mixed-gender research, Heazlewood et al. (2018) noted psychological coping and Zach et al. (2015) determined life meaning and goal achievement as primary motives. Though the study by Loughran et al. (2013) was of marathon runners over the age of 40, the purpose was to associate psychological benefits to running and not the motives of why. Due to the small sampling within these more extensive studies, no study has solely focused on this age demographic of runners, the MLR, about the motivation of both genders.

The increase in participation by these MLR questions the relationship of health as a primary motivator with advancing age. As a positive coping mechanism, Timm et al. (2017) equated the motivation of running as a means to increase personal strength and

capabilities regardless of age. In contrary, an age-dependent study of general exercisers by Quindry, Yount, and O' Bryant (2011) attested a statistically significant difference between adolescents and older adults. Where fitness was a priority for everyone, health was a high motive only for those age 35 and older. In contrast, the middle age group, defined as 35 to 49 years of age, emphasized the importance of interpersonal relationships and psychological health. As age changes, motivation may also vary.

Debatable to what causes the changing of motives is the social environment where marathon running occurs. As the younger runners seek prestige, Goodsell et al. (2013) presumed the transitioning of roles contributes to older runners seeking identity, control of health, and maintaining the ability. Interestingly, achievement as a motive was not found in connection with studies that included older runners, most often those over the age of 50 (Ogles & Masters, 2000; Zach et al., 2015).

The social support of others in similarity increases intrinsic motivation. Brown and Neporent (2015) agreed the social reinforcement is of substantial value to the runner. There is a psychological adjustment accompanying the changes in age and phases of life. This external support builds confidence to counter the negative societal beliefs that MLR participating in marathon running should be abandoned for its adverse impact on physical health.

Motivation and Adherence

Motivation, as previously discussed, is what leads to adherence of selected behaviors. In marathon running, adherence requires a commitment to sustaining activities that often involve considerable amounts of time. This dedication is often mistaken for exercise dependence. According to Masters and Ogles (1995), motivation is essential in

the experiences and concerns connected to this concept. The challenge becomes the awareness of traits leading to negative actions rather than positive ones.

The commitment to marathon running has been explored from the perception of passion. Paradis, Cooke, Hall, and Martin (2013) describe passion as two opposing forces. The harmonious side is a skillful balance among life dimensions as the obsessive goes beyond self-control leading to fixated traits. While their study attempted to show a relationship between passion for exercise as harmonious and exercise dependence resulting from obsession, their findings were negative. Only the concepts of time and tolerance were positive; of which are two highly visible and known elements of training for a marathon. Lucidi et al. (2015) countered this result and confirmed the earlier works of Vallerand et al. (2006). Obsession does have a positive association, explicitly to higher stress levels, due to a runner's assessment of performance. If too detail-oriented, the attention to training becomes an external tasking (Lucidi et al., 2015). Like motivation, passion has a varied potential towards commitment and the impact on the projected outcome.

Part of what commits any marathon runner is the suggestion of psychological contentment. With the physical benefits both evidenced and empirically observed, conflicting conclusions exist to the mental health effects of distance running. Leedy (2000) explored this concept between committed and recreational long-distance runners. Adherence levels to training were negatively correlated with depression scores and stress relief positively correlated to anxiety scores. Stated simply, running is of a healthy mind which was also supported by both groups in rating health and fitness as the strongest motivators. However, if one was to stop running, there is an opposite result.

There is some evidence of a negative experience of withdrawal when unable to run. In a systematic review of controlled exercise withdrawal by Weinstein, Koehmstedt, and Kop (2017), nine of 19 studies were identified as statistically significant to the undesirable withdrawal effects of cessation when greater than two weeks in duration. These results were not enough for clinical diagnosis. Such information could inadvertently persuade many runners to forego stopping for any reason. Thus, a commitment could be confused with the portrayal of a negative addiction to running.

Marathon running is a form of regular exercise whereby the casual observer sees what appears to be an innately abusive activity due to frequency and volume. Where being addicted to running is meant to convey passion and intrinsic motivation, true exercise addiction occurs in about 0.04% of the total population (Hausenblas & Smoliga, 2017). In response to committed runners, Leedy (2000) imparted negative running behaviors would need established addiction traits which include pessimistic moods from the deprivation of running and having to deal with an impairment to physical, mental, or social health that discourages incidence.

Addiction to running is confirmable and identifiable. Conferring to the Exercise Dependence Scale-Revised (ES-R) as one assessment to qualify for addictive properties, Hausenblas and Smoliga (2017) disclosed three of the seven criteria must be met. These actions included withdrawal, intention effects, tolerance, loss of control, time, continuance, and conflict or reduction in other activities. Several distinctions within each criterion are referenced for further confirmation to avoid misrepresentation resulting from unique circumstances.

Sancho and Ruiz-Juan (2011) compared 300 marathon runners by means of the Spanish version of the Running Addiction Scale (RAS) for adherence by either positive or negative displays of running addiction behaviors. Their results, offering no variance between age, demonstrated runners could differentiate positive as being pleasant, non-domineering, and compatible with one's life. Obsessive traits, consequently, do divert from self-defining activities altering identity due to the lack of distinction between adaptive and maladaptive actions (Paradis et al., 2013). Most marathon runners do have the aptitude to know when their passion and commitment for running may override expected benefits and goals.

The Aging of Master Level Runners and Marathon Running

For all adults, the aging process is inevitable. As MLR, this status of runners portrays what is possible in minimizing the effects of physiological, psychological, and social changes. Though proven is the decreased cognitive abilities and diminished strength in functional quality of life (Puett, 2018), Leyk, Rüther, Witzki, Schomaker, and Löllgen (2017) explained foreseeable impairments as undistinguishable between the age-related versus lifestyle choices. For these MLR, these behaviors may prolong physical capacities reciprocating greater social well-being.

What is known are the benefits of physical activity relevant to the older population. The American College of Sports Medicine (ACSM) endorses regular physical exercise to reduce or prevent the declines associated with aging (Nelson et al., 2007). The position is emphasized by the 2008 Physical Activity Guidelines for Americans (USDHHS, 2008). With participation comes an expected outcome. Breda and Watts (2017) found a positive association where physical activity mediated the relationship

between expectation and physical functioning. Though suggesting the influence of a dose-response relationship, Dogra and Stathokostas (2012) concluded lifestyle behaviors, once developed, continue to persist reducing the early onset of aging from sedentary behaviors.

For runners, there is little difference in beliefs and behaviors regarding physical activity and aging. In their study of 196 runners, Koronios et al. (2017) also confirmed a positive correlation between the amount of time participating in physical activity equating to better attitudes about aging. This stance furthers beliefs, when optimistic, strengthening motivation and self-efficacy (Notthoff, Reisch, & Gerstorf, 2017). Greater adherence is the result of where engaging in activity becomes a habit and eventually a lifestyle as modeled by the behaviors of marathon running.

The research on running and its effects on physiological aging show occurrences of adaptation. Trappe (2007) reviewed longitudinal data where expected declines in oxidative capacity were 0.5% to 1.5% less among runners. Even muscle strength with the biomechanical limitations found in connective tissue and smaller fiber size continue to sustain the endurance required (McCarthy & Hannafin, 2014; Trappe, 2007). When accompanied by overall good health, decreased cardiac output and anaerobic threshold in addition to increased peripheral resistance are modified (Arlis-Mayor, 2012). As suggested by Lee et al. (2017), longevity is extended by seven hours for each hour of running. However, Notthoff et al. (2017) offered the reminder that individual characteristics vary in the absence of explicit measures of activity. Though optimistic, the aging process remains a negotiating factor in all decisions to run.

Performance and Running Related Injuries

The capacity to continue marathon running has known decreases in performance. Peak accomplishments are maintained from ages 30 to 35 then decline moderately until after age 60 when most reductions occur (Knechtle, Rüst, Rosemann, & Lepers, 2012). Similar to these findings, Brisswalter and Nosaka (2013) determined a 2.6% to 4.4% reduction with higher levels in runners over the age of 35. This evidence gives reasoning to the endurance abilities thought to decline as much as 15% per decade after reaching the age of 30. As part of the Performance, Aging, Competition, and Exercise (PACE) project, Leyk and Sievert (2012) reviewed the results of over 500,000 marathon runners. They discovered no significant decrease by runners until reaching the age of 55. Therefore, a possibility, though small, does exist to an imposed demand promoting potential.

Not to be discouraged, these MLR do offer contrasts to the reported physiological performance data. More than 25% of these runners are faster than their younger marathon counterparts (Leyk & Sievert, 2012). Not all MLR have a prolonged level of experience either. Approximately 33% of the 50 to 59-year-olds and 25% of the 60 to 69-year-olds began running in the previous five years (Leyk et al., 2017). MLR now comprise 50% of all marathon finishes (Running USA, 2018a). Even with the reduction in finish times, Hirvensalo and Lintunen (2011) stated the permanence of exercise is a predictor to the continuance. Health, both good and the need to improve, is often said as the reasoning and limitation that keeps the MLR running (Breda & Watts, 2017; Jenkin, Eime, Westerbeek, O'Sullivan, & Van Uffelen, 2017). When coupled with aging, this factor provides a sufficiency for sustainability.

Running marathons as MLR must underscore the balance of training with physical and mental abilities. Training efforts are comparable to younger runners. Frequently they do not exceed the average of three to four weekly sessions of 60-minutes in duration (Leyk & Sievert, 2012). A concern for caution is suggested. Tanaka (2017) stressed the importance of maintaining higher levels of resilience and tolerance to minimize the repetition of inflicted stress. This act requires a greater recovery time due to the known decrease in physiological, metabolic, and neuromuscular factors (Brisswalter & Nosaka, 2013). Trappe (2007) observed the benefits of training to mimic habits. If MLR reinforces what is necessary for long-term success, performance losses can be minimized.

While it is true marathon running offers much individual health and social benefits, the adverse consequences, especially with age as a contributing factor, must be acknowledged. As described by Paradis et al. (2013), marathon runners at any age can become obsessively passionate in their motives diverting into the consequences of negative susceptible actions. Risk becomes acceptable in the pursuit of more running opportunities. De Jonge, Van Iperen, Gevers, and Vos (2018) described this action as an inability to control cognitive and emotional demands with the available resources leading to greater exposure to RRI. The concern by Nowak (2017) emphasized this critical transition indicative of achievement overriding health as recreational runners seeking a stronger competitive running identity. A disconnect between self-improvement and the potential for injury becomes imperative.

The existence of RRI to marathon runners is highly recognized. Previous studies have identified several external factors regarding training habits, experience, and racing

preferences to the onset of incidence; yet with a limited prediction (Messier et al., 2018; Nielsen et al., 2013; Satterthwaite et al., 1999). Christensen and Ogles (2017) patterned RRI to training within the biopsychosocial model for a general understanding of this complex behavior at best. As part of the training, these intentional aspects are modifiable risks which can prevent injuries when the runner chooses to do so.

Other conditions associated with RRI are etiology or internal determinants. Biomechanical structures, gender, previous injuries, BMI, health status, and age have also been studied to the extent their role alters the benefit to risk ratio of running behaviors (Christensen & Ogles, 2017; Rasmussen et al., 2013; Van Gent et al., 2007). Many of these determinants were overlapping in the structure of studies to show variations in potential relationships or differences. Ogles and Masters (2000) were specific to training habits according to older and younger ages of male runners though with no emphasis on injuries. Van Gent et al. (2007) was one of the few to find limited evidence through a meta-analysis that age is statistically significant to RRI; though only to lower extremity injuries. A higher risk was identified in females over age 50 by Taunton et al. (2003) with the inclusion that shoes and frequency in training intercede these findings. De Araujo et al. (2015) disagreed RRI occur at a high rate among older runners. Age has not been exclusively studied as an independent variable to the conclusion of injuries. In part, this is due to the complexity of these determinants as confounding variables. Unfortunately, this lack of consensus leads to vagueness and altered perception of RRI to MLR in marathon running.

What is essential to review is the effect of aging as a precursor to RRI and its role in the recovery process. Strenuous exercise such as running creates oxidative stress

promoting an inflammatory response indicating damage (Gomez-Cabrera, Ferrando, Brioche, Sanchis-Gomar, & Vina, 2013). The most susceptible are the musculoskeletal regions of the knee and ankle having reduced vascularization in connective tissue (McCarthy & Hannafin, 2014). The loss of muscle strength instills a greater reliance on ligaments and tendons leading to overstimulation, overload, and altered tissue repair leading to structural changes. Taunton et al. (2002) related age as a statistically significant factor in many overuse injuries such as patellar femoral pain syndrome, iliotibial band syndrome, plantar facilities, and tendinopathies of the patella, tibia, and Achilles tendon. Though increasing in the MLR (Fields, 2011), these issues can happen to all runners.

The rate of recovery is what extends the healing time with RRI for MLR. The recovery itself is three corresponding stages which reduce inflammation, remodel injured tissue, and reshape new tissue to a matured state lasting from a few days to 10 weeks depending on severity (Sharma & Mafulli, 2006). The aging process slows the metabolic rate for physiological repair requiring a lengthier healing capacity (Fields, 2011; McCarthy & Hannafin, 2014; Sharma & Mafulli, 2006). In similarity, this equates to how young and healthy people can increase the exercise intensity or duration of at a reasonable rate of every week or two without major concern where an older person may need as much as four to avoid such risk (USDHHS, 2008). More so, it also depicts how the combination of diagnosed chronic disease, lifestyle behavior choices, and the discovery of underlying age-related issues such as osteoporosis and osteoarthritis (OA) can complicate the clinical diagnosis of RRI (Arlis-Mayor, 2012). This slowed response

to healing creates a noticeable delay in the return to running which may inadvertently indicate a prognosis greater than anticipated or diagnosed.

Discussing the relationship between RRI and marathon running by MLR warrants a brief examination of the awareness of OA believed to be caused by running. As a degenerative joint condition, the literature is replete of studies suggesting an association and even causation. Worldwide, OA affects 10% of men and 18% of women with higher risks for previous joint injury, obesity, and occupational activity (Arlis-Mayor, 2012; Baum et al., 2013; Richmond et al., 2013). In comparing risk factors, the findings of Silverwood et al. (2015) revealed 24.6% of knee pain due to being overweight or obese. Thus, aligning with the updated guidelines for managing OA set forth by the National Institute for Health and Care Excellence (NICE). In an 18-year longitudinal study utilizing serial knee radiography, Chakravarty, Hubert, Lingala, Zatarain, and Fries (2008) showed a 32% increase in OA of non-runners and a lesser 20% in runners. As part of a six-month marathon training program, Hinterwimmer, Feucht, Steinbrech, Graichen, & von Eisenhart-Rothe (2014) compared pre and post MRI reports with the only statistically significant difference being a 3.2% decrease in lateral femoral cartilage with no indication of injury. With the exact cause of OA not recognized, the perception of running as a cause is without scientific merit.

Recent literature also unveils a lack of consistency to the focus on age and marathon running in the classification of RRI and the impact on overall training. Although there is a consensus to the type of RRI, there is a lesser distinction of the severity of the running habits of marathon MLR. A clinical scale to overuse injuries exists to indicate a graded measure from one to three upon clinical diagnosis (Messier et

al., 2018). Outside of diagnosis and recommendations by a health care provider, most runners rate the RRI when it is necessary to modify or abstain from running for an extended period. The length of change in training varies. Yamato et al. (2015) agreed with De Araujo et al. (2015) on seven days though De Araujo et al. (2015) established an upper limit of 28 days as severe. The runners in the study by Rasmussen et al. (2013) stated RRI were severe when having to stop for only 14 days. None of these findings mentioned a runner's age to the effect of adequate time away from training for sufficient healing.

A different approach was taken to RRI without the need for change. Nowak (2017) stated experienced runners could run with RRI as a disruption in training would be an unhealthy use of time. Marathon runners run with discomfort which tends to diminish during activity. Chalabaev et al. (2017) referenced a proactive position in advance of RRI. By applying self-determined motives, there is a negative predictor to injury as runners were less likely to adopt risky behaviors leading to RRI. The use of self-evaluation offers a better estimation of future performance. In findings by Messier et al. (2018) of The Runners and Injury Longitudinal Study (TRAILS), runners were evenly divided in continuing to run with a sustained RRI or altering performance.

The limitation to either viewpoint on training with or without RRI is the reliability of these self-reports. Runners tend to overestimate or underestimate the severity of RRI. The systematic review of 23 studies on RRI of marathon runners, Kluitenberg et al. (2011) found the memory recall in retrospective studies varied considerably from a low 7.8% during a race to 64.7% in the first 30-days post event. A year later, 31.7% were still mildly bothered by the RRI. Such an extension of injury perception may be confused

with the ongoing health status of a runner. Hollander et al. (2018) observed 37.3% of MLR had health issues, 18% with persistent overuse issues, and 14% with another form of illness. More than half sustained an injury for over 12 months; confirming 20% more than the same findings of Hespanhol, Van Mechelen, Postuma, and Verhagen (2016). Clearly, there is no categorization of RRI to confirm the formidable need for an adjustment from one's current running schedule.

Running Related Injuries From a Social and Psychological Perspective

Up to this point, the physiological assessment of RRI and its impact on the continuance of marathon running performance has been the focus. What is not sufficiently considered is the social and psychological aspects of RRI toward the identification of a marathon runner and the disposition to accept such risk. The lack of investigation to these behavioral consequences and the outcome to RRI of this growing population of MLR participating in marathons is of substantial importance to maintain exercise adherence and positive health.

Along with the age-related physiological variations are the changes to motivation. Though intrinsic determination may decrease, external motivation increases through social interactions (Brown & Neporent, 2015; Knechtle et al., 2012). Hirvensalo and Lintunen (2011) contributed to the importance of motivation to physical activity affecting cognitive and social development. Sports participation was two-fold in benefits in a systematic review by Jenkin et al. (2017). Of 36 studies, the physical, mental, and social health of older adults transformed personal identity from an aging older adult to a competitive master athlete. This shift opens new networks of community connections reducing the age stereotype and stigma of aging as a barrier to maintaining health and

involvement. The newfound purpose reciprocated the need to maintain health to continue an activity (Hooker & Masters, 2016). The motivation to stay healthy becomes as personal as it is social.

The dynamics of a group environment foster an individual's affiliation with social identity. Amiot and Sansfaçon (2011) reasoned all forms of motivation except amotivation seek the in-group behaviors towards self-improvement and are consistent with other studies demonstrating self-efficacy (Samson, 2014). In comparison to the general population, marathon runners have been shown to be reserved and self-sufficient with higher levels of hardiness and self-discipline (Nikolaidis, Rosemann, & Knechtle, 2018). Though self-concept varies with individual characteristics, the opportunity for association allows motivation to traverse the different roles encountered by the changes in life. Among MLR with grown children, marathon running is viewed as a therapeutic alliance of friendship with an even lesser need for achievement (Goodsell et al., 2013).

Apart from the social component is developmental psychology as a primary testament to behavior choices. In many sports, to include marathon running, athletic identity (AI) takes on the mindset of a stronger cognitive structure to thoughts, feelings, and attitudes about performance (Ronkainen et al., 2016). It is presumed at the expense of the other dimensions of self. Horton and Mack (2000) studied 236 runners finding no evidence of neglect to other areas of a runner's life. Runners with a high AI displayed a mean age of 51.09 whereas the low AI was 30.97. They also determined those with high AI to be more positive in performance and inclusive to their social network. However, AI is viewed with negative aspects thought to contribute to compulsive and pathological training methods leading to injuries (Hausenblas & Smoliga, 2017). The implied

assumption is that a strong focus on running will lead to injuries at the expense of other priorities as a runner.

With the recognition as a marathon runner comes the keen awareness of the known and high risk of RRI. Brown and Neporent (2015) contend the experience of running does not stop a runner from what is important. Thereby enhancing a personal relationship established on identity through a self-belief system. When confident and secure, a runner accepts the reasoning to temporarily abstain from running such as with the onset of RRI. When this identity contains self-doubt, there is the potential for an altered decision of continuance. Without the structure of routines, this interruption can increase anxiety and depressive symptoms. The study findings of Weinstein et al. (2017) showed a statistically significant decrease in mental health with a two week or more extended absence of activity. The choice in preserving physical health does come with its after-effect to other possible difficulties.

There is preliminary evidence of reasoning associated with the absence and return to sports post-injury. Fifteen psychological risk factors were measured via a scale of importance by 983 athletes in the study by Ardern, Taylor, Feller, and Webster (2012). When there was a positive response in confidence and motivation, there was a greater likeliness to sports return. However, negative emotions and the initial fear of re-injury were positive indicators of not resuming performance. Social comparisons play a role in diminishing a return to signifying a form of malicious envy. This behavior is thought to reduce predicted training and racing withdrawal (Lange & Crusius, 2015). Equally, too much social facilitation creates a negative and stressful effect (Brown & Neporent, 2015). The multi-faceted decision to run with RRI may be less consequential than the risk of not.

Several concerns are creating a gap in why runners continue to run. In a 2017 study by Christensen and Ogles, 70% of runners ran while injured with only 41.4% seeking medical care; yet, 5.7% missed school or work. This is comparable to the results of Masters and Ogles (1998) where 61% had RRI with 35.4% seeking medical care, and 72.8% seeking a temporary reduction in training. Self-diagnosis appears to remain as a primary method to determine RRI status without objective reasoning.

The lack of inclusion of the health care provider in the onset and diagnosis of RRI among MLR participating in marathons creates a discrepancy. Even more so where slower healing time may compound injuries. Only one study, which was specific to knee OA, stated 50% of physicians advise patients to continue running; a recommendation that 43% have endorsed throughout their practice (Esculier et al., 2018). There is the perception of logic the other 50% would then advise the runner to cease activity. Arlis-Mayor (2012) suggested these runners may exclude their provider due to lack of comprehension of well-being in the prescribed treatment plan. There is an intense emotional difficulty in accepting a change in behavior that is synonymous with a lifetime of accomplishments, pride, and socialization.

However constructive and meaningful to these MLR participating in marathons, the motivation for their purpose must consider the occurrence of RRI which result from the physical demands of marathon running. Each injured runner experiences a unique chain of incidence prior to injury which involves intrapersonal and interpersonal determinants (Hulme & Finch, 2016). With the disproportionately high increase in these MLR continuing to run, along with the growth of the population now representing a median age of 37.9 years and expected to increase (U.S. Census Bureau, 2017), there is a

strong prevalence to the importance of understanding what motivates this age demographic to continue running.

The lack of literature to what motivates these MLR to continue activity with a high risk for RRI poses a problem when the injury itself does not deter training. In a survey of 13,037 runners over the age of 50, Leyk et al. (2017) concluded health was a strong motive for sustaining participation. What remains is an unidentified motivation creating a strengthened faithfulness overriding a compliant logic to stop which may be the result of a change in the type of motivation upon becoming injured. Overlooked are the other aspects of health and wellness, more so the psychological and social benefits, that offer greater advantages in lieu of injury risk.

Summary and Conclusion

This chapter reviewed the literature regarding the motivation to marathon running specifically to the MLR. While there has been a 29.9% increase in event participation, 50% of all marathon finishes are by these MLR, up 47% in the past 10 years (Running USA, 2018a). With the evidence documenting the importance of consistent exercise for health and physical fitness (USDHHS, 2008), the aging process is also shown to have optimistic attributes from exercise and running (Arlis-Mayor, 2012; McCarthy & Hannafin, 2014; Trappe, 2007). For the marathon runner, the recognition continues beyond the physical dimension to the psychological and social (Christensen & Ogles, 2017; Shipway & Holloway, 2010; Zach et al., 2015). The SDT offers universal reasoning for the motivation to run marathons as autonomy, relatedness, and competence support the underlying psychological needs (Deci & Ryan, 2008). The ongoing involvement of reinforcing behaviors necessitates a continuum of extrinsic and intrinsic

motivation that manages individual and environmental variances. For many MLR, participation in marathon running is a meaningful focal point in their life.

Running, in general, is known for its multitude of benefits. The evidence to enhanced health and fitness in all forms of physical activity are documented (USDHHS, 2008). There is a positive association of cardiovascular improvements and life expectancy as demonstrated in the Aerobic Center Longitudinal Study and the Copenhagen City Heart Study (Aguib & Al Suwaidi, 2015; Lee et al., 2014; Lee et al., 2017; O'Keefe et al., 2012). The satisfaction of running offers improved psychological health (Mikkelsen et al., 2017) aiding self-efficacy (Samson, 2014) and perceived satisfaction for positive lifestyle choices (Hooker & Masters, 2016; Yeh et al., 2017). Lastly, social endorsement increases adherence as motivation for the continuance of running may change because of life roles (Koronios et al., 2018). Ultimately, the identity as a runner is facilitated with greater sustainment (Brown & Neporent, 2015; Ogles & Masters, 2003).

The perception of RRI is problematic in marathon running. What is not identified is the association of complementary and casual causes from a training assessment versus the influence of age. With a consistently high agreement in RRI of the musculoskeletal system (Christensen & Ogles, 2017; Damsted et al., 2017; Small & Relph, 2017; Timm et al., 2017), there is also the risk of cardiovascular issues resulting in sudden death (Burkule, 2016; Lavie et al., 2015). Arguably, the lack of categorization of injury status (Nielsen et al., 2013), self-reported behaviors without sufficient medical diagnosis (Jungmalm et al., 2018), and ongoing health conditions as part of the aging process such as OA (Chakravarty et al., 2008; Hinterwimmer et al., 2014; Silverwood et al., 2015)

predisposing many runners, especially these MLR, to adverse physical issues despite the desire for health improvements.

Numerous studies have explored the motivation of marathon running. The MOMS survey was introduced in 1993 by Masters et al. It was the first quantitative assessment to participation determined by four overarching motives to be psychological, physical, social, and achievement. Since its inception, the survey has been used extensively in a variety of populations with internal consistency (Hanson et al., 2015; Heazlewood et al., 2018; Ogles & Masters, 2000, 2003; Sancho & Ruiz-Juan, 2011; Zach et al., 2015). Due to the small sampling of older runners within these studies, a motive lacking a consistent age description of these MLR remains to be recognized.

No study has exclusively sought to understand the categorical motivation of the MLR, specifically and exclusively to their age demographic. Therefore, a gap exists in the literature to recognize the sustained motives of a demographic that is known for its decrease in physical activity as age advances in lieu of injury status (USDHHS, 2008). This collective group of runners not only continues to run, but there is also the acknowledgment in the accompaniment that running leads to the risk of an injury creating a potential adverse result. Given the risk of injury, there is an interest in this aging population seeking to maintain good health as well as disease prevention through marathon running.

The purpose of this study seeks to identify a difference in categorical motives as stated by the MOMS survey (physical, achievement, social, and psychological), if any, among master level runners running without running-related injuries when compared to master level runners continuing to run with running-related injuries. This chapter has

provided the key variables of motivation, marathon running, and the presence of injuries related to running in marathon runners age 40 and older for a quantitative study. Chapter 3 will include the quantitative methods of a research study to answer the research questions and hypotheses regarding the difference in the motivation of the master level runners and when separated by gender.

Chapter 3: Research Methods

The purpose of this study was to identify a difference in categorical motives as stated by the MOMS survey (physical, achievement, social, and psychological), if any, among MLR running without RRI when compared to those continuing to run with RRI. The secondary purpose of the study was to determine the motivational difference between the interactions of gender and injury status. The continuance of marathon running despite RRI could display motives that differ due to the experience of injuries. This contrast may refute the physical reasoning which potentially offers insight into overlooked psychological and social motives. The findings highlighted the motivation for behavior choices not directly observed or understood in the known acceptance of a negative consequence.

In Chapter 3, I describe the research design and rationale to answer the research questions according to stated analytical procedures. The methodology which included participant selection, justification in sampling procedures, and instrumentation are explained for their inclusion and contribution to the study. The basis for the operationalization of variables along with data analysis is provided for discussion of validity as well as ethical procedures of concern.

Research Design and Rationale

The research design was quantitative to reflect on how the results led to relevant conclusions of the research questions and hypotheses. The rationale for identifying a statistically significant difference, if any, in the categorical motives according to the MOMS survey among those MLR running without RRI when compared to those continuing to run with RRI utilized an independent-samples *t* test. With two distinct and

categorical independent variables, the MLR running without RRI and the MLR running with RRI, the independent-samples *t* test compared the mean score of motivation between the groups (Rutherford, 2011). When separated for gender, as indicated by the second research question, the groupings increased to a total of four; therefore, violating an assumption of the independent-samples *t* test (Neutens & Rubinson, 2014). A two-way ANOVA allowed for the differentiation between/among mean scores of more than two groups. The ratio of observed differences included the between-group variation as displayed by gender as well as the in-group variations of injury status (Rutherford, 2011).

The probability of detecting comparative differences existed due to mean score comparisons of each group represented by the capacity of these testing methods (Dimitrov & Rumrill, 2003). By optimizing the understanding of the group factors that contribute to exercise adherence as the result of the categorical motives of the MOMS survey (physical, achievement, social, and psychological) offered is a potentially accepted rationale for participation in marathon running. While any injury can be perceived as a barrier to physical activity, the onset may have an influential role which changes motivation. With the groupings defined as MLR without RRI, MLR with RRI, and then separated by gender, the interest of the statistical testing is the differences. Any variation measured the deviations of the group score. With no differences determined, the groups are equal, and the ratio of the *f*-value is one (Rutherford, 2011). Motivation is the same regardless of injury status and gender.

For this study, there were nine dependent variables which consisted of the subcategories that contributed to the four categorical motives of the MOMS survey (physical, achievement, social, and psychological). The subcategories for the physical

motive were health orientation and weight concern. The achievement motive consisted of competition and personal goal achievement. The affiliation and recognition subcategories comprised the social motives with the psychological motive to include psychological coping, self-esteem, and life meaning.

The independent variables, also referred to as categories of reference, was the MLR described as age 40 and older who identified as a marathon runner, then separated by their injury status. The MLR were organized into two distinct groups where the runner belonged to either the group of noninjured runners or those with RRI in the previous 12 months. Gender was included as an independent variable due to the increased participation of female marathon runners specific to the age demographic (Running USA, 2018a). The interaction of these variables were the results of the group behaviors dependent on the motivational reasoning according to the MOMS survey predicting a difference in motives based on injury status.

The motivational differences between groups required the acknowledgment of known characteristics. For this study, these factors were age, the number of marathons completed, and training status as reported by the number of years of running experience and the weekly average of miles run. These variables provided descriptive statistics to define in greater detail the sample population attained.

The purpose of this study was to identify a difference in categorical motives as stated by the MOMS survey (physical, achievement, social, and psychological), if any, among MLR running without RRI when compared to MLR continuing to run with RRI. While previous studies have found no common motive among older runners (Masters & Ogles, 1995; Ogles & Masters, 2000, 2003; Ruiz-Juan & Sancho, 2011; Zach et al.,

2015), the inclusion of a classification of runners with and without RRI supposed a logic that accompanied the known outcomes to long-distance running. The high occurrence of RRI (Christensen & Ogles, 2017; Damsted et al., 2017; Messier et al., 2018; Timm et al., 2017) combined with increasing age and participation rates, advanced the probability of incidence from a group perspective and offered a practical observance. The difference in the type of motive when comparing the injury status of MLR running without RRI and those running with RRI was to indicate motive could change due to the onset of occurrence. The inclusion and comparison, when separated by gender, provided an additional suggestion to continuance previously unexplained.

As stated in Chapter 1, there are two overarching research questions:

Research Question 1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries when separated by gender?

In response to these research questions, the opportunity for knowledge offered the opportunity of more in-depth findings. This inclusion translated into a greater understanding of group behaviors through the applied statistical testing methods. The difference between two distinct groups of runners when accounting for RRI which are known for a high probability of occurrence demonstrated potential volatility of

motivation that does not always adjust for a change in conditions. However, some degree of change was expected in the complexity of behaviors which may not be directly observed or reported for their genuine intent.

Methodology

The methodology specific to the quantitative research design to identify a difference, if any, in the categorical motives of MLR continuing to run without RRI when compared to MLR running with RRI required a detailed assessment of the selection and process of collection and analysis. In this section is presented the sampling procedures of criteria and size, along with instrumentation and operational definitions.

Population

The population sought for this study were runners, both men and women, age 40 and older, that self-identified as a marathon runner. These runners are an already established group, based on their age, with their status recognized by the USA Track and Field Association as master level amateur athletes (USA Track and Field, 2017). While gender and age are known, the classification of a marathon runner was subjectively expressed through the self-reported responses. There was no standardized designation to define at what level or the number of races completed where a person assumes such an identity. Lastly, while the discussion of RRI was an emphasis of the study, any marathon runner meeting the criteria, with or without injury, was allowed to participate.

Sample size calculations for an independent-samples *t* test and an ANOVA involved considerations for the number of participants, independent variables, and the power of statistical testing (Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996). For categorical data, the size also depended on the strength of the association of in the

similarity. For this study, the differences in motivation broadly represented the population based on the inclusion criteria of age and the ongoing involvement in marathon running. Gender and injury status were further portrayed by descriptive characteristics.

The approximate population sample size was determined via the G*Power 3.1 analysis (Faul, Erdfelder, Buchner, & Lang, 2009). Two types of calculations were administered due to the separate testing methods required for the research questions. Additional analysis was applied, when necessary, to specify the variable of any significant interactions. For the first question to determine if the group means were equal or lacking a difference, an independent-samples *t* test was set with the means measured for a difference between two independent means (two groups). With no restrictions to the standard deviation (*SD*), a two-tailed test was administered. The effect size was 1.333 as determined by utilizing the method to calculate an unbalanced design due to the possibility of different sample sizes. With an expected mean of 100 to group one or the control group being the MLR without injuries, and 120 to group two as those with injuries, the *SD* was set at 15 to calculate this outcome. The probability of a Type I error was 0.05, the power or probability of a Type II error at .95, and the allocation ratio N2/N1 for 1.25. The output parameters were an actual power of 0.9514866 and a sample size of 14 in group one, and 18 in group two, for a total of 32 participants. The result was a 95% chance of correctly rejecting the null hypothesis of no difference between the two groups with 14 participants in group one, the control group of running without RRI, and 18 participants in group two, running with RRI.

In response to the second research question, the statistical testing was an ANOVA, specifically, the fixed effects, special, main effects, and interactions procedure. This two-way ANOVA with two predictor variables calculated the power of the main effects and the interaction. The effect size of 0.2526456 was based on an estimated medium total variance in the outcome variable, or the categorical motives, which was the approximate partial *n2* (eta squared) of 0.06. The probability of a Type I error was set at 0.05, the power or probability of a Type II error at .95, the numerator *df* at 1 for power to the interaction, and the number of groups were four, as displayed by the two categories of injury status and gender. The output parameters were an actual power of 0.950 with a total sample size of 206. The result was a 95% chance of correctly rejecting the null hypothesis of no difference with a total of 206 participants.

The justification for determining the inputs for the sample size relied on the level of significance and the power of statistical testing. Substantial meaning as well as detecting statistical significance in the difference of mean scores among the MLR was sought. Supposing a sufficient sample size minimized the detection of differences where a statistical significance would not be relevant (Faber & Fonseca, 2014). The probability of a Type I error, rejecting the null hypothesis when true, was set with an alpha level or *p*-value of 0.05 whereas a greater number would have increased the error potential. A Type II error, not rejecting the null hypothesis when the hypothesis was false, presumed a power level of 0.95 indicating a beta level of 0.05 to increase power. Specific power values less than .80 incurred too much risk for a Type II error (Cohen, 1992).

The determination of effect size led to the importance of practical and theoretical contributions. An effect size which is large, though nonsignificant, indicates further

research with greater power (Fritz, Morris, & Richler, 2012). This study sought to identify a difference among the mean group score of the categorical motives for the continuance of marathon running by MLR in groupings of a defined condition of running without RRI versus running with RRI. This was further predicted to determine if a difference existed between the interaction of injury status and gender. Any effect between the groups was shown as a change in the observable difference in relationships.

Sampling and Sampling Procedures

The strategy in selecting an appropriate sample size considered the attainment of participants representative of these marathon runners, age 40 and older, found in the general population. The attempt to gain such a homogeneous group provided better prospective findings (Schneider, Hommel, & Blettner, 2010). Recruitment centered on purposeful sampling with sufficient responses to minimize any researcher bias due to personal affiliation.

The first objective in finding these runners was through the specific selection of running groups which emphasized long-distance events versus running in general. The use of social networking was the method of study notification. Although social media did limit availability to those with access, 63% of runners have a smartphone with 50% sharing running-related information and 33% communicating such through email (Running USA, 2018a). Several running groups which focused on marathon participation were contacted for their cooperation in the distribution of the research invitation which included the survey. This communication was via social media postings tailored to the group. The participant recruitment invitation is available in Appendix A. This method also extended the awareness of the study beyond the geographic location of the

researcher. However, it was limited to runners residing within the United States to minimize cultural concerns impacting the study results.

The second objective was to achieve a high enough response rate for a study of sufficient outcome. Participants did not receive compensation for their time in completing the survey. Their willingness to participate was derived from a perceived personal benefit in contributing to social change towards marathon running. Added, surveys are known to have incomplete answers. This issue can result in an initial sampling size to be overestimated by as much as 40% to 50% (Kotrlik & Higgins, 2001). The design of the survey was concise and customized through a well-established survey company to ensure all responses were complete which reduced data loss due to participant error and improved accuracy in data analysis.

Recruitment, Participation, and Data Collection

The criteria for the required sample structured all participant responses to directly contribute to the two research questions. Appendix B contains the participant eligibility questions. The first three measures were sequentially formatted with a ‘yes’ response leading to the eligibility of participation. Any response of ‘no’ excluded and exited the participant from the survey. The sequence of the questions was as follows:

1. Do you run marathons, a race consisting of 26.2 miles?

2. Are you age 40 or older?

3. Do you identify yourself as a marathon runner?

For purposes of simplicity and participant convenience, the eligibility conditions were compiled into a single, yet comprehensive question. This question was: For this study, you must be age 40 or older, self-identify as a marathon runner, and are currently

running, regardless of injury status. Do you meet these requirements? Upon answering yes, the informed consent was provided. All information necessary to the understanding of the participant was stated. The contact information of the researcher and the university was made available. Once agreed to, implied consent was given, and the participant proceeded to the MOMS survey and demographic questions for categorization purposes. A copy of the MOMS survey is in Appendix C and a copy of the demographic questions is in Appendix D.

The data collection for the MOMS survey was created in conjunction with the well-recognized online survey services and tools of SurveyMonkey©. Within the recruitment invitation, a link to confirm eligibility was displayed allowing participants to continue to the survey. An exit page for both ineligible participants and those completing the survey was provided which thanked each person for their time and effort. Appendix E contains a copy of the exit page. As the completion of the MOMS survey was a one-time event, no debriefing procedures was necessary. Results were customized for advanced data exporting to SPSS© for analysis.

Instrumentation and Operationalization of Constructs

Motivational measuring of participants was assessed via the MOMS survey available in Appendix C. This survey by Masters et al. (1993) was developed as a quantitative survey establishing four categorical motives, psychological, physical, social, and achievement, as reasoning for the explanation of running behavior specific to marathon runners. The MOMS survey was a 56-item questionnaire utilizing a seven-point Likert-type scale. The psychometric properties stated the Cronbach's Alpha coefficients

from .80 to .92 for internal consistency, reliability among the categories as .71 to .90, and confirmed factorial validity of scales (Masters et al., 1993).

The MOMS survey has been tested extensively among various groups of marathon runners. Age was a common descriptive variable, though without consistency, to a defined mature runner demographic (Christensen & Ogles, 2017; Loughran et al., 2013; Masters & Ogles, 1995, 1998; Ogles & Masters, 2000, 2003). The survey was also tested for generalizability among non-marathon running events and with cultural influences (Hanson et al., 2015; Havenar & Lochbaum, 2007; Heazlewood et al., 2018; Ruiz-Juan & Sancho, 2011). Only one study conducted by Zach et al. (2015) stated the scale should be expanded to reflect the changing social trends exhibited by marathon runners.

As a predictive measure to motivation among marathon runners, the use of the MOMS survey was consistent; however, the results according to RRI occurrence are not. Besomi et al. (2017) tested the MOMS for injury awareness among runners of mixed-level experiences observing that more than half had RRI. Masters and Ogles (1995) assessed only male runners to the effect of weekly mileage finding no correlation. Injury occurrence via association and dissociation by Christensen and Ogles (2017) confirmed the results of Masters and Ogles (1998) to state no relationship; though it revealed a substantial number of runners continuing to run with RRI.

For this study, participant demographics were obtained with the questionnaire in Appendix D. Inclusion of the MOMS survey to the study was given with permission by the authors. Though public use is granted, Appendix F contains the letter to the authors acknowledging its usage.

Operationalization

Each variable was defined with its operational intent and role in the study. The dependent variables were the nine subcategories of the motives stated in the MOMS survey (psychological coping, self-esteem, life meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement). The MOMS survey was a 56-item questionnaire using a seven-point Likert-type scale with responses ranging from a 1 (strongly not a reason) to 7 (strongly most important reason). Questions were organized according to subcategory with cumulative scaled responses indicating the assignment of the overarching categorical motive (physical, achievement, social, and psychological) signifying the reason for running marathons.

The independent variables were MLR described as age 40 and older who identify as marathon runners, organized into groups of either running marathons without RRI or those running with RRI. For this study, the distinction of running with an RRI was self-reported to have occurred within the previous 12 months. Gender was the third independent variable which categorical assigned each MLR as female MLR or male MLR. A list of the variables and their descriptions appears in Table 3.

Table 3

Description of Variables

Variable	Type of variable	Source name	Level of measurement	Categories
Running-related injuries (RRI)	Independent	RRI	Dichotomous	0=Without injuries 1=With injuries
Gender	Independent	GENDER	Dichotomous	0=Males 1=Females
Motive-life meaning	Dependent	MTVLFMN	Continuous	7-point Likert-type scale[a]
Motive-health orientation	Dependent	MTVHLTOR	Continuous	7-point Likert-type scale[a]
Motive-weight concern	Dependent	MTVWTCN	Continuous	7-point Likert-type scale[a]
Motive-affiliation	Dependent	MTVAFFIL	Continuous	7-point Likert-type scale[a]
Motive-recognition	Dependent	MTVRCGN	Continuous	7-point Likert-type scale[a]
Motive-competition	Dependent	MTVCMPN	Continuous	7-point Likert-type scale[a]
Motive-personal goal achievement	Dependent	MTVPGAC	Continuous	7-point Likert-type scale[a]

NOTE. [a]Each dependent variable is a 7-point Likert-type scale corresponding to 1=Strongly not a reason, 2=Not a reason, 3=More or less not a reason, 4=Neutral, 5=More or less a reason, 6=Important reason, 7=Strongly an important reason.

Data Analysis Plan

IBM© SPSS© Statistics Version 25 was the plan for data analysis. The data collected via the responses were exported and downloaded from SurveyMonkey© through the procurement of advanced services into a password-protected laptop with only me, the researcher, having access. The inclusion criteria were applied to screen and organize the data. Appropriate variables were selected and transformed into identifiable codes from SPSS© software. A list of assigned coding to variables is shown in Table 3.

The data analysis plan prepared the data to answer the research questions and the corresponding alternative and null hypotheses. The questions are as follows:

Research Question 1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries when separated by gender?

The data was analyzed from the collected participant inclusion criteria, demographics, and responses to the 56-questions of the MOMS survey. All MLR were separated into one of two groups according to injury status. The MLR identified as without RRI was the baseline group while the MLR with RRI was the comparison group. The defining criteria for an injury, specifically RRI, was one that was current or having

occurred in the previous 12-month period. In response to the first research question, there was no gender separation.

The scoring of the MOMS survey was based on the organization of the 56 questions, each representing one of the nine subcategories (psychological coping, self-esteem, life meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement); see Appendix C for questions by subcategory breakdown. Ranging from four to eight questions per subcategory, the seven-point Likert-type scaled responses collectively indicated an average score. These scores were ranked according to the four broad categories (physical, achievement, social, and psychological) which displayed the motive for marathon running. Statistical testing compared the outcomes of each independent variable for statistical significance.

An independent-samples *t* test was conducted comparing the mean scores for the type of motivation (the dependent variables), between the two groups of runners (the independent variables). The purpose was to provide an examination of the differences, if any, for statistical significance between the four overarching categories of the MOMS survey (physical, achievement, social, and psychological) according to the responses to the nine subcategories (psychological coping, self-esteem, meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement) as indicated by a seven-point Likert-type scale. These nine subcategories are the dependent variables. The two independent variables are the MLR with no RRI and the MLR with RRI. Statistical significance is reported with the p-value > 0.05.

A two-way ANOVA examined the second research question to compare the mean scores for the type of motivation, the dependent variable, between the two groups of

MLR without RRI and MLR with RRI; however, now separated by gender. The data of the MLR was organized by gender and injury status. Therefore, this process now recognized male MLR without RRI, male MLR with RRI, female MLR without RRI, and female MLR with RRI for a total of four independent variables. The purpose remained to provide an examination of the differences, if any, for statistical significance between the four overarching categories of the MOMS survey (physical, achievement, social, and psychological) according to responses to the nine subcategories (psychological coping, self-esteem, meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement) as indicated by a seven-point Likert-type scale. These nine subcategories were the dependent variables. Statistical significance was reported with the p-value > 0.05.

Descriptive statistics were calculated with frequencies for both dichotomous and ordinal variables within each category. These statistics provided the mean and *SD* of the sample using the age of the participant, the number of marathons completed, and training status as indicated by the years of running experience and the number of miles run weekly. The intention was to provide greater detail to the participation sample and its representation of the general population of MLR.

Before conducting the analyses, the necessary assumptions for each testing method were assessed and met through the actions required to do so. Both independent-samples *t* tests and the two-way ANOVA shared assumptions requiring the random sample of data, the independent variables to be categorical, the dependent variables to be continuous, and no relationship where one subject can be assigned to both groups of independent variables (Rutherford, 2011). However, the independent-samples *t* test

allowed for a comparison of only two variables; hence, the two-way ANOVA for the second research question which then also reduced the potential for Type I errors (Neutens & Rubinson, 2014). Other assumptions for normal distribution, no outliers, and homogeneity of variances were tested for during the analyses.

Threats to Validity

The threats to internal validity supposed a degree of subjectivity due to the number of variables. In turn, the cause-effect assessment of the independent variables on the dependent variable justified an outcome (Pedhazur, 1997). Not all factors were included in the study which would have challenged the strength of the observed relationship (Campbell & Stanley, 1963). Clearly stating the operational definitions, along with the reliability of the MOMS survey to measure motivation, offered formidable attempts to minimize erroneous influences.

External validity considered the response and recruitment of participants demonstrating relationships which may not appear as generalizable to the population of marathon runners. Selection bias in the recruitment of participants sought a diverse group meeting the inclusion criteria (Osborne, 2015). Purposeful sampling via social media networks also strived to equalize any compromise. The conditions in which participants completed the survey were not confirmed to an environment compromising results (Campbell & Stanley, 1963). The availability of the survey via an online link offered the opportunity for honest and thorough answers better reflecting the accuracy necessary for sufficient evidence. Lastly, anonymity through implied consent was given as no personal information was requested and all data was collected through an independent online survey company.

Ethical Procedures

Institutional Review Board (IRB) approval was obtained prior to the commencement of any research involving recruitment, data collection, and analysis (approval number 03-19-19-0637008). Attempts to attain sufficient sampling for this study necessitated permissions from running groups to introduce the availability of the survey. Upon request for inclusion by a participant, informed consent was presented to ensure their understanding and perception of involvement as voluntary in nature with no harm anticipated. Such form was presented for confirmation and replication. Further, withdrawal from the study was without consequence. All data relative to the study was collected through a third-party online survey company with the exporting of information to a password-protected database.

Access to the data is only by the sole researcher with dissemination made available on a need to know basis by Walden University staff involved in the research process. The data will be stored for a minimum of five years following the completion of the study or until data no longer serves value for future studies. While the data does not contain personal or protected health information, it is treated in a respectful professional manner. Lastly, there was no conflict of interest by personal or professional means of the researcher with the research procedure and attainment of findings.

Summary

This chapter described the research methodology of a quantitative study to identify a difference in categorical motives as stated by the MOMS survey (physical, achievement, social, and psychological), if any, among MLR running without RRI when compared to MLR continuing to run with RRI. A more complete description of the

methodology, study design, and approach with its rationale for selection was provided. Several procedures to the attainment of population size and sample along with the instrumentation, and the MOMS survey, were introduced with full availability found in the appendices. The data analysis and collection as well as the threats to validity and adherence to ethical considerations provided the final stage of the research procedures. Chapter 4 describes and discusses the data collection procedures and the analysis conducted to address the research questions and hypotheses of the study.

Chapter 4: Results

Introduction

The purpose of this study was to identify a difference, if any, in the categorical motives (physical, achievement, social, and psychological) of MLR, those age 40 and older, as stated by the MOMS survey among those running without RRI when compared to those with RRI. While evidence-based to its physical benefits of health and fitness (USDHHS, 2008), running is also known for its high risk of injury (Arlis-Mayor, 2012; Christensen & Ogles, 2017; Masters & Ogles, 1998). An understanding of the suggested motivations of a psychological or social nature explore any existing differences between the groups for continued participation, regardless of injury status. Further, if there was a difference according to gender. The following research questions and hypotheses were addressed:

Research Question 1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

$H_0$1: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is no statistically significant difference in the motivational score of continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries.

$H_1$1: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is a statistically

significant difference in the motivational score of continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries.

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without injuries and master level runners with injuries when separated by gender?

$H_0$2: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is no statistically significant difference in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries when separated by gender.

$H_1$2: Of the four motivational categories for marathon running as indicated by the MOMS survey (physical, achievement, social, and psychological), there is a statistically significant difference in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries when separated by gender.

This chapter presents the findings of survey results from 225 MLR completing the MOMS survey through social media groups with an emphasize on marathon running. The procedures for data collection to include recruitment and response rates are followed by a summary of statistics to describe the sample population. The results are explained through the analysis of the categorical motivations of the MOMS survey then summarized of the independent-samples *t* test and ANOVA used to compare the

differences between the injury status in running with RRI versus running without RRI of MLR and then separated by gender.

Data Collection

Prior to explaining the findings of the study and the relevance to the research questions, it is necessary to state how the data was collected. This description includes the approval and consent to proceed, attainment of the population sample size, and the data transfer with the corresponding organization.

Approval and Consent

The approval to conduct the study was granted before any data collection to maintain compliance procedures. Without an additional organizational affiliation, only the IRB approval from Walden University was necessary and granted (03-19-19-0637008). Though a public survey, written permission to use the Motivation of Marathoners Scales (MOMS) survey found in Appendix E was obtained. Consent was received from participants via implied consent procedures to ensure anonymity and confidentiality of responses. This option was designated via the option selected through the survey link created in SurveyMonkey© after confirmation of eligibility.

Instrumentation

A survey was created on SurveyMonkey© to collect data via online due to the recruitment of participants via running groups on social media. A total of 64 questions addressed the eligibility, consent form, demographic classification, and the MOMS survey itself. The use of the original MOMS survey with its 56 questions was retained due to consistent reliability and validity (Masters et al., 1993). The demographic questions consisted of six multiple choice questions for participant classification and one

open-ended question to the number of marathons completed. While the initial thought was the survey duration to be approximately 15 minutes, the approximate length of the survey remained under 12 minutes according to SurveyMonkey©.

The scoring of the MOMS survey to the study remained as established by the authors (Masters et al., 1993). The resulting scores were based on the organization of the 56 questions. Each question represented one of the nine subcategories (psychological coping, self-esteem, life meaning, health orientation, weight concern, affiliation, recognition, competition, and personal goal achievement). With four to eight questions per subcategory, the seven-point Likert-type scaled responses collectively indicated the average group score. The scores were then further noted to the four broad categories (physical, achievement, social, and psychological) to display the motive for marathon running.

Population and Sample Size

As planned, volunteer participants were recruited from social networking platforms which tailor membership to long-distance running, many which specifically mention marathon running. With prior permission granted from each site administrator, the communication via a social media posting of the invitation for participation was displayed. A copy of the participant recruitment invitation is found in Appendix A. There were no adverse incidents to report.

The length of data collection remained open to ensure adequate sample size reflecting the necessary response rate for the testing of statistical significance and effect size. Two-hundred-six participants were predetermined through G*Power 3.1 analysis (Faul et al., 2009). The initial response rate was 308. After meeting eligibility, the

number was reduced to 289 and then again to 257 after an agreement to the consent form. The final number of eligible participants completing the survey was 225. There were no discrepancies in the data plan previously presented.

Data Transfer

The survey closed after the satisfactory response rate was achieved. All individual responses were downloaded from SurveyMonkey© and exported into IBM© SPSS© Statistics Version 25.0 onto the password-protected computer of the researcher. While the survey was created to require a reply to each question of the MOMS questionnaire and demographic classifications, the ineligible and incomplete responses remained. Once in SPSS, the data was reviewed to alleviate missing responses. With only complete responses remaining, the demographic classification questions were given identifiable labels and the MOMS survey questions were renumbered to match the original numerical order. The appropriate independent and dependent variables were selected and transformed into identifiable codes according to SPSS© standards.

Results

For this study, a quantitative survey design was utilized with the testing for statistical significance through an independent-samples *t* test and analysis of variance (ANOVA) for the comparative differences in categorical motives of MLR, injury status, and gender. A total of 225 participants produced descriptive statistics to show the sample population of the study. IBM SPSS© Version 25.0 was the software which generated the descriptive statistics and performed the analytical testing to answer the respective research questions. The findings convey the acceptance or rejection of the null hypothesis.

Descriptive Statistics

The descriptive statics were derived from the demographic characteristics of the study participants which were facilitated by the variables of gender, injury status, and age. For gender comparisons from the total of 225, the findings show the sample was comprised of 91 male MLR or 40.44% of the total. There were more female MLR at 134 or 59.56% as displayed in Figure 2.

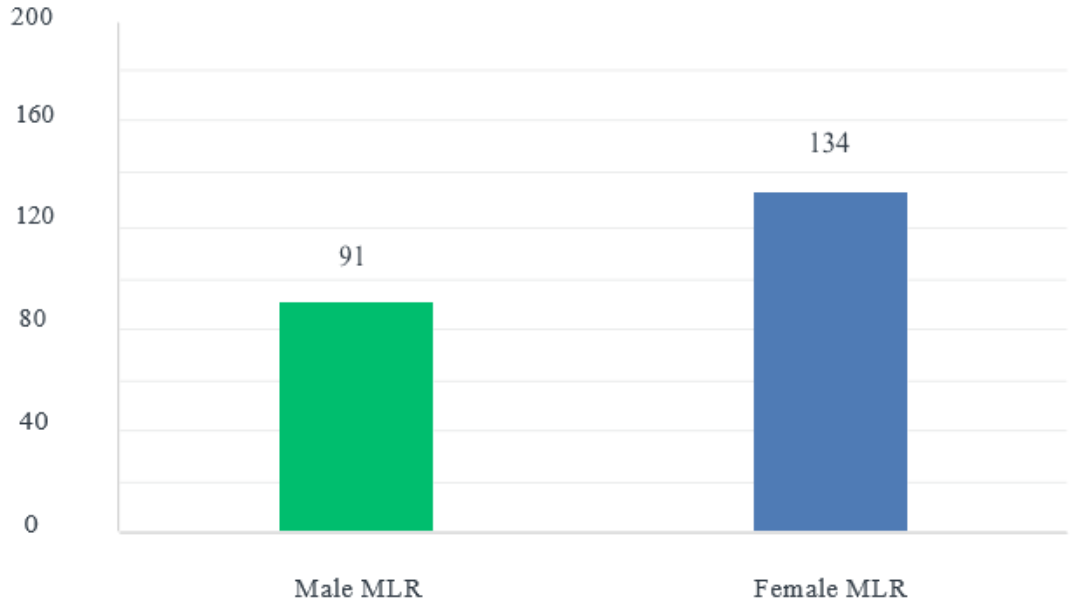

Figure 2. Gender of Master Level Runners.

Figure 3 depicts the comparison of the reported injury status of the study participants in the previous 12-month period. The findings show of the 225 total MLR, 142 or 63.11% were running without injuries (RRI) when compared to 83 or 36.89% running with injuries (RRI). This finding was just slightly lower than previously stated statistics ranging from 75% to 90% of those running with injuries (Christensen & Ogles, 2017; Running USA, 2018b; Timm et al., 2017).

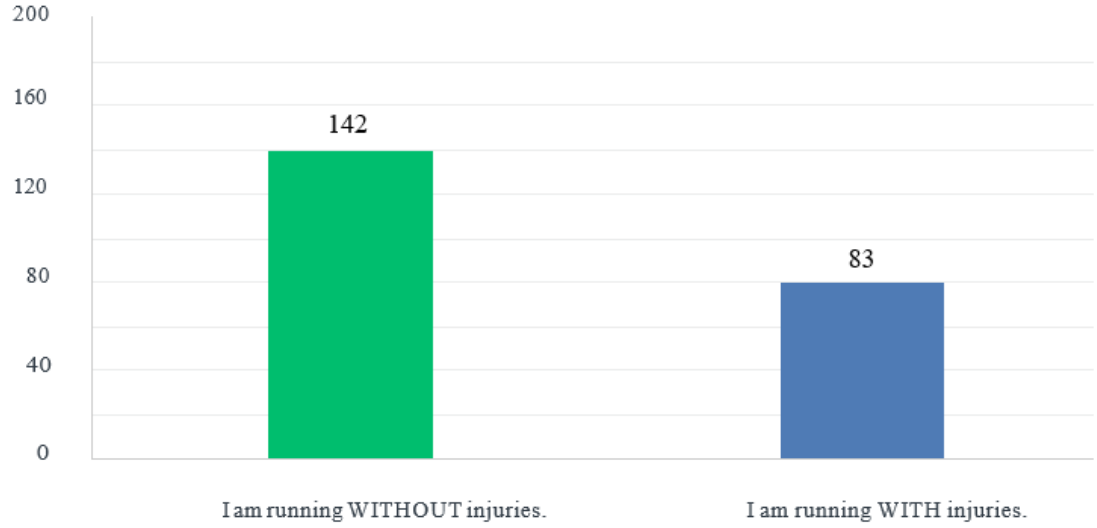

Figure 3. Injury Status of Master Level Runners.

While the eligibility criteria of all study participants to be at least 40 years of age, there was a range of respondents according to five-year age category intervals. As shown in Table 4, the corresponding number of categories with participant response rates and their overall percentage is displayed. The age category of 50 to 54 had the highest rate of responses at 52 or 23.11% while the 45 to 49 age category was second with 43 for 19.11% of the total. The 55 to 59 age category was third at 41 for 18.22%.

Table 4

Age of Master Level Runners

Age categories	Responses	Actual Numbers
40-44	16.44%	37
45-49	19.11%	43
50-54	23.11%	52
55-59	18.22%	41
60-64	12.00%	27
65-69	4.44%	10
70-74	3.56%	8
75-79	2.67%	6
80 and older	0.44%	1
Total		225

To offer further clarity on the training habits which may contribute to RRI, two additional classification questions attained the information to the prolonged existence of the MLR to marathon running. In response the duration of participation as described by the number of years of experience in marathon running, Figure 4 shows 73 MLR or (32.44%) stated a history of marathon running for five to 11 years. Meanwhile, 53 MLR or (23.56%) stated less than five years. Only 41 MLR or 18.22% reported running for more than 20 years.

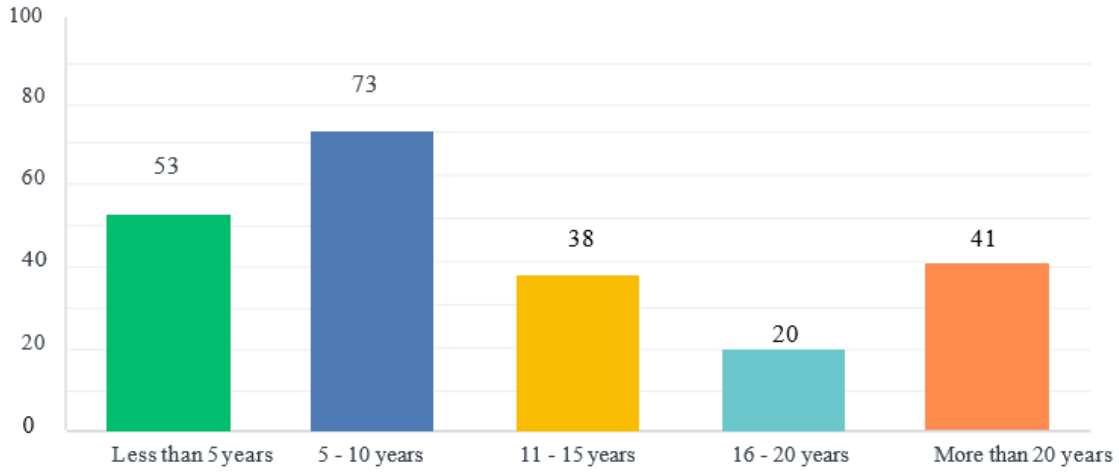

Figure 4. Years of Experience Running Marathons.

As to the frequency of running, MLR were asked the number of average miles run per week. Figure 5 displays 87 MLR or 38.67% run an average of 21 to 30 miles per week with only 58 or 25.77% running 31 to 40 miles. Of interest was the 38 MLR or 16.89% which run less than 20 miles weekly compared to an almost equal 42 or 18.67% running more than 40 miles per week.

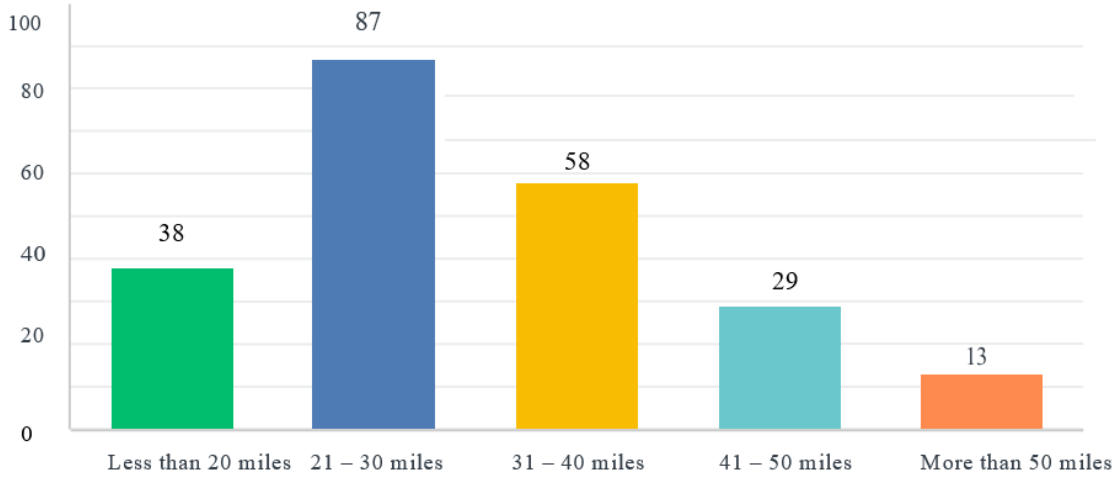

Figure 5. Average Number of Miles Run Weekly.

Research Question 1

Research Question 1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

Per the statistical analysis plan previously describe, an independent-samples *t* test identified a difference, if any, in the motivational score between the group of MLR continuing to run marathons without RRI compared to the group of MLR continuing to run with RRI.

The dependent variables were the nine subcategories of the motives stated in the MOMS survey (health orientation weight concern, personal goal achievement, competition, recognition, affiliation, psychological coping, life meaning, and self-esteem). Each of the 56 questions from the MOMS survey were classified according to the subcategory and category procedures as described by the authors to accurately score the results (Masters et al., 1993). Table 5 displays the organization of the number of questions to subcategories and thus, corresponding categories which provided the results for group comparison scores.

Table 5

Categories and Subcategories for Survey Outcomes

Categories	Subcategories	Number of questions
Physical motives	Health orientation	6
	Weight concern	4
Achievement motives	Personal goal achievement	6
	Competition	4
Social motives	Recognition	6
	Affiliation	6
Psychological motives	Psychological coping	9
	Life meaning	7
	Self-esteem	8

The independent variables are MLR described as age 40 and older who identify as marathon runners, organized into groups of either running marathons without RRI or those running with RRI. For this study, the distinction of running with an RRI is a self-reported injury to have occurred within the previous 12 months that required a change in running behavior.

Subcategorical Statistical Findings

Data screening. The statistical analysis was conducted using SPSS© Version 25.0. Before computing data analyses, the data were screened to assess accuracy, missing data, outliers, and the violation of assumptions for the following variables: injury status and questionnaire subcategories (health orientation, weight concern, personal goal

achievement, competition, recognition, affiliation, psychological coping, life meaning, and self-esteem). The data were found to be accurate and there were no missing data. Mahalanobis distance was calculated and no outliers were found using the $p < .001$ criterion. Next, normality was assessed by objectively examining the distributions and based upon the skewness and kurtosis values, using the >|3| criterion. The normality assumption was met for the following questionnaire subcategories: recognition, psychological coping, and life meaning. However, the remaining questionnaire subcategories did not meet the normality assumption. Lastly, the homogeneity assumption was met for all the questionnaire subcategories as assessed by the Levene's Test of Equality of Variances using the $p <.001$ criterion.

The total sample size for the analyses were 225 (running with injuries $n = 83$; running without injuries $n = 142$). Confidence intervals were set for 95%. Data are mean $\pm$ *SD* unless otherwise stated. Table 6 is the display of descriptive statistics for comparison between each group for the subcategorical motives (Group Statistics Independent-Samples *T* Test for Subcategorical Motives-Injury Status) and Table 7 shows the results (Results Independent-Samples *T* Test for Subcategorical Motives-Injury Status).

Health orientation results. An independent-samples *t* test was performed to examine differences in health orientation between MLR running with RRI and those who have been running without RRI. The result revealed no significant differences in health orientation between the groups, $t(223) = 1.049$, $p = .295$, $d = 0.14135$, $r = 0.07049$. In other words, MLR running with RRI ($M = 31.7952$, $SD = 7.04992$, $SEM = .77383$), 95%

CI [-.80527, 2.63745] had similar health orientation as compared to MLR running without RRI (*M* = 32.7113, *SD* = 5.85714, *SEM* = .49152), 95% *CI* [-.80527, 2.63745].

Weight concern results. An independent-samples *t* test was performed to examine differences in weight concern between MLR running with RRI and those running without RRI. The result revealed no significant differences in weight concern between the groups, *t*(223) = .774, *p* = .440, *d* = 0.10404, *r* = 0.05195. In other words, MLR running with RRI (*M* = 30.4940, *SD* = 7.17783, *SEM* = .78787), 95% *CI* [-1.05530, 2.41946] had similar weight concern as compared to MLR running without RRI (*M* = 31.1761, *SD* = 5.86769, *SEM* = .49241), 95% *CI* [-1.05530, 2.41946].

Personal goal achievement results. An independent-samples *t* test was performed to examine differences in personal goal achievement between MLR running with RRI and those running without RRI. The result revealed no significant differences in personal goal achievement between the groups, *t*(223) = .789, *p* = .431, *d* = 0.10896, *r* = 0.05440. In other words, MLR running with RRI (*M* = 29.4699, *SD* = 6.74507, *SEM* = .74037), 95% *CI* [-1.10006, 2.56875] had similar personal goal achievement as compared to MLR running without RRI (*M* = 30.2042, *SD* = 6.73252, *SEM* = .56498), 95% *CI* [-1.10006, 2.56875].

Competition results. An independent-samples *t* test was performed to examine differences in competition between MLR running with RRI and those running without RRI. The result revealed no significant differences in competition between the groups, *t*(223) = .-0.636, *p* = .526, *d* = -0.08760, *r* = -0.004376. In other words, MLR running with RRI (*M* = 12.7470, *SD* = 5.85567, *SEM* = .64274), 95% *CI* [-2.08065, 1.06555] had

similar competition as compared to MLR running without RRI (*M* = 12.2394, *SD* = 5.73150, *SEM* = .48098), 95% *CI* [-2.08065, 1.06555].

Recognition results. An independent-samples *t* test was performed to examine differences in recognition between MLR running with RRI and those running without MLR. The result revealed no significant differences in recognition between the groups, *t*(223) = .466, *p* = .642, *d* = .06348, *r* = 0.03172. In other words, MLR running with RRI (*M* = 26.3614, *SD* = 6.15764, *SEM* = .67589), 95% *CI* [-1.19701, 1.93891] had similar competition as compared to MLR running without RRI (*M* = 26.7324, *SD* = 5.51325, *SEM* = .46266), 95% *CI* [-1.19701, 1.93891].

Affiliation results. An independent-samples *t* test was performed to examine differences in affiliation between MLR running with RRI and those running without MLR. The result revealed no significant differences in affiliation between the groups, *t*(223) = -0.003, *p* = .997, *d* = -0.00045, *r* = -0.00022. In other words, MLR running with RRI (*M* = 26.6024, *SD* = 7.59965, *SEM* = .83417), 95% *CI* [-2.33156, 2.32392] had similar competition as compared to MLR running without RRI (*M* = 26.5986, *SD* = 9.05543, *SEM* = .75991), 95% *CI* [-2.33156, 2.32392].

Psychological coping results. An independent-samples *t* test was performed to examine differences in psychological coping between MLR running with RRI and those running without RRI. The result revealed no significant differences in psychological coping between the groups, *t*(223) = -0.147, *p* = .883, *d* = -0.01020, *r* = -0.01020. In other words, MLR running with RRI (*M* = 38.6867, *SD* = 11.41985, *SEM* = 1.25349), 95% *CI* [-3.39421, 2.92212] had similar competition as compared to MLR running without RRI (*M* = 38.4507, *SD* = 11.70172, *SEM* = .98199), 95% *CI* [-3.39421, 2.92212].

Life meaning results. An independent-samples *t* test was performed to examine differences in life meaning between MLR running with RRI and those running without RRI. The result revealed no significant differences in life meaning between the groups, *t*(223) = -0.058, *p* = .954, *d* = -0.00799, *r* = -00399. In other words, MLR running with RRI (*M* = 29.4819, *SD* = 9.14699, *SEM* = 1.00401), 95% *CI* [-2.57491, 2.42796] had similar competition as compared to MLR running without RRI (*M* = 29.4085, *SD* = 9.21004, *SEM* = .77289), 95% *CI* [-2.57491, 2.42796].

Self-esteem results. An independent-samples *t* test was performed to examine differences in self-esteem between MLR running with RRI and those running without RRI. The result revealed no significant differences in self-esteem between the groups, *t*(223) = -.247, *p* = .805, *d* = -0.00799, *r* = 0.01727. In other words, MLR running with RRI (*M* = 37.6867, *SD* = 9.16639, *SEM* = 1.00614), 95% *CI* [-2.33684, 3.00560] had similar competition as compared to MLR running without RRI (*M* = 38.0211, *SD* = 10.16632, *SEM* = .85314), 95% *CI* [-2.33684, 3.00560].

Table 6

Descriptive Statistics Independent-Samples T *Test for Subcategorical Motives-Injury Status*

Subcategorical motive	RRI Status	*n*	Mean	*SD*	Std. error mean	Cohen's *d*	Effect size - *r*
Health orientation	Without injuries	142	32.7113	5.85714	0.49152	0.14135	0.07049
	With injuries	83	31.7952	7.04992	0.77383		
Weight concern	Without injuries	142	31.1761	5.86769	0.49241	0.10404	0.05195
	With injuries	83	30.4940	7.17783	0.78787		
Personal goal achievement	Without injuries	142	30.2042	6.73252	0.56498	0.10896	0.05440
	With injuries	83	29.4699	6.74507	0.74037		
Competition	Without injuries	142	12.2394	5.73150	0.48098	-0.08760	-0.04376
	With injuries	83	12.7470	5.85567	0.64274		
Recognition	Without injuries	142	26.7324	5.51325	0.46266	0.06348	0.03172
	With injuries	83	26.3614	6.15764	0.67589		
Affiliation	Without injuries	142	26.5986	9.05543	0.75991	-0.00045	-0.00022
	With injuries	83	26.6024	7.59965	0.83417		
Psychological coping	Without injuries	142	38.4507	11.70172	0.98199	-0.02041	-0.01020
	With injuries	83	38.6867	11.41985	1.25349		
Life meaning	Without injuries	142	29.4085	9.21004	0.77289	-0.00799	-0.00399
	With injuries	83	29.4819	9.14699	1.00401		
Self Esteem	Without injuries	142	38.0211	10.16632	0.85314	0.03454	0.01727
	With injuries	83	37.6867	9.16639	1.00614		

Table 7

Results Independent-Samples T *Test for Subcategorical Motives–Injury Status*

		Levene's Test for Equality of Variances		*t* Test for Equality of Means			95% Confidence interval of the difference	
Subcategorical motive		F	Sig.	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Health orientation	Equal variances assumed	4.919	.028	.295	.91609	87349	-.80527	2.63745
	Equal variances not assumed			.319	.91609	.91674	-.89554	2.72772
Weight concern	Equal variances assumed	5.931	.016	.440	.68208	.86162	-1.05530	2.41946
	Equal variances not assumed			.464	.68208	.92909	-1.15415	2.51831
Personal goal achievement	Equal variances assumed	.041	.840	.431	.73435	.93086	-1.10006	2.56875
	Equal variances not assumed			.431	.73435	.93132	-1.10397	2.5266
Competition	Equal variances assumed	.021	.884	.526	-.50755	.79826	-2.08065	1.06555
	Equal variances not assumed			.528	-.50755	.80278	-2.09234	1.07723
Recognition	Equal variances assumed	.402	.527	.642	.37095	.79565	-1.19701	1.93891
	Equal variances not assumed			.651	.37095	.81907	-1.24689	1.98879
Affiliation	Equal variances assumed	4.858	.029	.997	-.00382	1.18120	-2.33156	2.32392
	Equal variances not assumed			.997	-.00382	1.12841	-2.22920	2.22156

(*table continues*)

		Levene's Test for Equality of Variances		*t* Test for Equality of Means			95% Confidence interval of the Difference	
Subcategorical motive		F	Sig.	Sig. (2-tailed)	Mean difference	Std. Error difference	Lower	Upper
Psychological coping	Equal variances assumed	.001	.980	.883	-.23604	1.60259	-3.39421	2.92212
	Equal variances not assumed			.882	-.23604	1.59234	-3.37868	2.90659
Life meaning	Equal variances assumed	.049	.825	.954	-.07348	1.26934	-2.57491	2.42796
	Equal variances not assumed			.954	-.07348	1.26704	-2.57436	2.42741
Self-esteem	Equal variances assumed	2.581	.110	.805	.33438	1.35550	-2.33684	3.00560
	Equal variances not assumed			.800	.33438	1.31915	-2.26802	2.93678

Categorical Statistical Findings

The same conditioning parameters for data screening were applied as indicated in the subcategorical statistical findings. Table 8 is the display of descriptive statistics for comparison between each group for the categorical motives (Group Statistics Independent-Samples *T* Test for Categorical Motives-Injury Status) and Table 9 shows the results (Results Independent-Samples *T* Test for Categorical Motives-Injury Status).

Physical motive results. An independent-samples *t* test was performed to examine differences in physical motive between MLR running with RRI and those running without RRI. The result revealed no significant differences in physical motive between the groups, $t(223) = .919$, $p = .359$, $d = 0.123593$, $r = 0.061679$. In other words,

MLR running with RRI (*M* = 62.2892, *SD* = 14.13914, *SEM* = 1.55197), 95% *CI* [-1.83016, 5.02649] had similar competition as compared to MLR running without RRI (*M* = 63.8873, *SD* = 11.59610, *SEM* = .97312), 95% *CI* [-1.83016, 5.02649].

Achievement motive results. An independent-samples *t* test was performed to examine differences in achievement motive between MLR running with RRI and those running without RRI. The result revealed no significant differences in achievement motive between the groups, *t*(223) = .146, *p* = .884, *d* = 0.02018, *r* = 0.01009. In other words, MLR running with RRI (*M* = 42.2169, *SD* = 11.18039, *SEM* = 1.22721), 95% *CI* [-2.83374, 3.28733] had similar competition as compared to MLR running without RRI (*M* = 42.4437, *SD* = 11.29459, *SEM* = .94782), 95% *CI* [-2.83374, 3.28733].

Social motive results. An independent-samples *t* test was performed to examine differences in social motive between MLR running with RRI and those running without RRI. The result revealed no significant differences in social motive between the groups, *t*(223) = .232, *p* = .816, *d* = 0.03220, *r* = 0.01610. In other words, MLR running with RRI (*M* = 52.9639, *SD* = 11.28397, *SEM* = 1.23858), 95% *CI* [-2.74487, 3.47913] had similar competition as compared to MLR running without RRI (*M* = 53.3310, *SD* = 11.51300, *SEM* = .96615), 95% *CI* [-2.74487, 3.47913].

Psychological motive results. An independent-samples *t* test was performed to examine differences in psychological motive between MLR running with RRI and those running without RRI. The result revealed no significant differences in psychological motive between the groups, *t*(223) = .007, *p* = .995, *d* = 0.00089, *r* = 0.00044. In other words, MLR running with RRI (*M* = 105.8554, *SD* = 26.94309, *SEM* = 2.95739), 95% *CI*

[-7.50813, 7.55785] had similar competition as compared to MLR running without RRI (*M* = 105.8803, *SD* = 28.07803, *SEM* = 2.35626), 95% *CI* [-7.50813, 7.55785].

Therefore, with no statistical significance reported in any category, the researcher failed to reject the null hypothesis.

Table 8

Descriptive Statistics Independent-Samples T *Test for Categorical Motives-Injury Status*

Categorical motive	RRI status	*N*	Mean	*SD*	Std. Error mean	Cohen's *d*	Effect size - *r*
Physical	Without injuries	142	63.8873	11.59610	.97312	0.123593	0.061679
	With injuries	83	62.2892	14.13914	1.55197		
Achievement	Without injuries	142	42.4437	11.29459	.94782	0.02018	0.01009
	With injuries	83	42.2169	11.18039	1.22721		
Social	Without injuries	142	53.3310	11.51300	.96615	0.03220	0.01610
	With injuries	83	52.9639	11.28397	1.23858		
Psychological	Without injuries	142	105.8803	28.07803	2.35626	0.00089	0.00044
	With injuries	83	105.8554	26.94309	2.95739		

Table 9

Results Independent-Samples T *Test for Categorical Motives-Injury Status*

Categorical motive		Levene's Test for Equality of Variances		*t* Test for Equality of Means			95% Confidence interval of the Difference	
		F	Sig.	Sig. (2-tailed)	Mean difference	Std. error difference	Lowe	Upper
Physical	Equal variances assumed	5.779	.017	.359	1.59817	1.73968	-1.830	5.02649
	Equal variances not assumed			.384	1.59817	1.83183	-2.022	5.21848
Achievement	Equal variances assumed	.27	.871	.884	.22679	1.55477	-2.837	3.29071
	Equal variances not assumed			.884	.22679	1.55061	-2.833	3.28733
Social	Equal variances assumed	.530	.467	.816	.36713	1.57917	-2.744	3.47913
	Equal variances not assumed			.815	.36713	1.57083	-2.733	3.46740
Psychological	Equal variances assumed	.091	.764	.995	.02486	3.82258	-7.508	7.55785
	Equal variances not assumed			.995	.02486	3.78128	-7.437	7.48690

Research Question 2

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without injuries and master level runners with injuries when separated by gender?

A two-way ANOVA allows for the differentiation of mean scores of more than two groups. The ratio of observed differences includes the between-group variations as displayed by gender as well as the in-group variations of injury status. The dependent variables were the nine subcategories of the motives stated in the MOMS survey (health orientation weight concern, personal goal achievement, competition, recognition, affiliation, psychological coping, life meaning, and self-esteem). Each of the 56 questions from the MOMS survey was classified according to the subcategory and category procedures as described by the authors to accurately score the results (Masters et al., 1993). Table 5 displays the organization of questions to subcategories and thus, corresponding categories which provide the results for group comparisons.

The independent variables were MLR described as age 40 and older who identify as marathon runners, organized into groups of either running marathons without RRI or those running with RRI. For this study, the distinction of running with RRI was a self-reported injury to have occurred within the previous 12 months that required a change in running behavior. The second independent variable was gender stated as male MLR and female MLR.

Subcategorical Statistical Findings

Data screening. The statistical analysis was conducted using SPSS© Version 25.0. Before computing data analyses, the data were screened to assess accuracy, missing data, outliers, and the violation of assumptions for the following variables: gender, injury status, and questionnaire subcategories (health orientation, weight concern, personal goal achievement, competition, recognition, affiliation, psychological coping, life meaning and self-esteem). The data were found to be accurate with no incomplete entries.

Mahalanobis distance was calculated and no outliers were found using the $p < .001$ criterion. The assumption of normality was satisfied for all group combinations of gender and injury status as assessed by Shapiro-Wilk's test ($p > .05$) unless stated otherwise in the results of the specific subcategories. Lastly, the homogeneity assumption was met for all the questionnaire subcategories as assessed by the Levene's Test of Equality of Variances using the $p < .001$ criterion.

The total sample size for the analyses were 225 ($N = 225$). With between group assignments, for male MLR and injury status when running with RRI ($n = 35$) and male MLR running without RRI ($n = 56$). For female MLR when running with RRI ($n = 48$) and female MLR when running without RRI ($n = 86$). Confidence intervals were set for 95% and the p-value < .05. Data are mean $\pm$ standard deviation unless otherwise stated. Table 10 is the display of descriptive statistics for comparison between each group for the subcategorical motives (Descriptive Statistics ANOVA for Categorical Motives-Gender & Injury Status) and Table 11 shows the results (Results ANOVA Categorical Motives-Gender & Injury Status).

Health orientation results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in health orientation between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .082$. The assumption of normality was not satisfied for females and the injury status of running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = .528$, $p = .468$, $\eta_p^2 = .002$ or for the injury status main effect, $F(1,221) = .469$, $p = .494$, $\eta_p^2 = .002$.

However, there was a statistically significant interaction, $F(1,221) = 4.09$, $p = .044$, $\eta_p^2 = .018$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in health orientation for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .151$, $p = .122$, $d = 0.350418$, $r = 0.172610$. In other words, male MLR running with RRI ($M = 33.2000$, $SD = 6.56103$, $SEM = 1.1090$), 95% *CI* [-.66155, 5.51988] had similar health orientation as compared to female MLR with RRI ($M = 30.7708$, $SD = 7.28227$, $SEM = 1.05111$), 95% *CI* [-.66155, 5.51988].

Results also revealed no significant difference in health orientation for male MLR running without RRI as compared to female MLR running without RRI, $t(223) = .396$, $p = .256$, $d = 0.192491$, $r = -0.095803$. In other words, male MLR running without RRI ($M = 32.0179$, $SD = 6.38034$, $SEM = .85261$), 95% *CI* [-3.13124, .84137] had similar health orientation as compared to female MLR without RRI ($M = 33.1628$, $SD = 5.48122$, $SEM = .59106$), 95% *CI* [-3.13124, .84137].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed a statistically significant difference in health orientation for injury status among female MLR running without RRI as compared to female MLR running with RRI, $t(223) = .006$, $p = .034$, $d = 0.371142$, $r = 0.182456$. In other words, injury status of female MLR running without RRI ($M = 33.1628$, $SD = 5.48122$, $SEM = .59106$), 95% *CI* [.18839, 4.59552] had different health

orientation as compared to female MLR running with RRI (*M* = 30.7708, *SD* = 7.28227, *SEM* = 1.05111), 95% *CI* [.18839, 4.59552].

Results, however, revealed no significant difference in health orientation for injury status among male MLR running without RRI as compared to male MLR running with RRI, $t(223) = .941$, $p = .397$, $d = -0.182667$, $r = -0.090955$. In other words, male MLR running without RRI (*M* = 32.0179, *SD* = 6.38034, *SEM* = .85261), 95% *CI* [-3.94363, 1.57935] had similar health orientation as compared to male MLR running with RRI (*M* = 33.2000, *SD* = 6.56103, *SEM* = 1.10902), 95% *CI* [-3.94363, 1.57935].

Weight concern results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in weight concern between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .068$. The assumption of normality was satisfied for only females and the injury status of running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = .673$, $p = .413$, $\eta_p^2 = .003$ or for the injury status main effect, $F(1,221) = .138$, $p = .711$, $\eta_p^2 = .001$. However, there was a statistically significant interaction, $F(1,221) = 5.169$, $p = .024$, $\eta_p^2 = .023$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in weight concern for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .142$, $p = .084$, $d = 0.391278$, $r = 0.191995$. In other words, male MLR running with RRI (*M* = 32.0857, *SD* = 6.67908, *SEM* = 1.12897), 95% *CI* [-.38306, 5.88782] had similar weight

concern as compared to female MLR with RRI (*M* = 29.3333, *SD* = 7.37256, *SEM* = 1.06414), 95% *CI* [-.38306, 5.88782].

Results also revealed no significant difference in weight concern for male MLR running without RRI as compared to female MLR running without RRI, *t*(223) = .713, *p* = .200, *d* = -0.218482, *r* = -0.108585. In other words, male MLR running without RRI (*M* = 30.3929, *SD* = 6.21049, *SEM* = .82991), 95% *CI* [-3.28057, .69419] had similar weight concern as compared to female MLR without RRI (*M* = 31.6860, *SD* = 5.61146, *SEM* = .60510), 95% *CI* [-3.28057, .69419].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed a statistically significant difference in weight concern for injury status among female MLR running without RRI as compared to female MLR running with RRI, *t*(223) = .006, *p* = .040, *d* = 0.359111, *r* = 0.176729. In other words, injury status of female MLR running without RRI (*M* = 31.6860, *SD* = 5.61146, *SEM* = .60510), 95% *CI* [.10912, 4.59630] had different weight concern as compared to female MLR running with RRI (*M* = 29.3333, *SD* = 7.37256, *SEM* = 1.06414), 95% *CI* [.10912, 4.59630].

Results, however, revealed no significant difference in weight concern for injury status among male MLR running without RRI as compared to male MLR running with RRI, *t*(223) = .811, *p* = .222, *d* = -0.262488, *r* = -0.130128. In other words, male MLR running without RRI (*M* = 30.3929, *SD* = 6.21049, *SEM* = .82991), 95% *CI* [-4.43019, 1.04448] had similar weight concern as compared to male MLR running with RRI (*M* = 32.0857, *SD* = 6.67908, *SEM* = 1.12897), 95% *CI* [-4.43019, 1.04448].

Personal goal achievement results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in personal goal achievement between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .549$. The assumption of normality was not satisfied with the injury status of running without RRI for both males and females as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = .027$, $p = .870$, $\eta_p^2 = .000$ or for the injury status main effect, $F(1,221) = .671$, $p = .414$, $\eta_p^2 = .003$. Further, there was no significant interaction between gender and injury status, $F(1,221) = .076$, $p = .784$, $\eta_p^2 = .000$.

Competition results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in competition between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .906$. The assumption of normality was not satisfied for all interactions of variables between gender and injury status as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed a statistically significant difference for the gender main effect for males, $F(1,221) = 4.678$, $p = .032$, $\eta_p^2 = .021$ while there was no significant difference for injury status main effect, $F(1,221) = .645$, $p = .423$, $\eta_p^2 = .003$. However, there was no significant interaction between gender and injury status, $F(1,221) = 1.595$, $p = .208$, $\eta_p^2 = .007$.

Recognition results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in recognition between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .299$. The assumption of normality was satisfied with all interactions among the

variables of gender and injury status as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = 1.776$, $p = .184$, $\eta_p^2 = .008$ or for the injury status main effect, $F(1,221) = .054$, $p = .817$, $\eta_p^2 = .000$. Further, there was no significant interaction between gender and injury status, $F(1,221) = 1.097$, $p = .296$, $\eta_p^2 = .005$.

Affiliation results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in affiliation between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .020$. R. The assumption of normality was satisfied for only males and the injury status of running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = .384$, $p = .536$, $\eta_p^2 = .002$ or for the injury status main effect, $F(1,221) = .180$, $p = .672$, $\eta_p^2 = .001$. However, there was a statistically significant interaction, $F(1,221) = 4.818$, $p = .029$, $\eta_p^2 = .021$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in affiliation for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .024$, $p = .270$, $d = 0.253423$, $r = 0.125706$. In other words, male MLR running with RRI ($M = 27.6857$, $SD = 6.01846$, $SEM = 1.01731$), 95% *CI* [-1.48297, 5.22940] had similar affiliation as compared to female MLR with RRI ($M = 25.8125$, $SD = 8.54688$, $SEM = 1.23364$), 95% *CI* [-1.48297, 5.22940].

Results revealed a statistically significant difference in affiliation for male MLR running without RRI as compared to female MLR running without RRI, $t(223) = .595$, p

= .031, *d* = -0.375639, *r* = -0.184592. In other words, male MLR running without RRI (*M* = 24.5714, *SD* = 8.78606, *SEM* = 1.17409), 95% *CI* [-6.38119, -.31316] had different affiliation as compared to female MLR without RRI (*M* = 27.9186, *SD* = 9.03355, *SEM* = .97411), 95% *CI* [-6.38119, -.31316].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed no significant difference in affiliation for injury status among female MLR running without RRI as compared to female MLR running with RRI, *t*(223) = .437, *p* = .189, *d* = 0.239504, *r* = 0.118902. In other words, injury status of female MLR running without RRI (*M* = 27.9186, *SD* = 9.03355, *SEM* = .97411), 95% *CI* [-1.05273, 5.26494] had similar affiliation as compared to female MLR running with RRI (*M* = 25.8125, *SD* = 8.54688, *SEM* = 1.23364), 95% *CI* [-1.05273, 5.26494].

Results also revealed no significant differences in affiliation for injury status among male MLR running without RRI as compared to male MLR running with RRI, *t*(223) = .012, *p* = .069, *d* = -0.413558, *r* = -0.202495. In other words, male MLR running without RRI (*M* = 24.5714, *SD* = 8.78606, *SEM* = 1.17409), 95% *CI* [-6.47300, .24442] had similar affiliation as compared to male MLR running with RRI (*M* = 27.6857, *SD* = 6.01846, *SEM* = 1.01731), 95% *CI* [-6.47300, .24442].

Psychological coping results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in psychological coping between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, *p* = .205. The assumption of normality was not satisfied for only the interaction of females running without RRI as assessed by the Shapiro-Wilk's test (*p*

> .05). Results revealed a statistically significant difference for the gender main effect for females, $F(1,221) = 4.954$, $p = .027$, $\eta_p^2 = .022$ while there was no significant difference for injury status main effect, $F(1,221) = .296$, $p = .587$, $\eta_p^2 = .001$. However, there was no significant interaction between gender and injury status, $F(1,221) = 3.3221$, $p = .070$, $\eta_p^2 = .015$.

Life meaning results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in life meaning between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .112$. The assumption of normality was satisfied for all interactions of the variables between gender and injury status as assessed by the Shapiro-Wilk's test ($p >$ .05). Results revealed a statistically significant difference for the gender main effect for females, $F(1,221) = 7.542$, $p = .007$, $\eta_p^2 = .033$ while there was no significant difference for injury status main effect, $F(1,221) = .204$, $p = .652$, $\eta_p^2 = .001$. However, there was no significant interaction between gender and injury status, $F(1,221) = 2.992$, $p = .085$, $\eta_p^2 = .013$.

Self-esteem results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in self-esteem between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .065$. The assumption of normality was satisfied for males in both injury status of running with RRI and without RRI assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed a statistically significant difference for the gender main effect for females, $F(1,221) = 13.553$, $p = .000$, $\eta_p^2 = .058$ while there was no significant difference for injury status main effect, $F(1,221) = .048$, $p = .826$, $\eta_p^2 = .000$. There was a statistically

significant interaction between gender and injury status, $F(1,221) = 4.121$, $p = .044$, $\eta_p^2 = .018$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in self-esteem for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .136$, $p = .288$, $d = -0.233439$, $r = -0.115932$. In other words, male MLR running with RRI (*M* = 36.4286, *SD* = 10.26784, *SEM* = 1.73558), 95% *CI* [-6.22593, 1.87474] had similar self-esteem as compared to female MLR with RRI (*M* = 38.6042, *SD* = 8.26358, *SEM* = 1.19275), 95% *CI* [-6.22593, 1.87474].

Results did reveal a statistically significant difference in self-esteem for female MLR running without RRI as compared to male MLR running without RRI, $t(223) = .038$, $p = .000$, $d = -0.767913$, $r = -0.358443$. In other words, female MLR running without RRI (*M* = 40.9884, *SD* = 8.35181, *SEM* = .90060), 95% *CI* [-10.75147, -4.29670] had different self-esteem as compared to male MLR without RRI (*M* = 33.4643, *SD* = 11.05682, *SEM* = 1.47753), 95% *CI* [-6.22593, 1.87474].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed no significant difference in self-esteem for injury status among female MLR running without RRI as compared to female MLR running with RRI, $t(223) = .459$, $p = .114$, $d = 0.286982$, $r = 0.142036$. In other words, injury status of female MLR running without RRI (*M* = 40.9884, *SD* = 8.35181, *SEM* = .90060), 95% *CI* [-.58117, 5.34958] had similar self-esteem as compared

to female MLR running with RRI (*M* = 38.6042, *SD* = 8.26358, *SEM* = 1.19275), 95% *CI* [-.58117, 5.34958].

Results also revealed no significant difference in self-esteem for injury status among male MLR running without RRI as compared to male MLR running with RRI, *t*(223) = .595, *p* = .204, *d* = -0.277826, *r* = -0.137591. In other words, male MLR running without RRI (*M* = 33.4643, *SD* = 11.05682, *SEM* = 1.47753), 95% *CI* [-.58117, 5.34958] had self-esteem as compared to male MLR running with RRI (*M* = 36.4286, *SD* = 10.26784, *SEM* = 1.73558), 95% *CI* [-.58117, 5.34958].

Table 10

Descriptive Statistics ANOVA for Subcategorical Motives-Gender & Injury Status

Subcategorical motive	RRI Status	Gender	Mean	*SD*	*N*
Health orientation	Without	Male	32.0179	6.38034	56
		Female	33.1628	5.48122	86
		Total	32.7113	5.85714	142
	With	Male	33.2000	6.56103	35
		Female	30.7708	7.28227	48
		Total	31.7952	7.04992	83
	Total	Male	32.4725	6.44005	91
		Female	32.3060	6.26631	134
		Total	32.3733	6.32337	225
Weight concern	Without	Male	30.3929	6.21049	56
		Female	31.6860	5.61146	86
		Total	31.1761	5.86769	142
	With	Male	32.0857	6.67908	35
		Female	29.3333	7.37256	48
		Total	30.4940	7.17783	83
	Total	Male	31.0440	6.41164	91
		Female	30.8433	6.37294	134
		Total	30.9244	6.37508	225
Personal goal achievement	Without	Male	30.2679	7.41863	56
		Female	30.1628	6.29072	86
		Total	30.2042	6.73252	142
	With	Male	29.2286	7.38873	35
		Female	29.6458	6.30936	48
		Total	29.4699	6.74507	83
	Total	Male	29.8681	7.38348	91
		Female	29.9776	6.27858	134
		Total	29.9333	6.73146	225

(table continues)

Subcategorical motive	RRI Status	Gender	Mean	*SD*	*N*
Competition	Without	Male	12.6786	5.6878	56
		Female	11.9535	5.82471	86
		Total	12.2394	5.73150	142
	With	Male	14.3429	5.90584	35
		Female	11.5833	5.59572	48
		Total	12.7470	5.85567	83
	Total	Male	13.3187	5.75013	91
		Female	11.8209	5.72536	134
		Total	12.4267	5.76978	225
Recognition	Without	Male	25.5714	5.87710	56
		Female	27.4884	5.15808	86
		Total	26.7324	5.51325	142
	With	Male	26.2286	6.94976	35
		Female	26.4583	5.58478	48
		Total	26.3614	6.15764	83
	Total	Male	25.8242	6.28153	91
		Female	27.1194	5.31708	134
		Total	26.5956	5.74852	225
Affiliation	Without	Male	24.5714	8.78606	56
		Female	27.9186	9.03355	86
		Total	26.5986	9.05543	142
	With	Male	27.6857	6.01846	35
		Female	25.8125	8.54688	48
		Total	26.6024	7.59965	83

(*table continues*)

Subcategorical motive	RRI Status	Gender	Mean	SD	*N*
Psychological coping	Without	Male	34.5357	12.49431	56
		Female	41.0000	10.46226	86
		Total	38.4507	11.70172	142
	With	Male	38.3143	13.30584	35
		Female	38.9583	9.96368	48
		Total	38.6867	11.41985	83
	Total	Male	35.9890	12.87245	91
		Female	40.2687	10.29575	134
		Total	38.5378	11.57351	225
Life meaning	Without	Male	26.0000	9.85347	56
		Female	31.6279	8.07763	86
		Total	29.4085	9.21004	142
	With	Male	28.7429	10.06258	35
		Female	30.0208	8.48651	48
		Total	29.4819	9.14699	83
	Total	Male	27.0549	9.96924	91
		Female	31.0522	8.23099	134
		Total	29.4356	9.16645	225
Self-esteem	Without	Male	33.4643	11.05682	56
		Female	40.9884	8.35181	86
		Total	38.0211	10.16632	142
	With	Male	36.4286	10.26784	35
		Female	38.6042	8.26358	48
		Total	37.6867	9.16639	83
	Total	Male	34.6044	10.80008	91
		Female	40.1343	8.36821	134
		Total	37.8978	9.78990	225

Table 11

Results ANOVA for Subcategorical Motives-Gender & Injury Status

Subcategorical motive	Variable	Df	Mean square	F	Sig.	Partial eta squared
Health orientation	Gender	1	20.906	.528	.468	.002
	Injury status	1	18.553	.469	.494	.002
	Gender*Injury status	1	161.924	4.090	.044*	.018
Weight concern	Gender	1	26.990	.673	.413	.003
	Injury status	1	5.519	.138	.711	.001
	Gender*Injury status	1	207.462	5.169	.024*	.023
Personal goal achievement	Gender	1	1.235	.027	.870	.000
	Injury status	1	30.700	.671	.414	.003
	Gender*Injury status	1	3.458	.076	.784	.000
Competition	Gender	1	153.917	4.678	.032*	.021
	Injury status	1	21.229	.645	.423	.003
	Gender*Injury status	1	52.465	1.595	.208	.007
Recognition	Gender	1	58.415	1.776	.184	.008
	Injury status	1	1.73	.054	.817	.000
	Gender*Injury status	1	36.083	1.097	.296	.005

(*table continues*)

Subcategorical motive	Variable	Df	Mean square	F	Sig.	Partial eta squared
Affiliation	Gender	1	27.539	.384	.536	.002
	Injury status	1	12.884	.180	.672	.001
	Gender*Injury status	1	345.450	4.818	.029*	.021
Psychological coping	Gender	1	640.493	4.954	.027*	.022
	Injury status	1	38.241	.296	.587	.001
	Gender*Injury status	1	429.399	3.3221	.070	.015
Life meaning	Gender	1	604.530	7.542	.007*	.033
	Injury status	1	16.352	.204	.652	.001
	Gender*Injury Status	1	239.852	2.992	.085	.013
Self-esteem	Gender	1	1192.598	13.553	.000*	.058
	Injury status	1	4.265	.048	.826	.000
	Gender*Injury status	1	362.612	4.121	.044*	.018

Note. * *p*-value < .05

Categorical Statistical Findings

The same conditioning parameters for data screening were applied as indicated in the subcategorical statistical findings. Table 12 is the display of descriptive statistics for comparison between each group for the categorical motives (Group Statistics ANOVA for Categorical Motives-Gender & Injury Status) and Table 13 shows the results (Results ANOVA for Categorical Motives-Gender & Injury Status).

Physical motive results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in physical motive between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .069$. The assumption of normality was satisfied for only female and the

injury status of running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = .609$, $p = .436$, $\eta_p^2 = .003$ or for the injury status main effect, $F(1,221) = .283$, $p = .595$, $\eta_p^2 = .001$. However, there was a statistically significant interaction between gender and injury status, $F(1,221) = 4.700$, $p = .031$, $\eta_p^2 = .021$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in physical motive for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .147$, $p = .099$, $d = 0.373406$, $r = 0.183532$. In other words, male MLR running with RRI ($M = 65.2857$, $SD = 13.15646$, $SEM = 2.22385$), 95% *CI* [-1.00482, 11.36792] had similar self-esteem as compared to female MLR with RRI ($M = 60.1042$, $SD = 14.56057$, $SEM = 2.10164$), 95% *CI* [-1.00482, 11.36792].

Results did not reveal a significant difference in physical motive for male MLR running without RRI as compared to female MLR running without RRI, $t(223) = .570$, $p = .222$, $d = -0.207737$, $r = -0.103312$. In other words, male MLR running without RRI ($M = 62.4107$, $SD = 12.46052$, $SEM = 1.66511$), 95% *CI* [-6.36779, 1.49154] had similar physical motive as compared to female MLR without RRI ($M = 64.8488$, $SD = 10.96467$, $SEM = 1.18235$), 95% *CI* [-6.36779, 1.49154].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed a statistically significant difference in physical motive for injury status among female MLR running without RRI as compared to female MLR running with RRI, $t(223) = .005$, $p = .035$, $d = 0.368122$, $r =$

0.181020. In other words, injury status of female MLR running without RRI (*M* = 64.8488, *SD* = 10.96467, *SEM* = 1.18235), 95% *CI* [.33768, 9.15166] had different physical motive as compared to female MLR running with RRI (*M* = 60.1042, *SD* = 14.5607, *SEM* = 2.10164), 95% *CI* [.33768, 9.15166].

Results, however, revealed no significant difference in physical motive for injury status among male MLR running without RRI as compared to male MLR running with RRI, $t(223) = .884$, $p = .297$, $d = -0.224377$, $r = -0.111489$. In other words, male MLR running without RRI (*M* = 62.4107, *SD* = 12.46052, *SEM* = 1.66511), 95% *CI* [-8.32560, 2.57560] had physical motive as compared to male MLR running with RRI (*M* = 65.2857, *SD* = 13.15646, *SEM* = 2.22385), 95% *CI* [-8.32560, 2.57560].

Achievement motive results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in achievement motive between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .968$. The assumption of normality was satisfied with all interaction among the variables of gender and injury status as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = 1.003$, $p = .318$, $\eta_p^2 = .005$ or for the injury status main effect, $F(1,221) = .007$, $p = .934$, $\eta_p^2 = .000$. Further, there was no significant interaction between gender and injury status, $F(1,221) = .228$, $p = .634$, $\eta_p^2 = .001$.

Social motive results. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in social motive between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .968$. The assumption of normality was not satisfied for only the

interaction of males running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed no significant differences for the gender main effect, $F(1,221) = 1.305$, $p = .254$, $\eta_p^2 = .006$ or for the injury status main effect, $F(1,221) = .040$, $p = .841$, $\eta_p^2 = .000$. However, there was a statistically significant interaction between gender and injury status, $F(1,221) = 4.751$, $p = .030$, $\eta_p^2 = .021$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in social motive for male MLR running with RRI as compared to female MLR running with RRI, $t(223) = .936$, $p = .516$, $d = 0.145640$, $r = 0.072628$. In other words, male MLR running with RRI ($M = 53.9143$, $SD = 11.03836$, $SEM = 1.86582$), 95% *CI* [-3.36444, 6.65135] had similar social motive as compared to female MLR with RRI ($M = 52.2708$, $SD = 11.52562$, $SEM = 1.66358$), 95% *CI* [-3.36444, 6.665135].

Results also did reveal a statistically significant difference in social motive for female MLR running without RRI as compared to male MLR running without RRI, $t(223) = .914$, $p = .007$, $d = -0.466935$, $r = -0.227353$. In other words, female MLR running without RRI ($M = 55.4070$, $SD = 11.20859$, $SEM = 1.20865$), 95% *CI* [-9.08664, -1.44160] had different social motive as compared to male MLR without RRI ($M = 50.1429$, $SD = 11.33848$, $SEM = 1.51617$), 95% *CI* [-3.36444, 6.65135].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed no significant difference in social motive for injury status among female MLR running without RRI as compared to female MLR running with RRI, $t(223) = .775$, $p = .127$, $d = 0.275874$, $r = 0.136643$. In

other words, injury status of female MLR running without RRI (*M* = 55.4070, *SD* = 11.20859, *SEM* = 1.20865), 95% *CI* [-.89913, 7.17141] had similar social motive as compared to female MLR running with RRI (*M* = 52.2708, *SD* = 11.52562, *SEM* = 1.66358), 95% *CI* [-.89913, 7.17141].

Results also revealed no significant difference in social motive for injury status among male MLR running without RRI as compared to male MLR running with RRI, $t(223) = .674$, $p = .122$, $d = -0.337050$, $r = -0.166181$. In other words, male MLR running without RRI (*M* = 50.1429, *SD* = 11.33848, *SEM* = 1.51517), 95% *CI* [-8.57720, 1.03435] had similar social motive as compared to male MLR running with RRI (*M* = 53.9143, *SD* = 11.03836, *SEM* = 1.86582), 95% *CI* [-8.57720, 1.03435].

Psychological motive. A two-way 2 (gender) x 2 (injury status) ANOVA was performed to examine differences in psychological motive between gender and injury status. There was homogeneity of variances, as assessed by Levene's Test for Equality of Variances, $p = .058$. The assumption of normality was satisfied for only the interaction of males running with RRI as assessed by the Shapiro-Wilk's test ($p > .05$). Results revealed a statistically significant difference for the gender main effect for females, $F(1,221) = 10.015$, $p = .002$, $\eta_p^2 = .043$ while there was no significant difference for injury status main effect, $F(1,221) = .212$, $p = .645$, $\eta_p^2 = .001$. However, there was statistically significant interaction between gender and injury status, $F(1,221) = 4.289$, $p = .040$, $\eta_p^2 = .019$.

A simple effect analysis to confirm post hoc testing was conducted. An independent-samples *t* test for a comparison between gender across injury status of MLR was performed. Results revealed no significant difference in psychological motive for

male MLR running with RRI as compared to female MLR running with RRI, *t*(223) = .152, *p* = .497, *d* = -0.148955, *r* = -0.074271. In other words, male MLR running with RRI (*M* = 103.4857, *SD* = 30.31537, *SEM* =5.12423), 95% *CI* [-16.05229, 7.85705] had similar psychological motive as compared to female MLR with RRI (*M* = 107.5833, *SD* = 24.38157, *SEM* = 3.51918), 95% *CI* [-16.05229, 7.85705].

Results did reveal a statistically significant difference in psychological motive for female MLR running without RRI as compared to male MLR running without RRI, *t*(223) = .021, *p* = .000, *d* = -0.718022, *r* = -0.337895. In other words, female MLR running without RRI (*M* = 113.6163, *SD* = 23.10038, *SEM* = 2.49098), 95% *CI* [-28.60324, -10.62932] had different psychological motive as compared to male MLR without RRI (*M* = 94.0000, *SD* = 30.96978, *SEM* = 4.13851), 95% *CI* [-16.05229, 7.85705].

Additionally, an independent-samples *t* test for a comparison between injury status across gender of MLR was performed. Results revealed no significant difference in psychological motive for injury status among female MLR running without RRI as compared to female MLR running with RRI, *t*(223) = .701, *p* = .158, *d* = 0.254025, *r* = 0.126000. In other words, injury status of female MLR running without RRI (*M* = 113.6163, *SD* = 23.10038, *SEM* = 2.49098), 95% *CI* [-2.36532, 14.43121] had similar psychological motive as compared to female MLR running with RRI (*M* = 107.5833, *SD* = 24.38157, *SEM* = 3.51918), 95% *CI* [-2.36532, 14.43121].

Results also revealed no significant difference in psychological motive for injury status among male MLR running without RRI as compared to male MLR running with RRI, *t*(223) = .949, *p* = .155, *d* = -0.309541, *r* = -0.152949. In other words, male MLR

running without RRI (*M* = 94.0000, *SD* = 30.96978, *SEM* = 4.13851), 95% *CI* [-2.63879, 3.66736] had similar psychological motive as compared to male MLR running with RRI (*M* = 103.4857, *SD* = 30.31537, *SEM* = 5.12423), 95% *CI* [-22.63879, 3.66736].

Therefore, with statistical significance reported in the categories of physical, social, and psychological motives, the researcher rejected the null hypothesis. There was a comparison of differences in injury status of MLR when separated by gender.

Table 12

Descriptive Statistics ANOVA for Categorical Motives-Gender & Injury Status

Categorical motive	Gender	RRI status	Mean	*SD*	*N*	Std. error mean
Physical	Male	Without	62.4107	12.46052	56	1.66511
		With	65.2857	13.15646	35	2.22385
		Total	63.5165	12.73784	91	
	Female	Without	64.8488	10.96467	86	1.18235
		With	60.1042	14.56057	48	2.10164
		Total	63.1493	12.52877	134	
	Total	Without	63.8873	11.59610	142	
		With	62.2892	14.13914	83	
		Total	63.2978	12.58667	225	
Achievement	Male	Without	42.9464	11.93531	56	1.59492
		With	43.5714	11.99580	35	2.02766
		Total	43.1868	11.89576	91	
	Female	Without	42.1163	10.91617	86	1.17712
		With	41.2292	10.56538	48	1.52498
		Total	41.7985	10.76040	134	
	Total	Without	42.4437	11.29459	142	
		With	42.2169	11.18039	83	
		Total	42.3600	11.22812	225	

(*table continues*)

Categorical motive	Gender	RRI status	Mean	*SD*	*N*	Std. error mean
Social	Male	Without	50.1429	11.33848	56	1.51517
		With	53.9143	11.03836	35	1.86582
		Total	51.5934	11.31369	91	
	Female	Without	55.4070	11.20859	86	1.20865
		With	52.2708	11.52562	48	1.66358
		Total	54.2836	11.38038	134	
	Total	Without	53.3310	11.51300	142	
		With	52.9639	11.28397	83	
		Total	53.1956	11.40516	225	
Psychological	Male	Without	94.0000	30.96978	56	4.13851
		With	103.4857	30.31537	35	5.12423
		Total	97.6484	30.90069	91	
	Female	Without	113.6163	23.10038	86	2.49098
		With	107.5833	24.38157	48	3.51918
		Total	111.4552	23.65466	134	
	Total	Without	105.8803	28.07803	142	
		With	105.8554	26.94309	83	
		Total	105.8711	27.60429	225	

Table 13

Results ANOVA Categorical Motives-Gender & Injury Status

Categorical motive	Variable	Df	Mean square	F	Sig.	Partial eta squared
Physical	Gender	1	95.404	.609	.436	.003
	Injury status	1	44.311	.283	.595	.001
	Gender*Injury status	1	735.955	4.700	.031*	.021
Achievement	Gender	1	127.573	1.003	.318	.005
	Injury status	1	.871	.007	.934	.000
	Gender*Injury status	1	28.983	.228	.634	.001
Social	Gender	1	166.171	1.305	.254	.006
	Injury status	1	5.116	.040	.841	.000
	Gender*Injury status	1	604.825	4.751	.030*	.021
Psychological	Gender	1	7128.284	10.015	.002*	.043
	Injury status	1	151.117	.212	.645	.001
	Gender*Injury status	1	30.52.724	4.289	.040*	.019

Note. * *p*-value < .05

Summary

This chapter described the descriptive and inferential statistical testing and results to identify a difference, if any, in the categorical motives (physical, achievement, social, and psychological) of MLR, those age 40 and older, as stated by the MOMS survey among those running without RRI when compared to those with RRI; then separated by

gender. A total of 225 MLR participated in the study. For the first research question, there was no statistically significant difference in the broad categorical motives according to the MOMS survey (physical, achievement, social, and psychological) for continued marathon running by MLR with RRI when compared to MLR without RRI. Therefore, the researcher fails to reject the null hypothesis.

For the second research question when accounting for any differences in motives among injury status, running without RRI compared to with RRI, when separated by gender, the findings were different. For the same broad categorical motives according to the MOMS survey (physical, achievement, social, and psychological), all categories were statistically significant with the exception of achievement. While physical and social were statistically significant based on the interaction of gender and injury to female MLR running without RRI, only psychological was statistically significant to gender, namely female MLR, and the interaction between gender and injury to female MLR running without RRI. Therefore, the null hypothesis is rejected.

For the subcategories, there were variations to significant differences according to gender as well as the interaction of gender and injury status. Of gender only, female MLR were statistically significant in their differences when compared to male MLR for psychological coping and life meaning while male MLR had a statistically significant difference in competition. For the interaction of gender and injury status, the female MLR running without RRI were statistically significant in difference only in health orientation, weight concern, and affiliation. Of more interest, female MLR running without RRI were statistically significant in difference for both gender only and the interaction of gender and injury status for self-esteem. Personal goal achievement and

recognition did not display any significant difference. Therefore, the null hypothesis is rejected.

The interpretation of the findings is offered in Chapter 5. These results will include a presentation of the study limitations and recommendations which propose a perspective on the implications for social change associated with this research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative study was to identify a difference, if any, in the categorical motives (physical, achievement, social, and psychological) of MLR, those age 40 and older, as stated by the MOMS survey among those running without RRI when compared to those running with RRI; then when separated by gender. While the risk of injuries may not be fully understood, this study focused on the motivational reasoning for association and participation despite risk and occurrence.

The increase in marathon running, notably among the MLR now comprising 50% of all marathon finishes (Running USA, 2018a), may appear as a trend. However, the attention to health during the mid-life phase of life may signify these runners age 40 and older realize the psychological and social benefits, in addition to the physical health improvements, offer a greater personal satisfaction. Age has been a variable to the explanation of the motivation for large populations of runners in various studies (Masters & Ogles, 1995; Ogles & Masters, 2000; 2003). Thus, there are supported reasonings which merit participation toward the MLR as offered by the rationale for motives as stated by the MOMS survey. Combined with the necessity to good health despite injuries which accompany age and activities of lifestyle, there is a need for an insight into the motivation of this population beyond the observed.

The study utilized a quantitative method through a self-reported questionnaire explicitly designed to assess the differences in the categorical motivation according to the MOMS survey (physical, achievement, social, and psychological) among injury status and gender of 225 participants. This inquiry resulted in two separate research questions

specific to the inclusion of RRI as identified by the MLR according to their injury status while continuing to run.

Research Question 1

Research Question1: Is there a difference in the motivation score according to the MOMS survey (physical, achievement, social, and psychological) in continued marathon running between master level runners without running-related injuries and master level runners with running-related injuries?

The data analysis for the Research Question 1 was measured via an independent-samples *t* test. The results showed no statistical significance of a difference in motivational scores for any of the nine subcategories of the MOMS survey (health orientation, weight concern, affiliation, recognition, psychological coping, life meaning, self-esteem, competition, and personal goals) between MLR running with RRI when compared to MLR running without RRI. Further, there was no statistical significance of a difference in the four broad categories of the MOMS survey (physical, achievement, social, and psychological) between these same two groups.

As a result, the data analysis was consistent to current literature where Patrick and Canevello (2011) suggested the individuality of determination contributed to elevated levels of motivation which may not necessarily change. Deci and Ryan (2008) added behavior is a continuum continually shifting towards intrinsic motivation. Thereby participation, regardless of RRI or age, may not alter the motivational reasoning.

Research Question 2

Research Question 2: What is the difference in the categories of motivation according to the MOMS survey (physical, achievement, social, and psychological) in

continued marathon running between master level runners without injuries and master level runners with injuries when separated by gender?

The data analysis for the Research Question 2 was measured via a two-way 2 (gender) x 2 (injury status) ANOVA. Of the nine subcategories of the MOMS survey (health orientation, weight concern, affiliation, recognition, psychological coping, life meaning, self-esteem, competition, and personal goals), the results showed no statistical significance of a difference in motivational scores for recognition and personal goals. Meanwhile, there was a statistically significant difference in health orientation, weight concern, affiliation, psychological coping, life meaning, self-esteem, and competition. These findings show a marked variance from the findings of the first research question.

There was a discerning difference with the inclusion of gender. When comparing female MLR to male MLR without factoring the status of injury, female MLR showed a greater difference as reported by the statistical significance in psychological coping, life meaning, and self-esteem. However, competition was a greater motivator for male MLR. With the interaction of injury status, only female MLR running without RRI were statistically significant or having greater differences in health orientation, weight concern, affiliation, and self-esteem when compared to female running with RRI and to all male MLR regardless of injury status. Interestingly, male MLR without RRI were statistically significant in affiliation.

Results were comparable to the subcategories in the broad categories of the MOMS survey (physical, achievement, social, and psychological). Excluding injury status, the psychological motive was the only statistically significant category demonstrating a greater difference by the responses of the female MLR. With the

interaction of injury status, female MLR running without RRI were again statistically significant or having greater differences in physical, psychological, and social motives when compared to female running with RRI and to all male MLR regardless of injury status.

As a result, where a common motive remains to be identified among MLR, there are distinct similarities. Despite no well-meaning impact to a difference in MLR running with RRI of either subcategories or categories, female MLR running without RRI demonstrate a motivation of critical discussion. First, only one study consisted of a female population of runners over the age of 40. Guérin and Fortier (2012) identified motivation as a means to control emotions and increase positive self-regulation. This rationale parallels psychological coping and self-esteem.

On the other hand, Ogles and Masters (2000) indicated general health and affiliation in older runners, age 50 and older, yet; their study did not include women. Similar results were demonstrated between the finding of Heazlewood et al. (2018) stating psychological coping and Zach et al. (2015) determining life meaning. However, there is no distinction between genders. An associated psychological benefit, not motive, found by Loughran et al. (2013) was of marathon runners over the age of 40. Age and gender continue to be distinct variables of influence to study findings.

Interpretation of the Findings

The findings of this research study provided insight into the comparison of differences between motivation and injury status of male and female MLR. An understanding of the suggested categorical motives of participating in physical activity, especially events of extended duration such as marathon running, should not be limited to

the physical benefits which sustain the motivation for continuance. While physical activity and exercise are strongly evidenced-based to health and fitness benefits according to the 2008 Physical Activity Guidelines for Americans (USDHHS, 2008), there are several considerations to engagement and sustainment by which psychological and social motivation as well as injuries play a pivotal role.

In various ways, the findings of the study reflected the existing literature. In an attempt to answer the first research question regarding the differences in the motivation of MLR running with RRI when compared to MLR running without RRI, there was no statistically significant difference. Though the risk of injury is known, and rates of occurrence are high, reportedly between 75% to 92% (Christensen & Ogles, 2017; Running USA, 2018b; Timm et al., 2017), there remains no significant differences in the change in motivation. The outcome was supported in studies by Besomi et al. (2017) and Goodsell et al. (2013) where modification in behavior may not indicate a shift in motivation. MLR continue to run for the reasons internalized without any discrepancy to injury occurrence. The message here is regardless of injury status; there continues to exist a motivation that is reliable and an influential factor towards participation and adherence.

This maintenance of activity, regardless of injury, supports the contextual theory of the self-determination theory (SDT). As offered by Deci and Ryan (2008), behavior is both regulated and maintained at the discretion of the individual based on what is best for their circumstances. When considering the other motives such as psychological or social to be compromised, an ongoing injury appears of lesser adversity. This idea followed the suggestion of Fortier et al. (2012) where continuance of a behavior mediates between choice and control of consequences. Deci and Ryan (2008) add that motivation functions

on a continuum where intrinsic motivation is the ultimate tenacity for perseverance towards sustainment.

In response to the second research question where several statistically significant differences emerged, the comparison between genders and injury status offered several perspectives of interest. First, there was no statistical significance to male or female MLR running with injuries regarding motives. This reverts to the first research question where injury status offered little to no difference. To the contrary, running without RRI did show statistical significance in several subcategories as well as the broad categories by female MLR which had the highest interaction among the motivational categories.

The psychological motive was statistically significant in difference by female MLR running without RRI as also indicated by the supporting subcategories of life meaning, psychological coping, and self-esteem. These results are supported by Inoue et al. (2015) where running was promoted to offer emotional well-being with higher self-motivation leading to greater self-efficacy. Consequently, in their study of 41 female runners with an average age of 40, Guérin and Fortier (2012) also found that controlled motivation gave immediate emotional relief with autonomous motivation increasing self-regulation and adherence. Brown and Neporent (2015) combined these psychological meanings to emerge as an identity, or in this case, an athletic identity that is purported in the sense of self. Their study also revealed the greater this athletic identity, the more resilient its retainability regardless of injury status. While that difference was not found in this study; a very robust message conveyed female MLR running without RRI find the psychological motive very appealing.

The social motive along with its subcategory of affiliation were both statistically significant in difference with female MLR running without RRI having a greater difference when compared to all other interactions. Similar to the literature, social motivations were particularly high in comparison for females, though in smaller study numbers, by Ogles and Masters (2003), and again with Ogles et al. (1995). For both genders, aging is thought to bring an opportunity of socialization especially in sport behaviors of mid and older adults (Sheehy & Hodge, 2015). Fortier et al. (2007) agreed marathon training requires social cognition supporting competence. This perspective aligns with the constructs of the SDT to where competence cannot be underscored to the support of social climate, encouragement, and self-regulated extrinsic motivation leading to greater intrinsic motivational rewards (Dacey et al., 2008; Deci & Ryan, 2008; Ogles & Masters, 2003). Though most of these studies did not state gender-specific outcomes, social persuasion expressed in a positive nature may be the catalyst necessary for long-term adherence in the activity.

Not to be overlooked, the physical reasoning of motivation shares the same recognition worthy of mention. Like the psychological motive, the statistically significant difference was noted in female MLR running without RRI when compared to all other interactions of gender and injury status and supported by the subcategories of health orientation and weight concern. These results for physical motives are supported by Masters and Ogles where health orientation and weight concern in addition to life meaning and affiliation in runners age 50 and older was indicated in two of their studies (Masters and Ogles, 1995; Ogles and Masters, 2000). Hansen et al. (2015) along with Havenar and Lochbaum (2007) likewise demonstrated physical motive as a priority,

though both these studies were to long-distance runners other than marathon runners and without age criteria. Lastly, in their survey of 13,037 runners over the age of 50, Leyk et al. (2017) concluded health was a strong motive for sustaining participation. Collectively, these findings proposed little argument against the observable health and fitness benefits from any physical activity be the result of physical motivations.

Limitations of the Study

The following limitations of this study should be considered. As previously mentioned, participant responses were self-reported which are prone to social desirability bias. The information gained from such reports has the tendency to display answers in circumstances offering better results compromising the trustworthiness of replies (Fisher, 1993). This type of bias may also overestimate or underestimate an individual's capacity to fully answer the questions due to specified scaled-type responses. In turn, reducing internal validity. Given the fact, the survey was anonymous with no personal or identifying information requested, aspects of this bias were reduced.

While the MOMS survey does limit responses to a Likert-type scale, it provided an operational definition to the construct validity along with consistent reliability. Utilized in motivational studies on marathon runners since its inception in 1993 by Master et al., only one study conducted by Zach et al. (2015) suggested an updated version expanding the MOMS to eleven subcategories for a modernized reflection of societal changes. The decision to remain with the original version was intentional due to the said reliability contributing to generalizability with previous studies. More so, this important choice offset the lack of an objective definition to the population of the study,

marathon runners age 40 and older, and their injury status. Thus, without the original MOMS survey, validity would have negatively affected generalizability at a greater level.

The method of recruitment, though purposeful in its sampling strategy, lacked sufficient probability. Participants were recruited from social media running groups noting an emphasis to marathon running or age as a criterion of membership. Hence, potentially interested runners were aware of the study only via online announcements during a specific timeframe. Though considered to limit generalizability, validity was satisfied through the statistical testing of assumptions according to Levene's Test of Equality of Variances which was met for all the subcategories and categories using the $p < .001$ criterion.

Recommendations

As there is little literature regarding the MLR population age 40 and older, along with the attention to injury status and motivation, there are many recommendations for future research based on the existing literature and the findings of this study. The most critical lesson learned from this study was a better understanding of the differences in motivation for marathon running among female MLR when compared to male MLR.

Whereas the subcategory of competition was foreseeable due to the competitive nature of any sport, there is a difference between genders. The male MLR displayed a greater preference for this motivational reasoning for participation. On the other hand, the female MLR had higher scores than male MLR in the differences of motives in the subcategories of psychological coping, life meaning, and self-esteem along with the broad category of psychological motives. In other words, male MLR remain more

motivated to run marathons for achievement while female MLR run for psychological motives.

When specific to gender and when separated by injury status, running with RRI compared to without RRI, only female MLR running without RRI displayed greater differences as confirmed by statistical significance. These differences were demonstrated in the subcategories of health orientation, weight concern, affiliation, and again, self-esteem. The broad categories included physical, social, and psychological motives. Thus, female MLR continue to show the relevant importance of a combination of motives.

The findings of this study recommend the continuance of motivational studies with an emphasis on running of the female MLR, namely those without RRI, to clarify the margins of the psychological, physical, and social motives portrayed. Where this study of 225 MLR was comprised of almost 60% female MLR, most studies have shown a disproportionate inclusion of female runners as low as 20% (Ogles et al., 1995; Zach et al., 2015). In one of the studies utilizing the MOMS survey with runners, age 50 and older, Ogles and Masters (2003) did not seek the inclusion of female runners as there only a few women running races at that time. Since then, women runners, to include MLR, are now almost equal rivals in their participation as they accounted for 44% of all marathon finishes in 2016 (Running USA, 2018a). Clearly, there is a need for more studies specific to female runners, MLR or not, as to further explore how psychological motives supercede the physical.

In investigating the differences between gender, age should continue to remain a central focus to the study of motivation. As with this study, most research on marathon running is conducted in a cross-sectional representation depicting specific environments

or select descriptive characteristics. Conducting a longitudinal study would offer the opportunity to note changes reflecting the transition of aging and life roles towards motivation. As such, this was the presumption by Goodsell et al. (2013) to explain the shift from achievement by younger runners to seeking identity and control of health by older runners. The use of the MOMS survey in a variety of studies shares this same perspective (Masters & Ogles, 1995; Ogles & Masters, 2000; 2003).

Due to the observed high rate of injury and its adverse appearance in association to marathon running, future studies should consider injuries specific to medical diagnosis and to go as far as with the inclusion of a MLR's healthcare provider for the purposes of study criteria. This is in part due to the arbitrary definition of RRI in long-distance running. When combined with the reliance on the self-identification of what defines a marathon runner, rather affirmative criteria such as that suggested, objective criteria would offer a perception of greater magnitude. This is more so relevant when observed injuries imply a relationship of risk that has not been proven.

Implications

As a reflection of positive social change, understanding these increased levels of marathon running by the MLR gives an insight into the motives which may differ from those directly witnessed. Physical benefits are synonymous with all forms of physical activity though not always the obvious motivator explaining continuance. Identifying the differences in motivation, especially among genders, offers an opportunity to further explore exercise adherence which is lacking in most current fitness programs and regimes for long-term sustainment; especially when many participants quit in the first six months (Deci & Ryan, 2008). A shift in perspective may be a factor in resolving the

continual need for health and wellness improvements as a person ages; yet, seeks to thrive in and contribute to the community in which they live.

This study fosters positive social change by comparing the differences in motivation regarding injury status and gender. The implication for positive social change includes a better understanding that psychological and social motives, especially among the female gender of MLR, have higher motivational reasoning for occurrence. Further studies should explore the why and how to incorporate such inclusion expanding the level of physical activity adherence as people encounter the challenges of aging with the desire for optimal health and quality of life.

A transformation is required which begins with the knowledge and attitudes which tailor physical activity programs toward a specific need or motive other than the known physical, offering an awareness not previously recognized. This recognition goes beyond the physical to psychological and social (Christensen & Ogles, 2017; Shipway & Holloway, 2010; Zach et al., 2015). Since their study in 1995, Masters and Ogles (1995) have suggested the immediate inclusion to the awareness of the psychological benefit accompanying exercise to promote sustainment and adherence. As demonstrated in this study, this is especially true for the female gender of MLR.

Marathon running to the MLR is a meaningful focal point becoming central in one's life. The developed connections with those of similar habits and likeness offer a social support system extending beyond the activity itself. Shipway and Holloway (2010) recognized marathon running as an equal social contributor to a runner's sense of self and affiliation within a community. Actions and behaviors requiring long-term engagement, especially when considering the training protocols for marathon running,

requires various levels of strategy and support that comes from community involvement (Besomi et al., 2017). Hence, the over-arching goal is a cooperation of socialization creating an environment promoting lifelong habits for all ages. This adoption of the habits and lifestyle represents a potential model for individual health prevention as well as community socialization for wellness.

The need for social change to incorporate healthy habits as a means of health management on a continual basis will persist and requires a proactive response of preparedness due to the increasing age of the population. This requisite cannot be minimized when physical activity tends to decline as a person ages (USDHHS, 2008). This is especially true with respect to the discussed health issues and risk of RRI which are undeniable.

Not to be overlooked, is the fact that injuries in any physical activity can and do occur. Navigating and managing any injury, running related or not, poses a conflict to maintaining a positive outlook on emotional, mental, and social well-being (Yeh et al., 2017). This aspect becomes even more difficult when medical treatments only manage the rehabilitation of injuries (Arlis-Mayor, 2012). Shipway and Holloway (2010) add that physical health is equal to mental health during the changes and phases of life where discipline and challenge may be necessary for optimal overall health. Suggested then is an alternative or a more holistic balance of the physical to psychological advantages of physical activity choices. This change in attitudes may also counter the negative societal beliefs of aging and injuries among this population of active middle and older adults allowing for further positive social change.

Conclusion

There are few studies exclusive to the focus of the motivation to why MLR continue to run, especially with the risk and occurrence of RRI. This study of 225 individuals of both male and female gender, with and without injuries, allowed for the display of comparative differences to which category of motive as offered by the MOMS survey (physical, achievement, social, and psychological) explained the rationale for continuance. While a common motive remains to be identified as an overarching conclusion to the general population of these aging marathon runners, there were some differences of significance.

Though a paradox that on-going participation incurs the potential consequence of injuries, demonstrated was a physical motive which was collectively comprised of health orientation and weight concern by female MLR. This same group of runners also demonstrated psychological motives derived from self-esteem, psychological coping, and life meaning. Hence, there are many personal and unique considerations neither observed or explained which require further exploration and investigation in female MLR.

Lastly, as suggested, the social motive does hold significance, however, only for the female MLR. Affiliation and the sense of belonging to a community of like-minded individuals creates a shared purpose extending beyond the engagement of behavior. During a time of changing roles and transitions through the phases of life, these MLR come together building new relationships and developing the wherewithal to the unforeseen circumstances of life. Where is it often said running builds character, for these runners, it also builds identity. The potential then reinforces the positive benefits while extending the boundaries to what supports a positive and healthy outlook.

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Appendix A: Participant Recruitment Invitation

Example-Social Media Posting

Fellow Runners,
My name is Marsha Kaufman, an avid marathon runner and member of this Facebook group. I am writing my doctoral dissertation on the motivation of marathon runners. The admin of this group is allowing me to announce my survey on this site. Would you be willing to participate in a 15-minute survey? I have included brief details of the study and its survey link.

'A Comparison of Motivational Differences Among Older Marathon Runners and Their Injury Status'

Runners participate in marathons for a variety of reasons, usually inspired by a motivational purpose. There is little understanding of what motivates marathon runners, both men and women, in this age demographic who keep running especially while experiencing running-related issues. This study seeks to identify and compare the common motive of these marathon runners with injuries compared to those without. Further, if there is any difference in genders. The findings will offer a potential explanation and benefit which supports the motivational reasonings often not directly observed during this form of physical activity. Additionally, the outcomes may contribute to a change in attitudes and misinterpretations held by other people affecting future involvement in marathon running.

To Participate: A survey link is provided below. This link includes questions regarding eligibility, information about your participation, and a survey assessing motivation to marathon running among four common categories (physical, psychological, social, and achievement). No personal or identifying information is required. All information is anonymous and confidential with no direct or indirect association. An informed consent form is provided to answer your questions. The survey will take no more than fifteen minutes. **All responses will remain anonymous and confidential during the entire research study. Your participation in this study is completely voluntary.**

Should you have any remaining questions or concerns, I am available via email. Thank you in advance. Respectfully, Marsha

Click on link to confirm eligibility and complete survey:
https://www.surveymonkey.com/r/motivationmarathonrunners

Appendix B: Participant Eligibility Questions

1. Do you run marathons, a race consisting of 26.2 miles?
- ☐ Yes (If selected, please answer question 2)
- ☐ No (If selected, thank you for your time. However, you do not meet the eligibility criteria.)

2. Are you age 40 or older?
- ☐ Yes (If selected, please answer question 3)
- ☐ No (If selected, thank you for your time. However, you do not meet the eligibility criteria.)

3. Do you identify yourself as a marathon runner?
- ☐ Yes (If selected, please respond to informed consent)
- ☐ No (If selected, thank you for your time. However, you do not meet the eligibility criteria.)

Comprehensive Eligibility: For this study, you must be age 40 or older, self-identify as a marathon runner, and are currently running, regardless of injury status.
Do you meet these requirements?

- ☐ Yes (If selected, please proceed to informed consent)
- ☐ No (If selected, thank you for your time. However, you do not meet the eligibility criteria.)

Appendix C: The Motivations of Marathoners Scales Survey

Please rate each of the following items according to the scale below in terms of how important it is as a reason for why you run. A score of 1 would indicate the item is 'not a reason' for running; a score of 7 indicates the item is a 'very important reason' for running, and scores in-between represent relative degrees of each reason.

Strongly Not a Reason	Not a Reason	Slightly Not a Reason	Neutral	Slightly Agree to Importance	Important Reason	Strongly an Important Reason
1	2	3	4	5	6	7

1. _____ To help control my weight.
2. _____ To compete with others.
3. _____ To earn respect of peers.
4. _____ To reduce my weight.
5. _____ To improve my running speed.
6. _____ To earn the respect of people in general.
7. _____ To socialize with other runners.
8. _____ To improve my health.
9. _____ To compete with myself.
10. _____ To become less anxious.
11. _____ To improve my self-esteem.
12. _____ To have something in common with other people.
13. _____ To add a sense of meaning to life.
14. _____ To prolong my life.
15. _____ To become less depressed.
16. _____ To meet people.
17. _____ To become more physically fit.
18. _____ To distract myself from daily worries.
19. _____ To make my family or friends proud of me.
20. _____ To make my life more purposeful.
21. _____ To look leaner.
22. _____ To try to run faster.
23. _____ To feel more confident about myself.

24. _____ To participate with my family or friends.
25. _____ To make myself feel whole.
26. _____ To reduce my chance of having a heart attack.
27. _____ To make my life more complete.
28. _____ To improve my mood.
29. _____ To improve my sense of self-worth.
30. _____ To share a group identity with other runners.
31. _____ It is a positive emotional experience.
32. _____ To feel proud of myself.
33. _____ To visit with friends.
34. _____ To feel a sense of achievement.
35. _____ To push myself beyond my current limits.
36. _____ To have time alone to sort things out.
37. _____ To stay in physical condition.
38. _____ To concentrate on my thoughts.
39. _____ To solve problems.
40. _____ To see how high I can place in races.
41. _____ To feel a sense of belonging in nature.
42. _____ To stay physically attractive.
43. _____ To get a faster time than my friends.
44. _____ To prevent illness.
45. _____ People look up to me.
46. _____ To see if I can beat a certain time.
47. _____ To blow off steam.
48. _____ Brings me recognition.
49. _____ To have time alone with the world.
50. _____ To get away from it all.
51. _____ To make my body perform better than before.
52. _____ To beat someone I've never beaten before.
53. _____ To feel mentally in control of my body.
54. _____ To get compliments from others.
55. _____ To feel at peace with the world.
56. _____ To feel like a winner.

Scoring Instructions for *MOMS* Survey

Average the items for each of the following nine scales. No items are reverse scored.

Health orientation - 8, 14, 17, 26, 37, 44

Weight concern - 1, 4, 21, 42

Personal goal achievement - 5, 9, 22, 35, 46, 51

Competition- 2, 40, 43, 52

Recognition - 3, 6, 19, 45, 48, 54

Affiliation - 7, 12, 16, 24, 30, 33

Psychological Coping - 10, 15, 18, 28, 36, 38, 39, 47, 50

Life Meaning - 13, 20, 25, 27, 41, 49, 55

Self-esteem - 11, 23, 29, 31, 32, 34, 53, 56

 Masters, K. S., Ogles, B. M., & Jolton, J. A. (1993). The development of an instrument to measure motivation for marathon running: The motivations of marathoners scales (MOMS). *Research Quarterly in Exercise and Sport, 64*(2), 134-143.

Appendix D: Participant Demographic Questionnaire

1. What is your gender?
   - □ Male
   - □ Female

2. Status of running-related injuries: Within the previous 12 months, have you experienced or are you experiencing an injury or injuries as the result of running?
   - □ No running-related injuries
   - □ Current running-related injuries

3. What is your age?
   - □ 40-44
   - □ 45-49
   - □ 50-54
   - □ 55-59
   - □ 60-64
   - □ 65-69
   - □ 70-74
   - □ 75-79
   - □ 80 and older

4. How many marathons have you completed? Indicate number. _____

5. Training: How many years of running experience do you have at the marathon level?
   - □ Less than 5
   - □ 5-10
   - □ 11-15
   - □ 16-20
   - □ +20

6. Training: What is the average number of miles that you run per week?
   - □ Less than 20
   - □ 21-30
   - □ 31-40
   - □ 41-50
   - □ +50

Appendix E: Survey Exit Pages

Exit Page for Ineligible Participants

Thank you for your interest and time seeking to participate in this research study. Unfortunately, at this time, you do not meet the inclusion criteria for continued participation.

Exit Page for Eligible Participants

Thank you for your time and effort in completing this research study. While your personal benefit from its completion may have been minimal, your participation will offer a better understanding of the attitudes and misinterpretations that accompany marathon running and exercise adherence despite the potential of injuries. Best in good health to you.

Appendix F: Notification Letter for Survey

Dear Dr. Ogles and Dr. Masters,

I am a doctoral student from Walden University writing my dissertation tentatively titled, *A Comparison of Motivational Differences Among Older Marathon Runners and Their Injury Status*, under the direction of my dissertation committee chair. I have obtained your survey, *The Motivations of Marathoners Scales* (*MOMS*) made available for public use through your web site offered via the following link: (https://sites.google.com/site/motivationsofmarathoners/researchers). With this letter, I am requesting that I may use your survey instrument. I will provide full credit to the original source.

Copyright. Masters, K. S., Ogles, B. M., & Jolton, J. A. (1993). The development of an instrument to measure motivation for marathon running: The motivations of marathoners scales (MOMS). *Research Quarterly in Exercise and Sport, 64*(2), 134-143.

In seeking my degree in Health Education and Promotion, the potential benefits of utilizing your survey within my study are two-fold. Foremost, it is for an understanding of the motivation found in groups of marathon runners, both without injuries as well as with injuries, that contribute to exercise adherence resulting in overall improved well-being for individuals and their communities. Secondly, to reduce the misinterpretation of motivation by participants, observers, and those who may be interested in marathon running to improve personal health. By recognizing different categories of motivation despite the occurrence of injury demonstrates that a potentially negative experience does not inhibit a person from reasonings of greater importance. While marathon running may require a physical effort, the benefits of psychological and social health cannot be overlooked.

Although the use of this survey is public, as a courtesy, I am reaching out to acknowledge that I will be using the instrument. Please do not hesitate to contact me via email or phone if you have any questions.

Respectfully,

Marsha Kaufman

RE: Request and Acknowledgement of MOMS Survey

MK

Masters, Kevin <KEVIN.MASTERS@UCDENVER.EDU>
Mon 2/18, 3:33 PM
Marsha Kaufman; MOMS@byu.edu

Dissertation

Action Items

Hello Marsha,

Dr. Ogles and I are happy to have the scale in use. Please use and credit accordingly.

Best,

Kevin S. Masters, Ph.D.
Professor and Program Director
Clinical Health Psychology
Editor-in-Chief, Annals of Behavioral Medicine
Past President, Society for Health Psychology
University of Colorado Denver
Denver, CO 80217-3364