

Modeling Motivation: Examining the Structural Validity of the
Sport Motivation Scale-6 among Runners

by

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ABSTRACT

Two models of motivation are prevalent in the literature on sport and exercise participation (Deci & Ryan, 1991; Vallerand, 1997, 2000). Both models are grounded in self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000) and consider the relationship between intrinsic, extrinsic, and amotivation in explaining behavior choice and outcomes. Both models articulate the relationship between need satisfaction (i.e., autonomy, competence, relatedness; Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) and various cognitive, affective, and behavioral outcomes as a function of self-determined motivation. Despite these comprehensive models, inconsistencies remain between the theories and their practical applications. The purpose of my study was to examine alternative theoretical models of intrinsic, extrinsic, and amotivation using the Sport Motivation Scale-6 (SMS-6; Mallett et al., 2007) to more thoroughly study the structure of motivation and the practical utility of using such a scale to measure motivation among runners. Confirmatory factor analysis was used to evaluate eight alternative models. After finding unsatisfactory fit of these models, exploratory factor analysis was conducted post hoc to further examine the measurement structure of motivation. A three-factor structure of general motivation, external accolades, and isolation/solitude explained motivation best, although high cross-loadings of items suggest the structure of this construct still lacks clarity. Future directions to modify item content and re-examine structure as well as limitations of this study are discussed.

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Chapter 1

INTRODUCTION

Individuals possess an innate drive to fulfill three basic needs: 1) they want to feel knowledgeable or competent; 2) they want freedom, choice, or autonomy in their decisions; and 3) they want to feel a sense of belonging or relatedness with others (Deci & Ryan, 1985, 2000). Given the essential nature of these needs to positive psychological outcomes, it is not surprising that individuals unable to get their needs satisfied in one domain of their lives (e.g., work) would look to other activities such as sport and exercise as a means of satisfying these unmet needs. Deci and Ryan (1985, 2000; Ryan & Deci, 2000) and later Vallerand (1997, 2000) hypothesized a relationship between need satisfaction and several positive psychological outcomes (e.g., “growth and integration...constructive social development and personal well-being,” Ryan & Deci, 2000, p. 68) that is mediated by intrinsic, extrinsic, and amotivation (IM, EM, and AM, respectively). It is unclear whether motivation may also serve as a moderator to the relationship between need satisfaction and psychological outcomes; this lack of clarity exists in part because of the poorly defined measurement structure of motivation as encompassing intrinsic, extrinsic, and amotivation. A comprehensive evaluation of the structure of measurement will provide valuable insight into its practical utility as well as its relationship to key theoretical concepts and, specifically, its impact on need satisfaction and psychological functioning. I will contribute evidence to better understand the structure of motivation among runners by comparing several different theoretically generated alternative models. This

information can be utilized in the future to examine the theoretical relation of motivation to need satisfaction and psychological outcome variables. In practical application, clarification of the construct of motivation will assist in developing training and intervention programs.

The literature on sport and exercise participation is predominately characterized by two models of motivation (Deci & Ryan, 1991; Vallerand, 1997, 2000). Both models are grounded in self-determination theory (Deci & Ryan, 1985, Ryan & Deci, 2000) and consider the relationship between intrinsic motivation, extrinsic motivation, and amotivation in explaining behavior choice and outcomes. In the former model, Deci and Ryan (1991) assert that these three broad types of motivation can be further divided into six unique dimensions, from low to high, of amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. These six dimensions exist along a continuum of self-determination and as individuals move from low to high in motivation they become more self-determined. Subsequent research (Vallerand, 1997, 2000) expanded and modified this model to give it global (personality), contextual (life), and situational (state) meaning. Vallerand (1997, 2000) contributed further division of these dimensions by adding three additional points of intrinsic motivation: IM to know, IM to accomplish things, and IM to experience stimulation. Follow-up studies (e.g., Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007) do not support these three separate types of intrinsic motivation (See Figure 1).

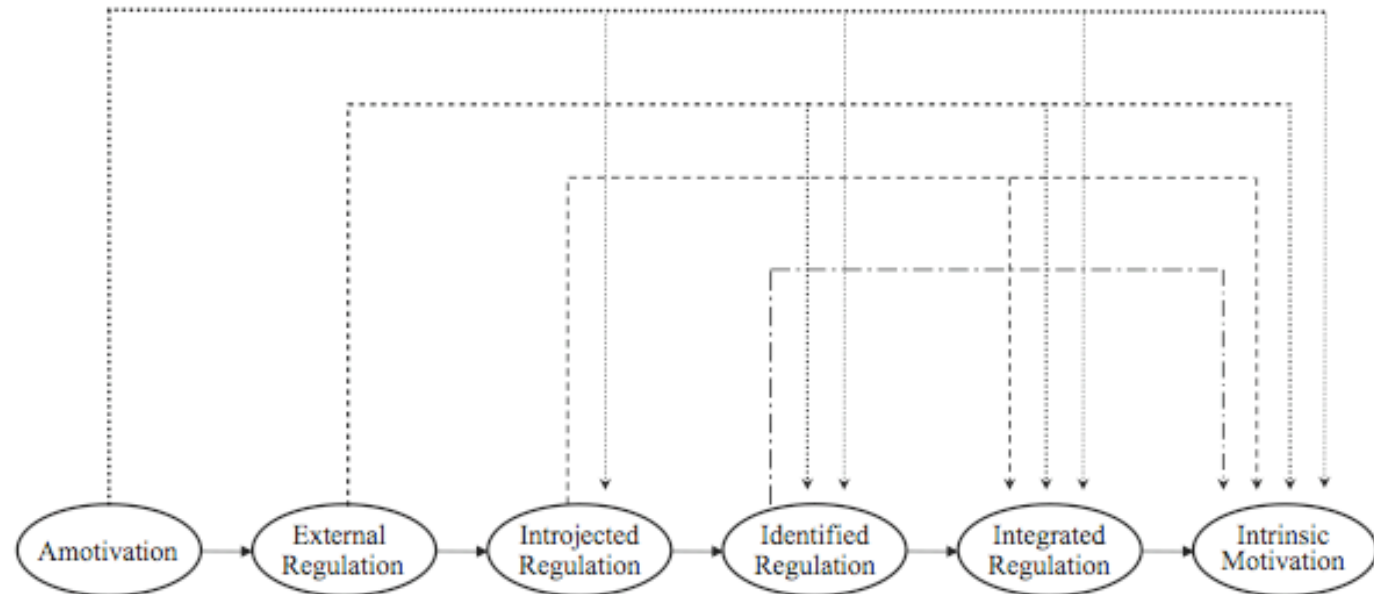


Figure 1. The proposed simplex structure of the SMS-6. This figure was reproduced from Mallett et al. (2007, p. 608; adapted from Li & Harmer, 1991). Direct effects between latent variables are indicated by solid lines; dotted lines capture the indirect effects across different levels of motivation. Previous authors chose to exclude observed variables and error terms for simplicity.

Albeit differently, both models articulate the relationship between need satisfaction (autonomy, competence, relatedness; Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) and various cognitive, affective, and behavioral outcomes as a function of self-determined motivation. Despite these comprehensive models to explain need satisfaction and self-determined motivation, there still exist inconsistencies between the theories and their practical application; essentially, the complexity of these models presents a challenge when developing psychometric scales or interpreting the results with respect to performance and psychological outcomes, specifically within the sport and exercise domain.

The running community comprises a group of individuals who share a common interest, but report different reasons for doing it (Masters, Ogles, & Jolton, 1993). The variance in motivation for running makes further exploration of sport motivation within this population worthy of inquiry. Past research (e.g., Mallett et al., 2007) explored sport motivation by sampling a variety of elite and undergraduate athletes. It is unlikely that motivation for these athletes across all types of sports applies specifically to a sample of community runners. By sampling from community runners rather than limiting the sample to elite or university-athlete runners, there is more likely to be variability in the motivational pursuits of these individuals. This population lends itself nicely to exploring the theory of intrinsic motivation, extrinsic motivation, and amotivation in sports because of the presumed heterogeneous nature of motivation for its members. Furthermore, the literature on runners is sparse, atheoretical, and mainly qualitative; a quantitative, theory-driven exploration of motivation in runners

would contribute largely to understanding this population and designing more effective training and intervention programs.

A variety of scales (Li, 1999; Mallett et al., 2007; Pelletier et al., 1995) have been developed in an effort to explain sport and exercise motivation within the framework of one or both of the aforementioned models. Validation studies conducted on these measures have failed to target runners; the samples obtained have included various types of sport and exercise participants, but have also excluded non-participants such that their respective samples had little variance to detect profile differences along the continuum, particularly at the level of amotivation. Further validation of the structure of the Sport Motivation Scale-6 (SMS-6; Mallett et al., 2007), which appears the most psychometrically sound instrument available, should target the broad range of runners so as to capture enough variance to understand all hypothesized levels of motivation and to determine if these levels exist on a continuum of self-determination and/or perceived locus of causality. Ultimately, it is still unclear whether the structure underlying this scale explains motivation most appropriately. The purpose of my study was to examine several alternative theoretical models of intrinsic, extrinsic, and amotivation using the Sport Motivation Scale-6 to aid in understanding the structure of motivation for runners. Findings from this study will provide a framework for developing a comprehensive typology of runners that could be used in creating training programs and interventions in the future.

I will evaluate the structure of intrinsic, extrinsic, and amotivation as proposed in the SMS-6 (Mallett et al., 2007) with respect to runners by testing a

series of different alternative, theoretically derived models that could underlie the measure. Each of these models will be specified in the next section.

Chapter 2

LITERATURE REVIEW

This chapter provides background justification for investigating the structure of intrinsic, extrinsic, and amotivation among runners. Two separate models from the literature on motivation and their applicability to understanding sport participation are presented. A detailed review of the current instruments available to measure sport motivation is included as well as recommendations for how to derive a more parsimonious and practically useful measure to understand runners. This chapter concludes with an explanation of the hypotheses that drive my study.

Theoretical Underpinnings

The Self. Deci and Ryan (1991) posit that psychological theories that conceptualize the ‘self’ as either a series of cognitive processes or a response or reaction to social forces fail to capture the true process by which an individual regulates and internalizes different influences to determine his or her own behavioral choices. In other words,

The self does not simply reflect social forces; rather, it represents intrinsic growth processes whose tendency is toward integration of one’s own experience and action with one’s sense of relatedness to the selves of others. Thus the self is not simply an outcome of social evaluations and pressures but instead is the very process through which a person contacts the social

environment and works toward integration with respect to it
(Deci & Ryan, 1991, p. 238).

This belief that individuals achieve growth by self-integrating their unique experiences is grounded in self-determination theory (SDT; Deci & Ryan, 1985, 2000). Unlike cognitive theories of goal pursuit, SDT looks at goal-directed behavior and how it fosters psychological development and well-being. SDT evaluates the underlying needs of the individual in relation to goal pursuits to understand better the “what (i.e., content) and why (i.e., process) of goal pursuits” (Deci & Ryan, 2000, p. 228). SDT posits that individuals have innate needs for competence, autonomy, and relatedness. Throughout their lives, individuals are motivated to seek out opportunities to have these three needs met. It is through optimally challenging environments (i.e., those only slightly beyond an individual’s current level of competence) that individuals continue to grow and receive reinforcement for their efforts (through external rewards or internal satisfaction). It is through the ability to self-regulate experiences such that the reasons and consequences are volitional and produce a sense of internal satisfaction that the highest level of self-determination is achieved.

Need Satisfaction. In the original development of self-determination theory, Deci and Ryan (1985) specified two (of the later three) main components individuals strive to attain in their lives: competence and choice (i.e., “effective interactions with the environment” and autonomy; p. 27). It is through optimally challenging environments, those just beyond the individual’s current level of ability, but that still align with his or her capabilities (i.e., the individual is forced

to grow, but maintains a sense of confidence that the task or activity is doable) that an individual is able to satisfy his or her basic need for competence. A positively reinforcing feedback loop in which satisfaction, or enjoyment, that comes from recognizing and demonstrating competence in a particular domain motivates the individual to continue to engage in the particular behavior or activity (i.e., intrinsic motivation). This proposition that individuals strive for competence highly relates to conceptualizations as to why individuals participate in recreation and competitive sports. As such, self-determination theory (SDT; Deci & Ryan, 1985) is the most readily applied theory to explain motivation in sports. Ultimately, when an individual is able to engage completely in an optimally challenging activity and simultaneously experience self-reinforcing enjoyment of being wholly integrated into a task, he or she experiences flow (Csikszentmihalyi, 1975, c.f. Deci & Ryan, 1985). This experience of flow perpetuates the likelihood of the individual engaging in the activity again because the individual feels freed from external pressure and experiences total enjoyment from engagement with the activity. For runners, this flow experience is often described as a “runner’s high” (Boecker et al., 2008) and may sustain continued motivation to run.

The next main component of SDT is choice, or freedom and autonomy from external pressures such as awards or contingencies. Individuals essentially want the freedom to determine for themselves whether they want to be in control in any given situation. Both the capability and need for choice and autonomy aides in the development of intrinsic motivation for those activities in which the individual

engages. One benefit of choice is that the individual selects activities that sound interesting and, with peaked interest, places more effort in the activity; selection choice coupled with heightened interest results in a higher probability of developing competence in that activity domain. As the individual attempts to gain autonomy in his or her environment, the environment ultimately influences his or her success at achieving it; in other words, if an environment supports the development of self-determined behaviors, the individual is more likely to have autonomy-related needs satisfied.

As self-determination theory evolved, a third need of relatedness was added to account for the assumption that humans seek social connectedness. Within the fitness community, it is often recommended that an individual solicit a training partner (i.e., a peer supporter) to increase accountability toward reaching a particular fitness goal. More specifically, within the running community, there are a variety of training groups and running clubs (i.e., charity fundraiser groups, for profit coaching, free group runs at local running stores, etc.) designed to assist individuals in maintaining their health and/or reaching their running goals. Running, although an inherently solo activity appears to have a community-based social aspect that may allow some types of runners to maintain a strong sense of belongingness. In one study (Ogles & Masters, 2003), the results of a cluster analysis using the Motivations of Marathoners Scale (MOMS; Masters, Ogles, & Jolton, 1993) revealed that 16% ($N=238$) of individuals training for a marathon cited social motives (i.e., affiliation and recognition) to run (among other things); these individuals were disproportionately female, older ($M=40.9$, $SD= 10.89$), and

had completed more marathons ($M=9.9$). Surprisingly, this was the only cluster of individuals to report social motives, suggesting that other types of runners may not run in order to socialize and/or gain the respect of their family and friends. There are two additional cautions for interpreting these cluster analytic results, including 1) the participants in the study were marathon runners, all recruited during pre-race registration and do not represent the broad range of runner types; and 2) the factors of affiliation and recognition are not synonymous with the construct definition of relatedness in Deci and Ryan's (2000) theory.

Overall, Deci and Ryan (2000) posit that optimal psychological health requires the satisfaction of all three needs. By that logic, individuals must seek opportunities and experiences to try to gain fulfillment of these need areas. Other research (Vallerand, 1997, 2000) suggests that perceived satisfaction of autonomy, competence and relatedness play a slightly different role in sustaining motivation to engage in certain contextual (life) domains (i.e., education, interpersonal relationships and leisure).

Deci and Ryan's Model of Intrinsic, Extrinsic, and Amotivation

Early research (deCharms, 1968, c.f. Deci & Ryan, 1991) viewed intrinsic and extrinsic motivation as a dichotomous, unidimensional construct. This was later challenged by research (Ryan, 1982, c.f., Deci & Ryan, 1991) that showed that external variables (e.g., feedback appraisals) could promote or reduce intrinsic motivation, depending on the context and the feedback. Based on this evidence, it was conceived that intrinsic and extrinsic motivation are separate

constructs. Amotivation is inadequately defined as a third construct that represents the absence of intrinsic or extrinsic motivation.

Intrinsic Motivation. Deci and Ryan (1991) state that motivation equates to an innate drive for need satisfaction. This drive for need satisfaction is intrinsic, or internal, to the individual and that the outcomes of certain behaviors “are the feelings and thoughts that emerge spontaneously as people engage in the activity” (p. 241). In an attempt to further explain intrinsic motivation, Deci and Ryan (1991) review four approaches. These include that intrinsic motivation occurs 1) without external rewards, 2) out of interest, 3) in optimally challenging environments, and 4) as a way to satisfy basic psychological needs. They conclude that although a large amount of variance in human behavior and the integration of different experiences can be explained by satisfaction of competence and autonomy, a substantial additional amount of variance is explained by the need for social connectedness. Other researchers (Vallerand, 2000) suggest that relatedness may only be applicable in certain environments (i.e., leisure and relationships rather than education) – ultimately competence and autonomy are what drive motivation.

Deci and Ryan (1975) further assert that as an individual becomes more self-determined his or her behaviors are predominately self-directed, or driven by intrinsic motives. Intrinsic motivation (IM) is defined by the act of engaging in a particular behavior or activity because of the satisfaction derived from doing it (Deci, 1975; c.f. Pelletier et al., 1995). In other words, when an individual is

intrinsically motivated, he or she does not need material or external reinforcements to engage in a particular activity.

Extrinsic Motivation. Extrinsic motivation is one best understood as behavioral engagement that is contingent upon social, material, or external reinforcement. Deci and Ryan (1991) posit a process called internalization, by which an individual begins to see him or herself as the source of behavioral initiation (i.e., the individual shifts from an external to internal locus of causality, which is further explained in the next section). This process, internalization, is characterized as the self-determined form of extrinsic motivation. According to their theory, there are three types of internalization (low to high): external, introjected, and identified regulation. When a behavior is externally regulated, it is subjected to external rewards and consequences; an individual who is externally regulated to exercise may feel an obligation to exercise to appease others. Introjected regulation explains a behavior that is chosen because the external contingency associated with that behavior has been, in part, internalized and the individual feels an internal sense of obligation to act in a particular way. The next regulatory point, identified regulation, occurs when a behavior holds some value to the individual and engaging in it is meaningful. A fourth regulatory point, integrated regulation, is explained as being a part of extrinsic motivation, but it is unclear how it differs from intrinsic motivation. It refers to behavioral choice that is in full alignment with an individual's other values. According to Pelletier et al. (1995), "for the sports domain, the various self-determined forms of motivation (three types of IM and identification) have been associated with greater

persistence (Pelletier, Briere, Blias, & Vallerand, 1988), positive emotions (Vallerand & Briere, 1990), and greater interest and sport satisfaction (Briere et al., in press)” (p. 39). Other research suggests the latter two aspects of extrinsic motivation (identified regulation and integrated regulation) are associated with similar psychological and performance outcomes to intrinsic motivation (Mallett et al., 2007); these findings again suggest considerable murkiness in the discrete definitions of intrinsic and some aspects of extrinsic motivation.

Amotivation. Beyond intrinsic and extrinsic motivation is amotivation, or the state in which an individual lacks intention or reason for engaging in a particular behavior. The individual, in an amotivated state, ultimately perceives no advantage to doing a task and simultaneously no consequence to not doing it. It is best described in connection with learned helplessness (Seligman, 1975, c.f., Deci & Ryan, 2000) because an individual ultimately gives up. Amotivation is most notably associated with drop out in education and leisure/sport settings.

Underlying Structure. (See Figure 2.) According to Deci and Ryan (1991), human agency requires intention in the absence of external pressures and constraints. When an individual participates in a particular activity for truly intrinsic reasons, he or she is an agent in his or her own life. Given that individuals are highly influenced by their social environments, the process of self-determination can be challenging and often an individual may conduct behaviors across a variety of life contexts that are self-determined and others that are non-self-determined. Stated differently, an individual may be intrinsically motivated in one context, but extrinsically or amotivated in another context. Ultimately,

autonomy (or self-determination) contributes most to human agency. And, “it concerns the desire to experience an internal perceived locus of causality with regard to action – that is, to experience one’s actions as emanating from the self” (Deci & Ryan, 1991, p. 243). An internal perceived locus of causality is different from an internal locus of control (Rotter, 1954, 1966, c.f. Deci & Ryan, 1991). Locus of control explains outcome expectations and an individual’s believe that he or she can control the attainment of particular outcome. In contrast, locus of causality refers to the source of initiation of a particular outcome (where it stems from internal or external sources).

Deci and Ryan (1991) posit a continuum of causality (internal to external) underlying intrinsic and extrinsic motivation; alternatively, they posit a continuum of self-determination (i.e., autonomy) that underlies intrinsic and extrinsic motivation. Along the continuum of self-determination, Deci and Ryan (1991) also suggest three regulatory points (high to low): self-determined, controlled, or amotivated. According to their theory, an individual can have intention at both the self-determined and controlled points along the continuum, although true intentionality occurs at the highest end of the continuum. In both self-determined and controlled instances, the individual engages in a particular behavior with intent of a particular outcome, whether to attain an external reward or to attain an internal sense of satisfaction.

To revisit the other continuum, that of locus of causality, it is important to note that Deci and Ryan (1991) assert that intrinsic motivation always operates

from an internal locus of causality, but that extrinsic motivation can be caused from an internal or external locus.

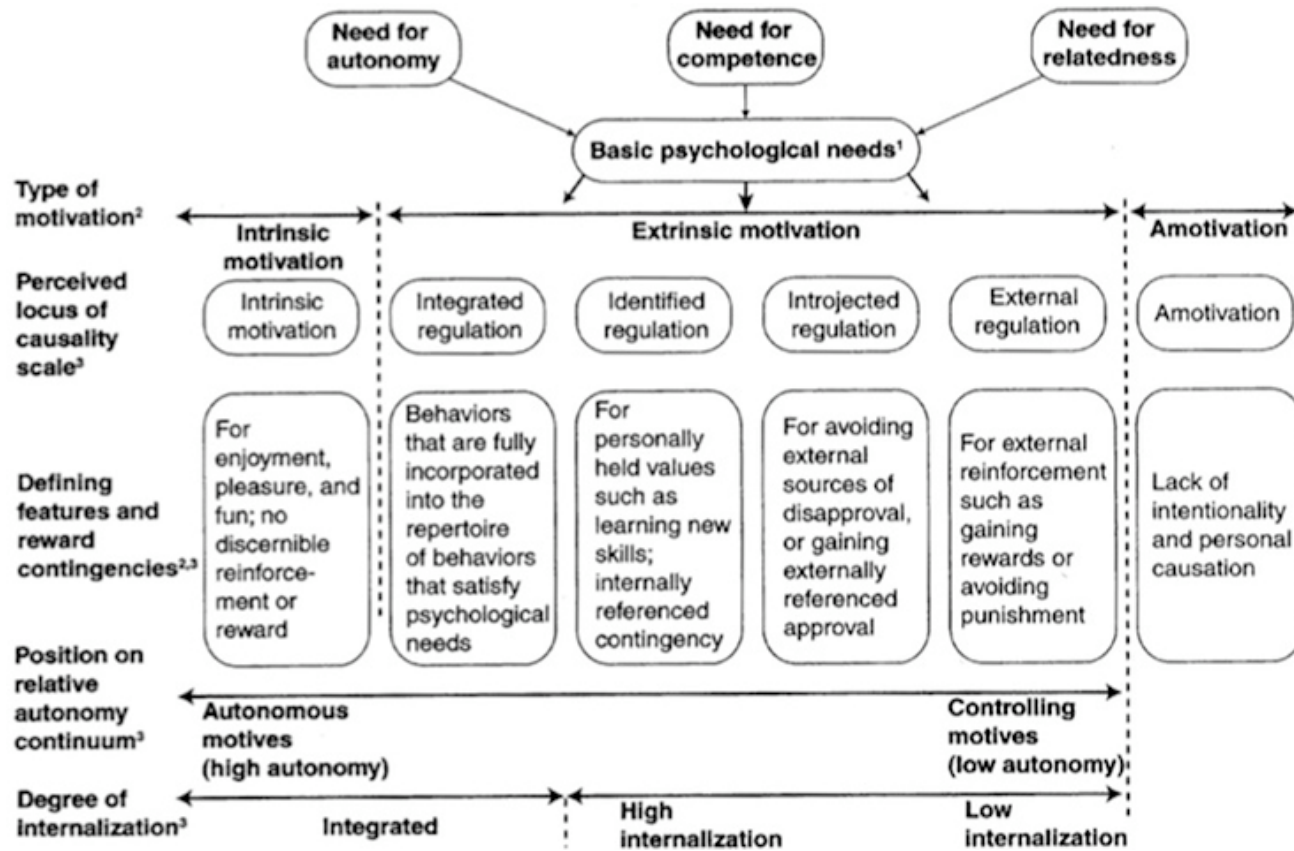


Figure 2. An overview of self-determination theory as presented in Ryan and Deci (2007, p. 8)

It is unclear whether the degree of perceived internal locus of causality is less for extrinsically motivated behaviors than it is for intrinsically motivated behaviors such that a true continuum separating intrinsic from extrinsic motivation exists. It could be equally plausible that this continuum underlies extrinsic motivation, but is completely separate from intrinsic motivation.

The dual continuums of self-determination and perceived locus of causality that are hypothesized to underlie intrinsic and extrinsic motivation do not appear to describe amotivation. In follow-up research, other authors (Mallett et al., 2007; Pelletier et al., 1995) describe amotivation as being at the lowest end of the continuum of self-determination, yet it is still unclear whether conceptually this is the most appropriate place for it.

Follow-up research (Pelletier et al., 1995; Vallerand, 1997, 2000) only make mention of the latter continuum when they conclude a quasi-simplex or simplex-like structure of motivation. It appears cumbersome and unpractical to assume such a complex structure for motivation; it appears equally inaccurate to develop a measure in alignment with only a portion of the original theory without presenting justification for its omission.

Vallerand's Hierarchical Model of Motivation

Similar to Deci and Ryan (1991), Vallerand (2000) conceptualizes motivation as a multidimensional construct. However, Vallerand expanded and modified the original model to include how global (personality), contextual (life), and situational (state) variables influence IM, EM, and AM. Vallerand (1997, 2000) suggests that individuals have a general orientation toward engagement

(global) as well as domain specific interests (contextual) that motivate them; individuals are also motivated in the present moment (state) to engage in an activity. Different social factors influence an individual's perception of whether he or she will be successful at a given task and can alter an individual's motivation across any of these levels.

In addition to considering how IM, EM, and AM function within a larger network of global, contextual and situational variables, Vallerand (1997, 2000) asserted that intrinsic motivation could be further divided into three additional points: IM to know, IM to accomplish things, and IM to experience stimulation. Pelletier et al. (1995) provide a detailed review of these different types of intrinsic motivation as related to sport participants (See Figure 3). IM to know refers to engagement because of an inherent curiosity to gain new knowledge; IM to accomplish things captures engagements that comes from a desire to experience pleasure and satisfaction from creating something; and IM to experience stimulation refers to sensory pleasures that arise from engaging in a particular activity. The discriminatory function of these three aspects of intrinsic motivation is still in question; one set of researchers were unable to distinguish these three types and recommend combining them into one factor (Mallett et al., 2007); other measures differentiate these points, but fail to show support for the discriminatory function of each point in relation to external criterion (Li, 1999; Pelletier et al., 1995).

Vallerand (2000) also posits that the environment (i.e., social factors) influences the perception of autonomy, competence, and relatedness, which

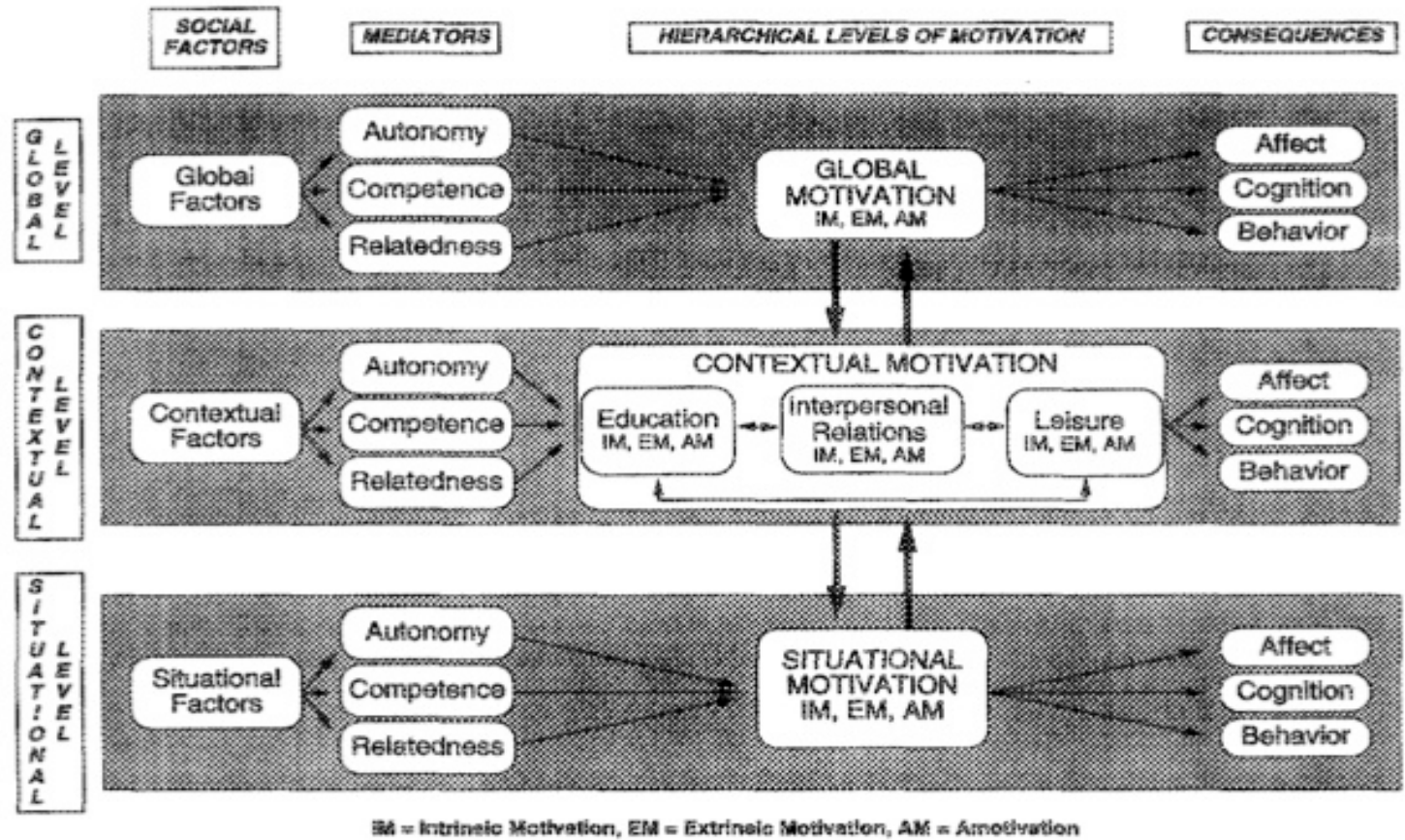


Figure 3. Hierarchical model of intrinsic, extrinsic and amotivation adapted from Vallerand (1995; c.f., Vallerand 2000, p. 313)

influence motivation and leads to cognitive, affective, and behavioral outcomes. He asserts that the amount of self-determined motivation (high or low) mediates the relationship between need satisfaction and various psychological outcomes; however, it appears more appropriate to state that motivation serves as a moderator between need satisfaction and various outcomes. Overall, intrinsic motivation leads to the most positive outcomes, whereas extrinsic motivation and amotivation produce more negative outcomes. But, the perception of autonomy and competence appears most important in facilitating more intrinsically motivated behaviors. Relatedness contributes differently to self-determined motivation because of its inherent social nature. It appears less important in educational settings where individual performance is valued and necessary, but more important and influential in sport and fitness contexts where high social functioning is necessary and important. Vallerand (2000) also posits that relatedness contributes to “value transmission” or the notion that over time, others’ beliefs and values “become internalized by other individuals” (p. 317).

Measures of Exercise and Sport Motivation

The Exercise Motivation Scale. Within the framework of self-determination theory, there have been a few scales developed to examine motivation in sport and exercise. The first scale, the Exercise Motivation Scale (EMS; Li, 1999) was developed to measure the eight aspects of exercise motivation as hypothesized in Vallerand (1997, 2000): amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, IM to know, IM to accomplish, and IM to experience stimulation.

In the development of the EMS, Li (1999) conducted a series of three studies: 1) construct development, 2) instrument development and initial validation, and 3) revised instrumentation and further validation. The first study focused on defining the construct and content of the EMS; this consisted of a comprehensive review of the literature, item generation from a focus group consisting of exercisers ($N=101$), and an evaluation of items by a panel of review experts using the Delphi method to develop a final list of 32 items. In the second study, participants ($N=371$) from a range of exercise classes were asked to respond to the following prompt “why are you currently participating in this activity?” to indicate their agreement to the EMS items using a six-point Likert scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*; Li, 1999, p. 102).

In Study 2, the author conducted a confirmatory factor analysis using LISREL to test the a priori structure of the EMS (i.e., an eight factor structure consisting of the intrinsic and extrinsic types of motivation and amotivation). The results yielded relatively poor model fit ($CFI = .86$; $RMSEA = .08$). The author re-fit the model by eliminating a negative, non-significant loading with amotivation and there was improvement in the model fit across other indices ($RMSEA = .06$ and $CFI = .89$), suggestive of adequate model fit for item-level data. Internal consistency reliability estimates across the eight subscales ranged from .75 to .90 and suggest an adequate internal structure of the instrument.

In Study 3, the authors explored alternative models to examine evidence of validity in a new sample and, as such, tested “(a) the eight factor structure of the EMS, (b) a higher-order factor structure consisting of intrinsic motivation,

extrinsic motivation, and amotivation, [and] (c) a simplex structure reflecting the proposed continuum of self-determination (Deci & Ryan, 1985)” (Li, 1999, p. 103). They concluded that the eight-factor, multidimensional structure of EMS fit the data better than the alternative one- and three-factor models. Additionally, the factor structure of the EMS was found to be equivalent across gender.

The author used LISREL to test the simplex model, or a correlation pattern among the factors that approximate a continuum-like relationship in which closely related concepts have higher correlation coefficients associated with them and less related concepts have low correlations. In a true simplex, the pattern of correlations (high to low) is the same across all pairs in the inter-factor correlation matrix. Li (1999) tested a simplex model in a fair fitting model (CFI = .89 and RMSEA = .07); this simplex pattern mirrored the proposed structure in self-determination theory with the order of amotivation to external regulation to introjected regulation to integrated regulation to intrinsic motivation. The authors were unable to justify a simplex pattern across all eight facets of the scale, which contributes doubt to the true simplex nature of motivation.

Each of the eight facets of exercise motivation are treated as a subscales and the discriminatory function of these facets were evaluated related to perceptions of competence, autonomy, and relatedness. The results indicated low positive correlations between perceptions of competence and the three types of IM and integrated, identified, and external regulation. There was also a low positive correlation between perceptions of autonomy and three types of intrinsic motivation, integrated, and identified regulation. There was a negative

relationship between perceptions of autonomy and external regulation and amotivation. A similar pattern of correlations existed between these seven facets and perceptions of relatedness. Surprisingly, there were no reported relationships between introjected regulation and perceptions of competence, autonomy, or relatedness. The authors did not provide explanation for this finding, particularly whether introjected regulation held discriminatory or practical significance in the overall structure of the model.

The Sport Motivation Scale. Another scale, the Sport Motivation Scale (SMS; Pelletier et al., 1995) was developed within the framework of self-determination theory to measure sports motivation across seven facets of sport motivation (amotivation, external regulation, introjected regulation, identified regulation, IM to know, IM to accomplish, and IM to experience stimulation). This scale did not include integrated regulation as a measured facet of sport motivation. Ultimately, this scale was developed to answer the broad question, "why do you practice your sport?" This particular scale was based on a French scale and the focus of its development was to translate the original scale into English, examine the factor structure, assess internal consistency of the seven subscales, assess construct validity based on correlations with various sport and psychological variables, and verify gender differences that existed in the French-Canadian version of the original scale (i.e., on the original scale, females had higher levels of intrinsic motivation to know, but had lower levels of external regulation than males).

The translation and validation process of the SMS consisted of two studies. The first study translated the SMS into English, evaluated the factor structure of the translated measure through confirmatory factor analysis using LISREL 7, and examined the internal consistency of the seven subscales. The final purpose of the first study was to gather evidence for construct validity through the evaluation of a simplex model to mirror the continuum of self-determination theory (Deci & Ryan, 1985). In the second study, the authors evaluated the temporal stability of the measure to collect additional evidence of validity for the measure.

In Study 1, a sample of college athletes ($N=593$) from a variety of team sports (namely basketball, volleyball, swimming, ice hockey, football, track, cross country running, soccer, and rugby), each with at least two years of competitive experience, were asked to respond to the following prompt, “why do you practice your sport” on a seven-point scale ranging from “does not correspond at all (1) [to] corresponds exactly (7) with the midpoint corresponds moderately (4)” (Pelletier et al., 1995, p. 42). An a priori seven-factor model, consistent with the structure of the French version of the SMS was tested via confirmatory factor analysis. Fit indices that are less affected by sample size suggested adequate fit (GFI = .94, AGFI = .92 and RMR = .048), particularly with item-level data. Correlations among these factors were suggestive of a simplex pattern, wherein “adjacent subscales (e.g., External Regulation and Introjection) have positive correlations, and subscales at the opposite ends of the continuum (i.e., IM and Amotivation) have the most negative correlations” (p. 44). The internal

consistency reliability estimates for the seven subscales of the SMS ranged from .63 to .80, with a mean alpha of .75; these reliabilities are reported as being similar to those obtained in the original French version of the scale.

A proposed benefit of the SMS is that it assesses IM to know, IM to accomplish things, and IM to experience stimulation, three of the four forms of regulation for extrinsic motivation (identified, introjected, and external), and amotivation that parallel the continuum of self-determination outlined in the previous section. However, unlike the EMS (Li, 1999), the SMS does not include integrated regulation, a component of extrinsic motivation, in the measurement of sport motivation. The authors do not articulate why this aspect of the theory was not accounted for the scale development process.

To demonstrate concurrent validity, the authors explored correlations between the seven individual subscales and a series of external variables, including perceptions of coach behaviors (i.e., perceived competence, autonomy support, caring, structure, and feedback of competence) and consequences (i.e., effort, sport intentions, and distraction). They hypothesized strong correlations between coaches' behaviors and three types of IM and identification; moderate correlations between external regulation and introjection; and negative correlations with amotivation. They also hypothesized positive correlations among consequence variables and self-determined forms of motivation. Results for both hypotheses were as expected. They used these correlation patterns to support a continuum of self-determination among the different facets of motivation.

The Sport Motivation Scale-6. The SMS-6 (Mallett et al., 2007) is a revised version of the Sport Motivation Scale (SMS; Pelletier et al., 1995) that consists of a six-factor structure of sport motivation. The authors assert that this scale offers the benefit of being more closely aligned with Deci and Ryan's (1991) model of intrinsic, extrinsic, and amotivation because it produces subscale scores at six regulatory points along a simplex-like continuum of self-determination. These subscale measures include (low to high): amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. Unlike previous measures (EMS; Li, 1999; SMS; Pelletier et al., 1995), the SMS-6 fits a quasi-simplex pattern to all six regulatory points.

The impetus for developing the SMS-6 was to improve the original scale (SMS) to be more compatible with self-determination theory. In Deci and Ryan's (1991) model, they do not conceptualize intrinsic motivation as consisting of three levels (IM to know, IM to accomplish things, and IM to experience stimulation); this distinction was hypothesized by Vallerand (1997, 2000) and used in the original scaling of the SMS. Mallett et al. (2007) did not find evidence to support this distinction in developing the SMS-6 and those three aspects were combined to measure intrinsic motivation.

Mallett et al. (2007) evaluated the original SMS using confirmatory factor analysis with robust maximum likelihood on a large population of elite athletes and university students ($N=614$). They concluded poor overall model fit based on multiple fit indices (RMSEA, SRMR, CFI, and NNFI); however, they did not

include these indices in their published results section. They report conducting an LM test to evaluate alternative model specification and noted six items that may load more appropriately on other factors within extrinsic motivation. These results suggest that there may not be a clear distinction between the proposed four factors of extrinsic motivation. It seems more likely that these aspects are levels, not factors that load onto one global factor of extrinsic motivation.

Next, the authors developed new items to measure integrated regulation (the aspect that had previously been left out of the model) and conducted a follow-up CFA. “Examination of attenuated correlations (discriminant validity) revealed that four pairs of factors were not statistically distinguishable with this sample: IM-accomplishment from both IM-knowledge and IM-stimulation, identified regulation from IM-accomplishment and integrated regulation” (Mallett et al., 2007, p. 607). The authors decided to collapse IM-knowledge, IM-stimulation, and IM-accomplishment into one factor of intrinsic motivation. They did not decide to resolve other issues related to the close relationship between integrated regulation and intrinsic motivation.

The authors then conducted a CFA for a revised six-factor structure of sport motivation and reported acceptable fit ($\chi^2(237) = 560.713$; RMSEA = 0.005, 90% CI [0.044, 0.055], SRMR = .044, and CFI = .934). They did not include fit change statistics to demonstrate incremental improvement of using a six-factor structure over and above the other models. The authors also tested a simplex pattern to evaluate the pattern of correlations between adjacent factors in Deci and Ryan’s (1991) original model (from low to high: “amotivation →

external regulation → introjected regulation → identified regulation → integrated regulation → intrinsic motivation; Mallett et al., 2007, p. 608). The process of testing a simplex pattern is used to determine whether there is an underlying continuum between a series of factors. In the original theory, Deci and Ryan (1991) proposed two continuums (self-determination and locus of causality) underlying six ordered factors. If this continuum exists, then a pattern of correlations will exist across all factors such that closely related concepts are highly correlated and loosely related concepts are lowly correlated. The pattern of correlations high to low will look the same for all inter-factor correlations and be displayed in a correlation matrix. The authors reported that the simplex model fit the data worse than the alternative CFA ($\chi^2(247) = 691.639$; RMSEA = 0.052, SRMR = .070, and CFI = .909). ; in general, “if the simplex model fails to reproduce the correlations with reasonable accuracy, then that model should be rejected even if its fit is acceptable” (Marsh, 1993, c.f., Mallett et al., 2007, p. 608). Despite inconsistencies in the proposed simplex structure (i.e., a large direct effect between external regulation and identified regulation), the authors determined that their data supported the presence of a simplex structure underlying the SMS-6.

There are several potential limitations to the SMS-6. In developing and validating the measure, the authors used the same sample to evaluate model fit across all analyses. It is more appropriate to split the sample and conduct separate analyses on different portions of the original data pool. Next, there is no mention of the practical utility of this scale, particularly related to score interpretations.

The scale produces six subscale scores, but no guidance is provided as to how to evaluate those scores or how individuals may look with certain profiles of scores. Furthermore, there is little evidence of concurrent validity and no evidence for incremental or predictive validity. The authors do not explicitly state how they conducted analyses to test concurrent validity – they report correlating subscale scores with the dispositional flow scale-2 (DFS-2; Jackson & Eklund, 2004, c.f., Mallett et al., 2007), but provide very little interpretation of the meaningfulness of the results.

To reiterate, there is poor evidence to support such a complex and discrete measure of intrinsic motivation, extrinsic motivation, and amotivation. Despite the improved psychometric properties of the current scale, it remains unclear whether the SMS-6 does in fact appropriately consist of six separate factors or rather three factors (intrinsic, extrinsic, and amotivation) wherein one of the factors (i.e., extrinsic motivation) consists of four distinct levels. The authors provide almost no support for the practical utility of a six-factor structure; again, they provide no instruction on how to use the scale or interpret its results.

However, the psychometric support for this scale surpasses that of any other current measure of motivation for sport or exercise. It appears an appropriate starting point for further inquiry is within a more specific sample, that is, runners.

Justification for Alternative Measurement Models

As described previously, there is considerable overlap in the definitions of the six proposed dimensions of motivation; this redundancy warrants inquiry into whether these dimensions are, in fact, discrete. Figures 4 through 8 depict each of

the a priori alternative models to explain sport motivation within the framework of self-determination theory. Figure 4 represents a unidimensional model of motivation whereby all 24 items load onto a single factor. This model presents an alternative perspective on the continuum of self-determination said to underlie the current six dimensions of motivation. In this model, motivation is conceptualized as a bi-polar dimension that ranges from low to high motivation rather than separate dimensions that correlate in a simplex pattern.

In Figure 5, a two-factor model of motivation is depicted to show a combined factor of intrinsic/extrinsic motivation and a separate factor of amotivation. This model considers the unique properties of amotivation posited by Deci and Ryan (1985, 2000) by estimating a negative correlation between this factor and the intrinsic/extrinsic motivation factor. The intrinsic/extrinsic motivation factor is viewed as a bi-polar dimension, ranging from external to internal control, where higher factor scores suggest more intrinsic motivation. In this model, motivation is distinguished from 'lack of motivation' but is not divided into more discrete categories. Low factor scores on the intrinsic/extrinsic motivation factor would account for more externally motivated behaviors; very low scores on this factor would result in higher scores on the amotivation factor. This is consistent with theory that describes amotivation as the point when an individual is unable to find any reason for engaging in a particular activity.

Next, Figure 6 outlines a three-factor model of intrinsic motivation, extrinsic motivation and amotivation. In this model, the items previously associated with amotivation and intrinsic motivation (Mallett et al., 2007) load

onto their respective factors; the items associated with all other domains of extrinsic motivation are collapsed to load onto one factor, extrinsic motivation. This model considers the unique properties of each type of motivation (Deci & Ryan, 1985, 2000) and the empirical evidence that suggests there is little usefulness in dividing these into even more discrete dimensions. This model tests specifically whether the inclusion of separate dimensions of extrinsic motivation provide additional insights into motivation for sport participation.

Figure 7 depicts a six-factor model of motivation consistent with previous research (Deci & Ryan, 1985, 2000; Mallett et al., 2007) with four items loading to each factor. As outlined by Mallett and colleagues (2007), this model includes a separate factor of integrated regulation (previously omitted by Pelletier et al., 1995) and uses empirical evidence to justify not dividing intrinsic motivation into more discrete dimensions. Overall, this model has the most theoretical and empirical support to date for explaining sport motivation. It demonstrates the plausible function of discrete types of motivation in predicting performance outcomes (Mallett et al., 2007).

In Figure 8, a hierarchical model is shown that consists of three first order factors of intrinsic motivation, extrinsic motivation, and amotivation and a second-order, general motivation factor. As with other models, this model accounts for the unique properties of each of the three main types of motivation (Deci & Ryan, 1985, 2000) and also considers an alternative perspective on general aspect of self-determination posited to relate these constructs. In contrast to SDT (Deci & Ryan, 1985, 2000), wherein a continuum of self-determination

explains correlations among the factors, this model suggests that this concept may serve as an umbrella over these second-order relations. In other words, there is some general tendency that influences more specific aspects of motivation.

Figure 9 depicts a bi-factor model with six domain specific factors and one underlying factor of general motivation. This model considers the six unique dimensions of motivation supported by past researchers and also the construct of self-determination posited to explain the relation among these other constructs. Here, the general motivation factor can be said to encompass self-determined motives and explain a portion of the variance in the items; the domain specific types of motivation explain the remaining variance.

In Figure 10, an alternative bi-factor model is proposed with three domain specific aspects of motivation and one underlying general motivation. This model is similar to the previous bi-factor model in that it considers an underlying general factor that explains self-determination; in contrast, this model investigates whether empirical evidence of high correlations among the four dimensions of extrinsic motivation (Pelletier et al., 1995; Mallett et al., 2007) can support a model with a factor that collapses these dimensions into one factor of extrinsic motivation.

Lastly, consist with past research (Pelletier et al., 1995; Mallett et al., 2007), a simplex pattern of motivation ranging from low to high (amotivation → external regulation → introjected regulation → identified regulation → integrated regulation → intrinsic motivation) is depicted (See Figure 11). Although not included in the figure, both indirect and direct effects do exist among these

variables and will be tested in accordance with past research (Li & Harmer, 1991, c.f., Mallett et al., 2007).

These hypothesized alternative models will be tested to determine the most appropriate structure of motivation among runners.

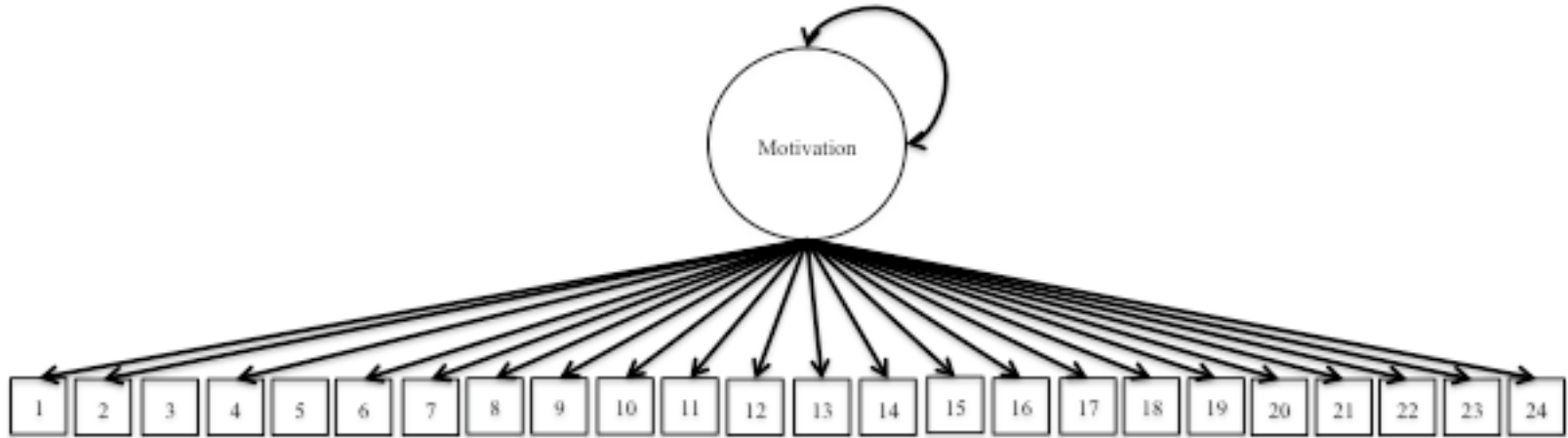


Figure 4. A unidimensional representation of motivation. Error terms have been removed for simplicity.

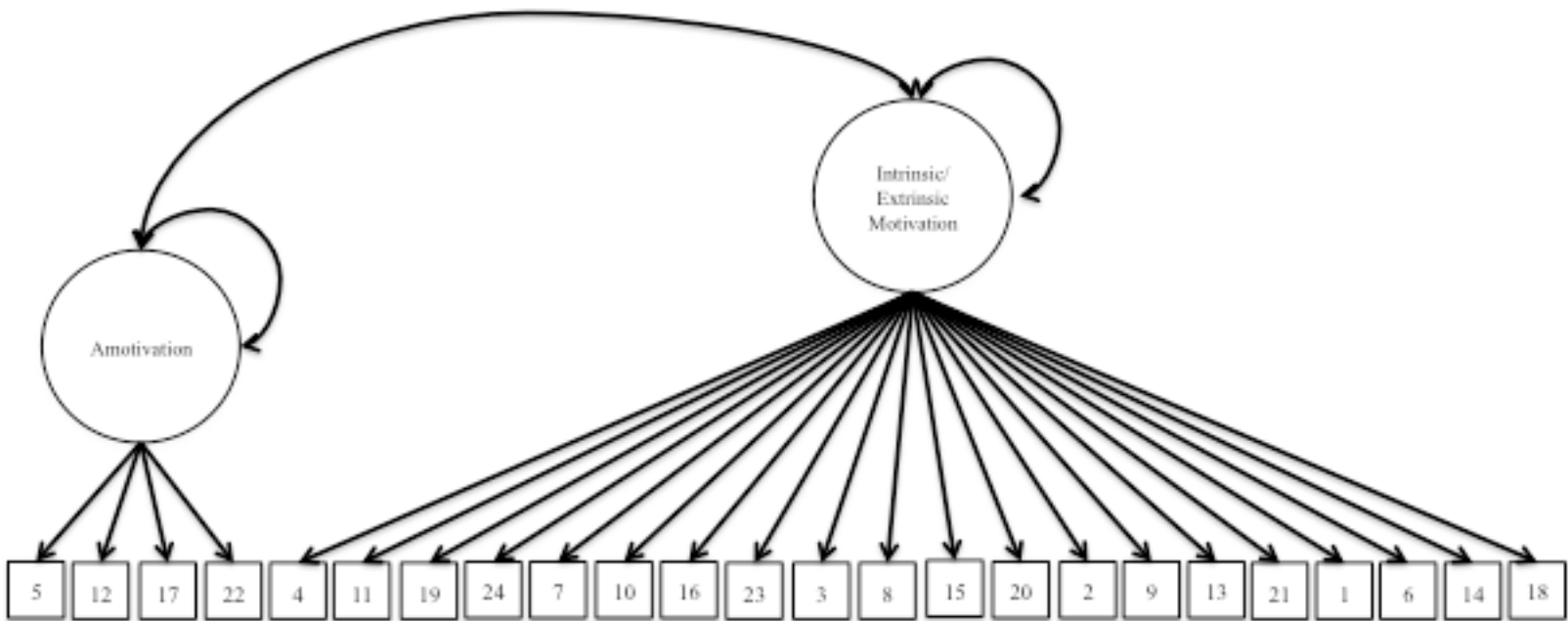


Figure 5. A two-factor model of intrinsic/extrinsic motivation, and amotivation. Error terms have been removed for simplicity.

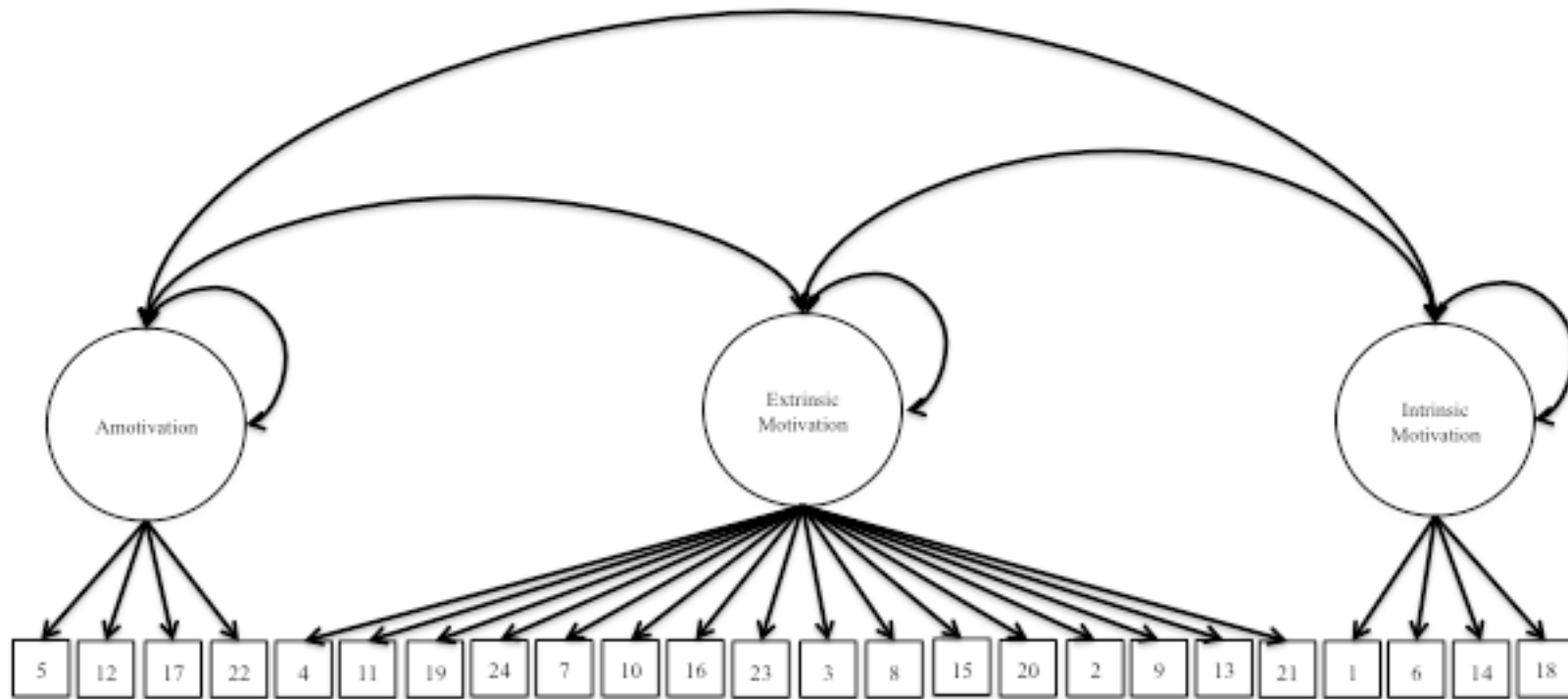


Figure 6. A three-factor model of intrinsic motivation, extrinsic motivation, and amotivation. Error terms have been removed for simplicity.

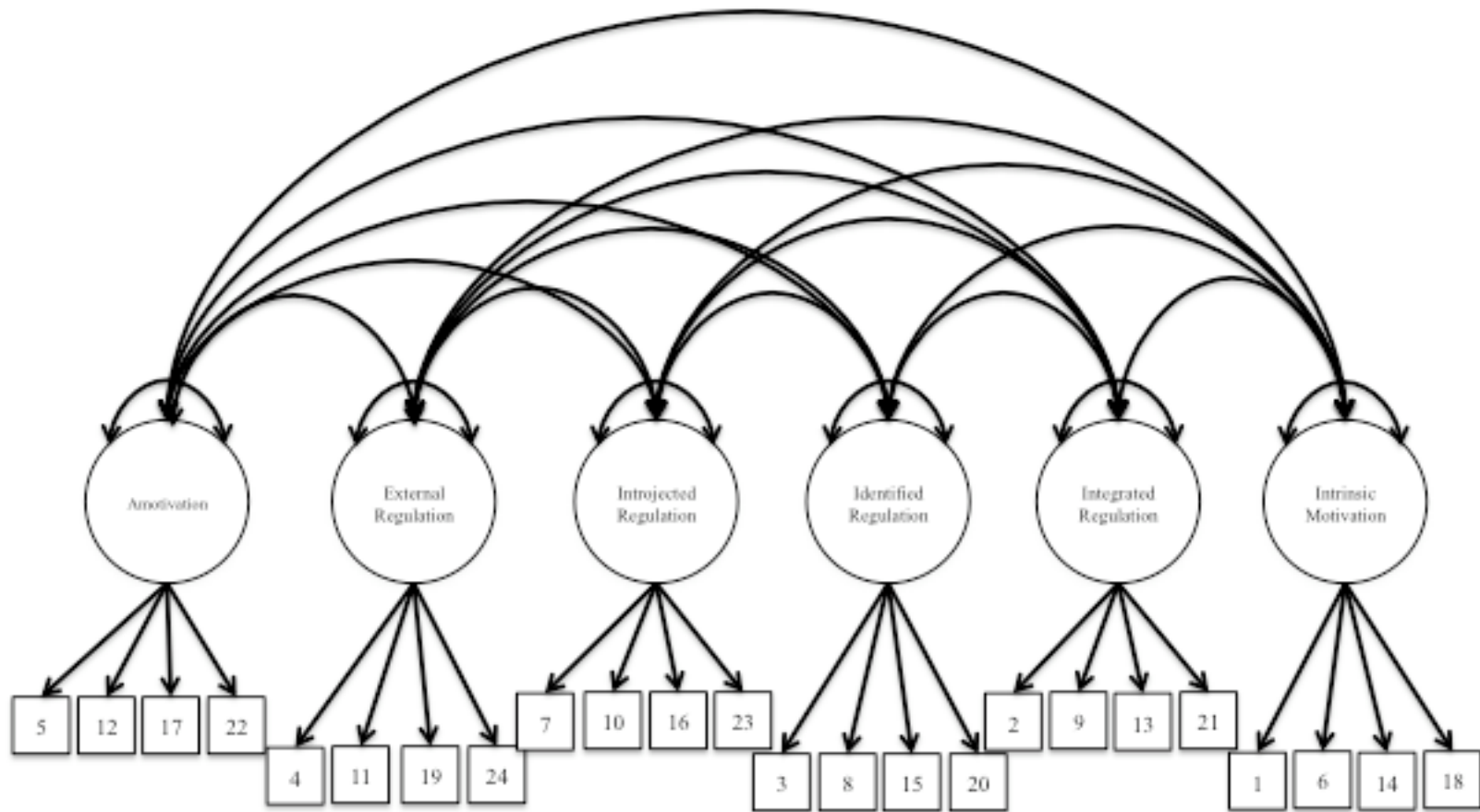


Figure 7. A six-factor model of motivation. Error terms have been removed for simplicity.

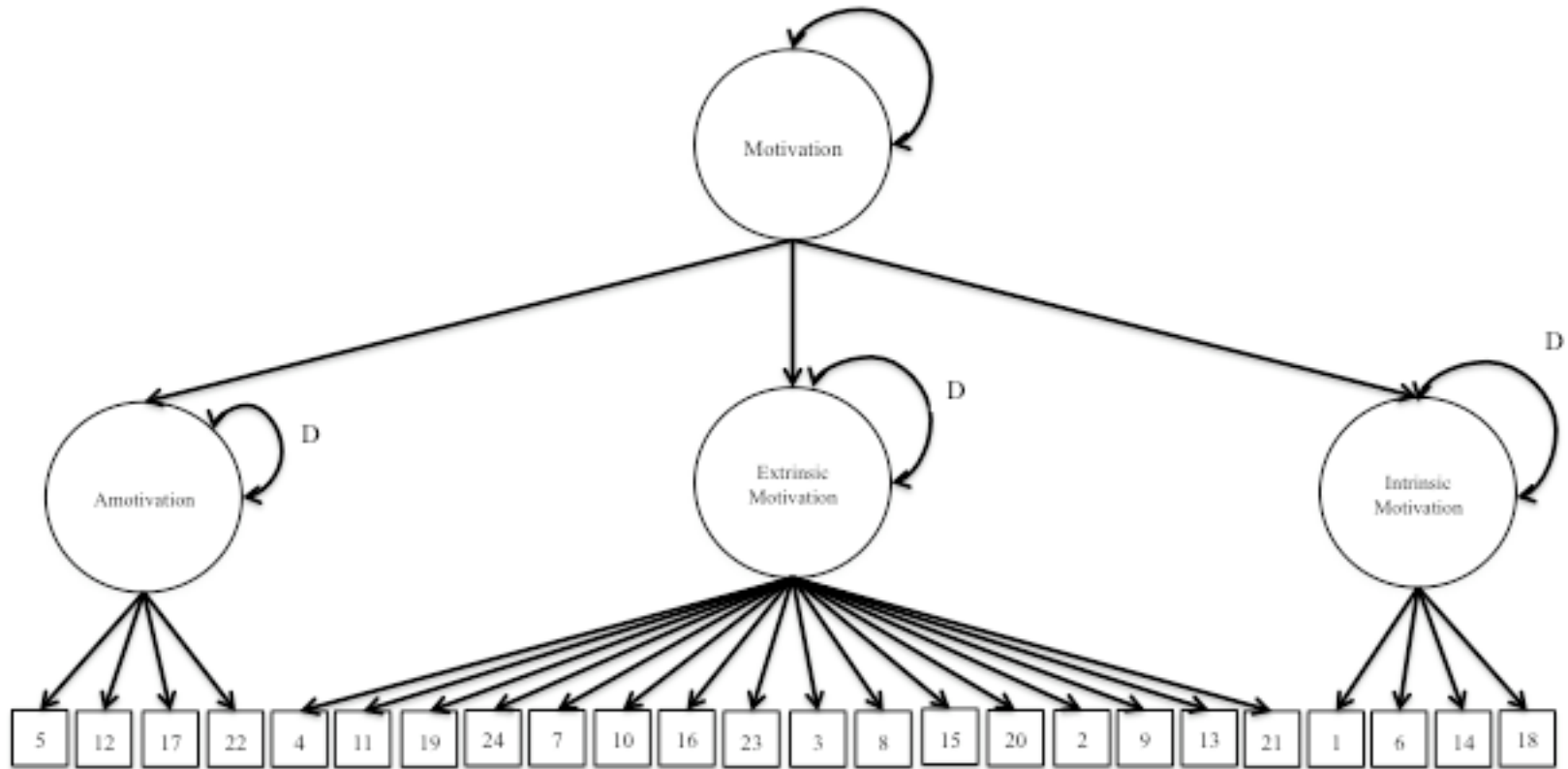
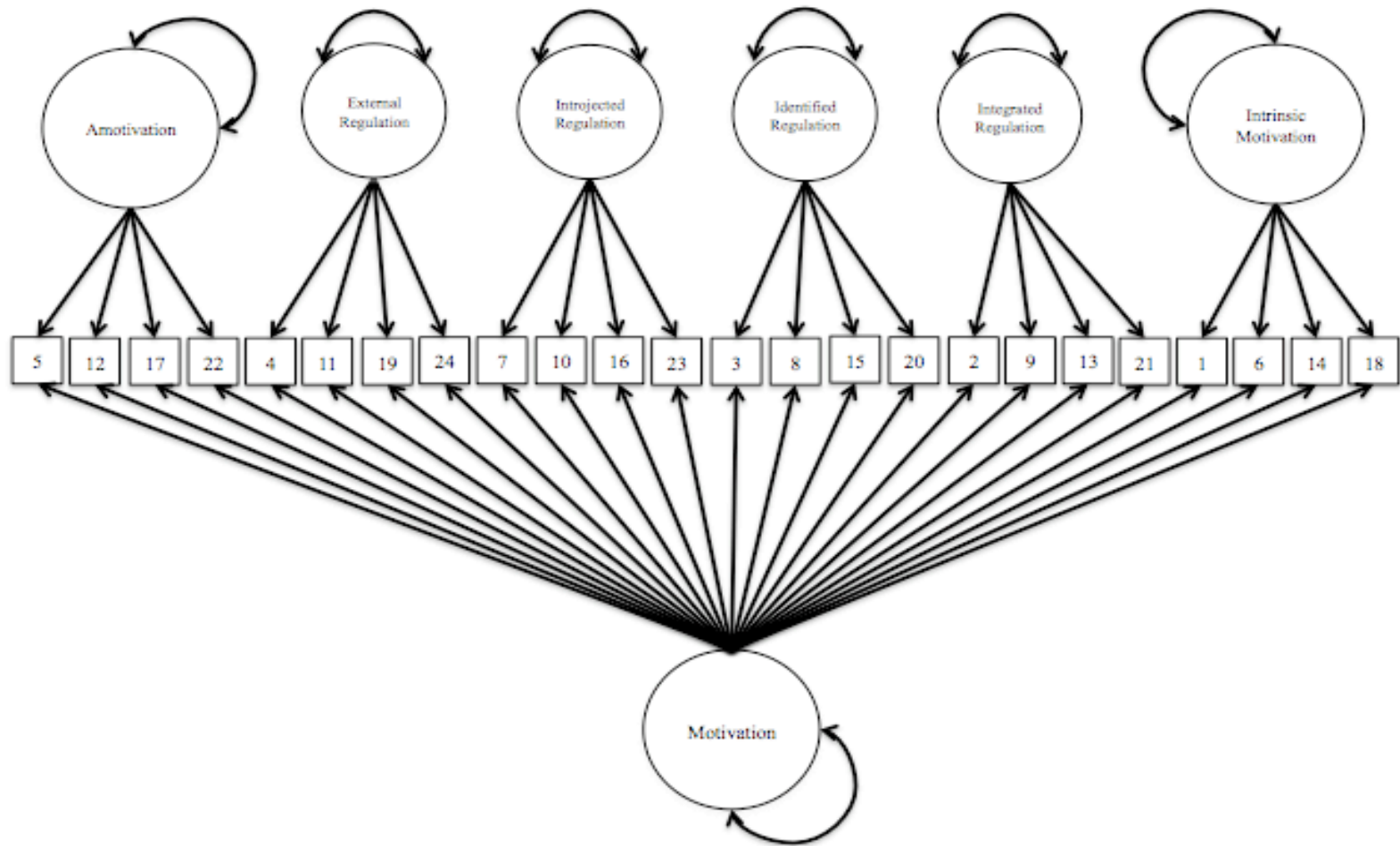
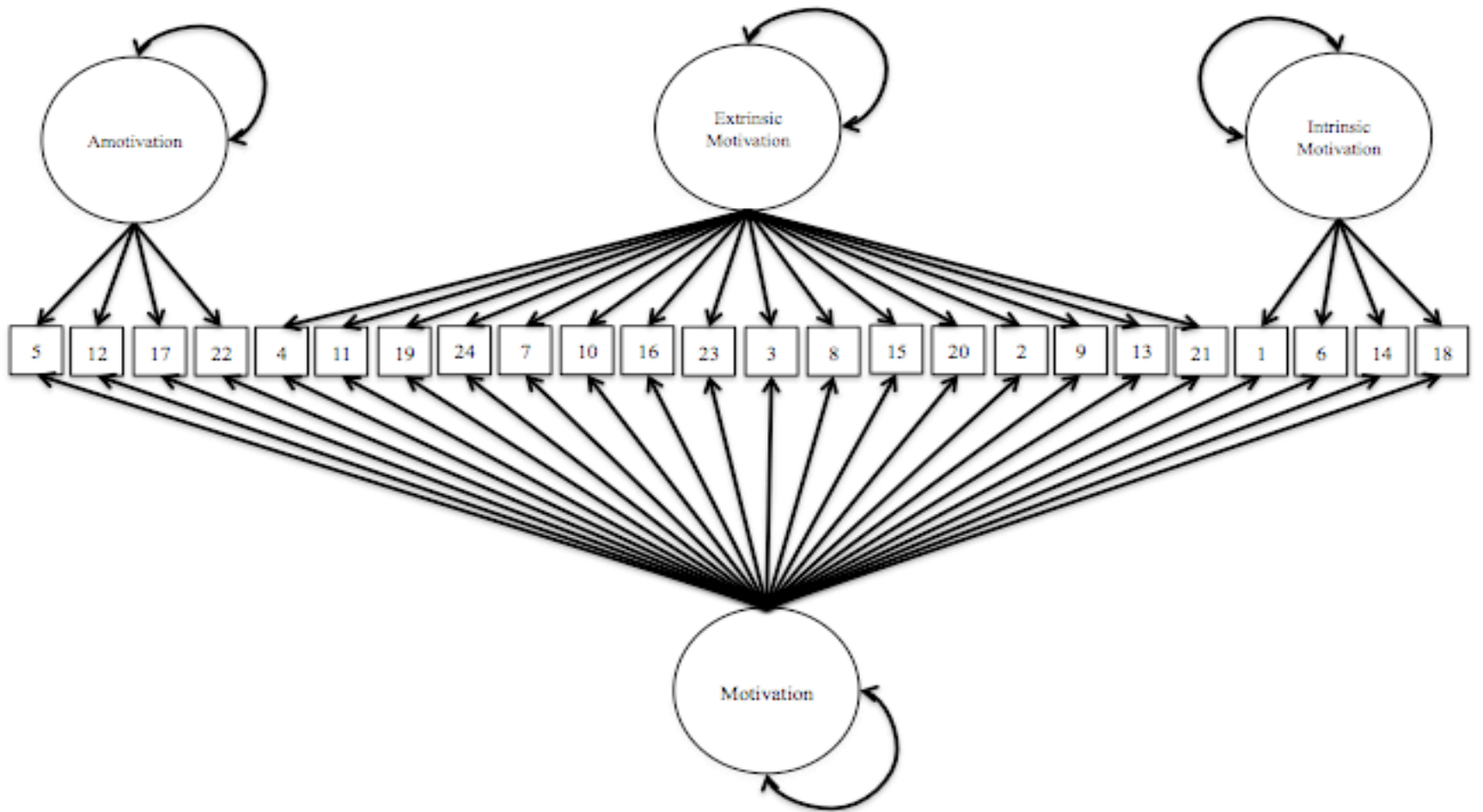


Figure 8. A second-order model of motivation. Error terms have been removed for simplicity.



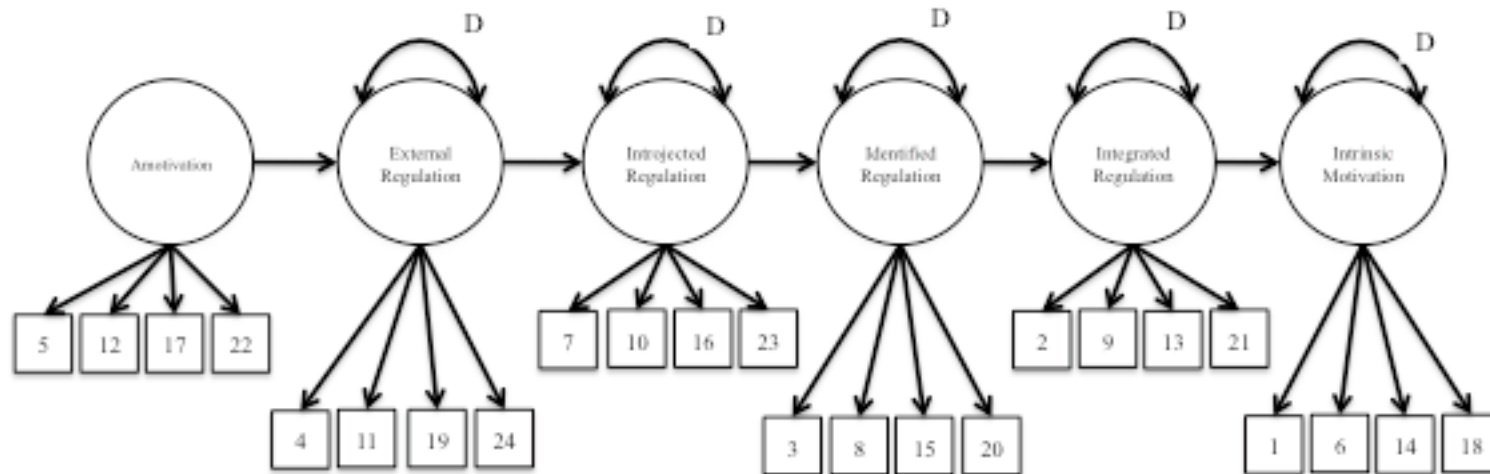
40

Figure 9. A bi-factor model of motivation with one general factor and six specific factors.



41

Figure 10. A bi-factor model of motivation with one general factor and three specific factors.



42

Figure 11. A simplex structure (low to high) of self-determined motivation. For clarity, solid lines connecting factors indicate direct effects for adjacent levels of motivation along a continuum of self-determination. Error terms have been removed for simplicity.

Rationale for the Current Study

The following sections articulate the need for this study by explaining the deliberate choice to use a population of runners and establish a better understanding of the construct of motivation through its relation to future intention to run. The hypotheses that drive this investigation are listed at the end of this section.

Sample Population of Runners. Current studies that examine motivation for sport or exercise consist of largely samples of individuals across a wide range of activities. Furthermore, in the development and validation of the SMS-6, participants consisted of elite athletes or undergraduates enrolled in competitive sports. Although this type of sample selection can provide support for the generalizability of the findings across activity types for superior participants, it is unlikely that the sample population accounts for the range of variance across motivation. Further, this sampling procedure does not provide insight into whether the structure of motivation for sport participation in general among superior athletes applies to unique groups of recreational athletes.

The running community is comprised of a group of individuals who share a common interest; yet, they report different reasons for doing it (Masters, Ogles, & Jolton, 1993). Reasons include losing weight, feeling good about themselves, lowering their risk of disease, or increasing their cardiovascular health. As such, runners were sampled in an attempt to capture variation across the range of possible motivations to run to better inform the structure of motivation.

Small sample, ethnographic studies have shown that individuals who run experience a variety of professional and personal benefits, which may contribute to a continued motivation to run and suggest that there is some additional motive over and above physical health that explains motivation among runners.

According to Boudreau (2009), running alleviates job stress and contributes to an increase in work productivity. In another study, individuals cited increased feelings of self-efficacy toward ending unhealthy relationships and pursuing alternative educational and career paths (Birk, 2009). These documented benefits suggest running as a likely mode of intervention for individuals struggling with relational or career distress. However, these reported benefits only provide post hoc insight into how a person's life changed after running; what these findings fail to do is to fully explain the motivation for one's initial and ongoing decision to run.

Alternatively, there are potential physiological disadvantages to running, such as the propensity for runners to develop knee, hip, and joint problems. The constant physical jarring leaves many runners seeking medical attention for injuries (van Mechelen, 1992). Given these consequences, many individuals still continue to run, often going to great lengths to fix their physical ailment or injury in order to keep running. From an evolutionary perspective, there is some support for the evolution from walking to endurance running despite the increased harm and physically demanding properties of the latter choice. Bramble and Lieberman (2004) suggest that increased efficiency in endurance running would have allowed humans better access to food to ensure survival among other species. As such,

competition and survival are both explained through endurance running; however, with present day technological and food production advances, there is little support for the necessity of endurance running to survival. In fact, the energy-depleting nature of endurance running could ultimately be detrimental to long-term survival of the species (Bramble & Lieberman, 2004).

The presence of both strong advantages and disadvantages to running lends additional support a more comprehensive examination of the structure of motivation for this population. Although I anticipate more variability in motivation scores across participants in my study versus previously used samples of elite athletes, I still do not expect a normal distribution of scores. I expect for the data to be slightly negatively skewed with fewer participants reporting low scores on motivation for running, particularly because I have chosen to exclude individuals from my study who report running less than one time in the past month. I believe this distribution of scores approximates the distribution of scores in the population at large, and will assume normality when conducting my analyses.

Hypotheses

The focus of this study was to investigate the structure of intrinsic motivation, extrinsic motivation, and amotivation in runners utilizing the SMS-6 (Mallett et al., 2007). Deci and Ryan (1985; Ryan & Deci, 2000) and Vallerand (2000) have contributed evidence for an eight-factor or six-factor structure of motivation, respectively, that appears to have limited practical utility. The purpose of my inquiry is to test a series of theory-driven alternative models to

uncover the most parsimonious and useful interpretation of motivation. I will test the following models from simplest to most complex: a unidimensional model (Figure 4), a two-factor model (Figure 5), a three-factor model (Figure 6), a six factor model (Figure 7), a second-order model with three, first-order factors (Figure 8), a bi-factor model with one general factor underlying six factors (Figure 9), a bi-factor model with one general factor underlying three factors (Figure 10), and a six-factor simplex structure (Figure 11). The final model will provide a framework for evaluating correlations with an external measure of persistence, developed for the purpose of this study. My hypotheses are as follows:

Hypothesis 1: A six-factor model does not best explain the structure of motivation. The lack of discrimination between intrinsic motivation and two types of extrinsic motivation (identified and integrated regulation) suggests a three-factor model with two moderately correlated factors of extrinsic and intrinsic motivation and an orthogonal factor of amotivation will better explain the data. Alternative models will provide support for adoption of the three-factor model over others.

Hypothesis 2: The structure of motivation does not conform to a true simplex pattern. Past research demonstrates loose evidence in support of a quasi-simplex pattern and it is proposed that similar correlations among the factors will be present here.

Hypothesis 3: The final structure of motivation will yield factors that are correlated as expected with future persistence. Amotivation will be negatively

correlated with intent to persist. Extrinsic motivation will be more strongly positively correlated with intent to sign up for future races than other indicators of persistence because of the reward based properties of racing. Intrinsic motivation will be positively correlated with intent to make time to run in the future, keep running a constant in one's life, avoiding setbacks to running, and continuing to run regularly; intrinsic motivation will display a low, negative correlation with intent to sign up in future races because race participation is assumed to be more externally rewarding than the other indicators of persistence.

Chapter 3

METHODOLOGY

Participants

Four hundred and three ($N = 403$) participants were recruited from a series of running and triathlon groups from across the country, university and community-based fitness clubs in the southwestern region of the United States, and undergraduate classes at a large southwestern university campus. Sixty-eight percent of participants in this sample resided in the southwest, approximately nine percent in the mid-west, six percent in the northeast, six percent in the northwest, and five percent in the south; the remaining participants' locations were unspecified. Participants ranged in age from 18 to 80 years ($M = 31.58$, $SD = 11.57$), with approximately 20 percent of participants indicating they were over the age of 40. Approximately, 63% of the current sample was female and 38% male. These age and gender findings are consistent with national reports of runner demographics (Running USA, 2012).

Most participants reported running “regularly” (50.4%) or “all the time” (30.8%); the fewest amount of participants indicated they run “sometimes,” or at least once in the last four weeks (18.9%).

Materials

A 24-item version of the Sport Motivation Scale-6 (SMS-6; Mallett et al., 2007) with revised instructions applicable to runners was used. Additional materials included informed consent (Appendix A) and a demographic survey (Appendix B). After participants read and agreed to the informed consent, they

were asked to respond to a screener question to assess their eligibility for participation (Appendix B). Below is a brief description of the SMS-6 (Mallett et al., 2007; Appendix B) and the demographic survey:

Sport Motivation Scale-6 (SMS-6; Mallett et al., 2007). This scale is a brief, 24-item measure of sport motivation based on two theoretical applications of self-determination theory (Deci & Ryan, 1991; Vallerand, 1997). In the original scale, participants indicated their reason for participating in their preferred sport; for the purposes of this study, instructions and statements were revised to reflect running specifically. Participants were asked to respond to a series of statements on a scale ranging from 1 (*does not correspond at all*) to 7 (*corresponds exactly*) with respect to their reason for running. The original measure produces six subscale scores for the following theory-driven domains: amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. Scores within each domain range from 4 to 28, such that higher scores indicate more domain specific motivation.

Demographic Survey. An initial screener question was given to assess eligibility; only participants who indicated having run a minimum of one time in the last four weeks were included in the study and directed to complete the remaining demographic and SMS-6 items. The demographic survey consisted of a series of questions related to current and past running, including weekly mileage, longest weekly run, type of running (treadmill, trail, outdoor), length of time running (in years and months). Additional questions were asked to assess whether participants were training for specific types of races currently or had been

in the past year. Lastly, participants were asked to respond to five statements on a scale of 1 (*very unlikely*) to 7 (*very likely*) regarding their intent to continue running in the future. These items were used as a measure of persistence and intended to serve as an external criterion to motivation scores in validating the structure of the SMS-6 for runners.

Procedures

A search was conducted online using Facebook to locate running and triathlon groups across the country. The search terms “running,” “runner,” “triathlete,” and “triathlon” yielded 20 unique online groups with fan pages that allowed for public posting. My personal networks within the running and triathlon community yielded an additional four unique running and fitness online groups. All potential participants were asked to help recruit other potential participants (snowball sampling) within the running, triathlon, and fitness community. Additional participants were also recruited via personal contacts unaffiliated with these online groups; these participants were contacted through email or in-person at local running group events. Further, participants were recruited by sending out emails to the head of the university campus fitness center requesting that she share recruitment information with her staff and students. Potential participants were also recruited from a series of undergraduate career development courses at a large southwestern university. A recruitment letter was sent to the instructors of these courses requesting that they share this information with their students (Appendix A3).

To recruit participants online through Facebook pages, a brief announcement (Appendix A4) was posted weekly to each of the 24 pages mentioned previously. These participants were directed to an online survey link (hosted on Survey Gizmo) and asked to respond to the informed consent form (Appendix A2) before proceeding to the screener question, demographic survey, and SMS-6 items. Participants were told that they could opt-out of the study at any time per Institutional Review Board requirements with no penalty. Potential participants who did not consent to participate and/or were found ineligible based on the screener question were directed to the final page of the survey and thanked for their time. Like all participants, these participants were given the option to be entered in a raffle for one of five \$20 gift cards to Sole Sports, a running store.

Participants recruited through personal email correspondence were sent an email that contained a brief introduction followed by a copy of the informed consent letter (Appendix A1). This letter included a link to the survey, which directed them to an identical informed consent page; participants were asked to give agreement before proceeding to the screener question, demographic survey, and SMS-6 items. Again, those participants who did not indicate consent and/or were found ineligible to participate were thanked for their time and given the option to enter into a raffle.

Still, other participants were recruited in-person at local running group events. These participants were read a script (Appendix A5) and given a link to the survey. This script was slightly modified (Appendix A6) and provided to individuals that volunteered to recruit potential participants at their local running

groups. Again, all potential participants were informed of the voluntary nature of their participation and eligible to enter into the participant raffle whether they chose to participate or not.

The process to recruit participants from undergraduate courses was two-fold: first, a recruitment letter was sent to course instructors (Appendix A3) and next, instructors emailed their students or posted recruitment information on the online forums for their courses. The same procedures were followed after this two-step recruitment process to assess eligibility and compensate these individuals for their voluntary participation.

All participants, regardless of whether they completed the survey, were given the option to enter into a raffle for one of five \$20 gift cards to a local and online-based running store, Sole Sports. A random drawing was conducted two weeks after the close of the study and winners were contacted via email; at this point, winners were asked to provide their address so that their gift card could be sent by mail.

Analyses

Descriptive statistics. Item-level descriptive statistics, including means, standard deviations, ranges, kurtosis, skew, and within-subscale item correlations were reported. Additionally, total scale descriptive statistics were analyzed and reported. Descriptive analyses were conducted using the Statistical Package for the Social Sciences (SPSS) Version 20 (IBM, 2011).

Dimensionality. Given the strong theoretical support for the proposed structure of motivation and subsequent alternative models, it was deemed

appropriate to forgo initial exploratory factor analytic procedures. Instead, a confirmatory factor analysis (CFA) was conducted using Mplus Version 6.11 (Muthen & Muthen, 2011). A robust weighted least squares approach was used to analyze categorical variables. Estimation was conducted using WLMSV, a robust weighted least squares approach within Mplus to accommodate categorical variables, nonnormal item distributions, and the small amount of missing data. All proposed models were specified a priori based on theory.

Global fits of models were evaluated using chi-square, CFI, WRMR, and RMSEA statistics. Best practice suggests that CFI estimates of .95 or greater is acceptable model fit; further, WRMR values less than 1.0 and RMSEA values less than .05 can also be interpreted as good fit (Yu & Muthen, 2002; Hu & Bentler, 1999). Individual parameter estimates were also examined, along with their statistical significance. Standardized parameter estimates were included on a figure for the best fitting model(s). Nested models were compared using the chi-square difference test wherein the null hypothesis is that the unconstrained model does not significantly improve model fit; a significant chi-square change statistic would mean that model fit has been improved by freeing parameter constraints on the original model.

Simplex Structure. Pending satisfactory fit of the measurement model, a simplex structure that replicates the self-determination continuum proposed by past researchers to underlie the SMS-6 (Mallett et al., 2007) was tested using the “randomization test of hypothesized order relations (Hubert & Arabie, 1987 and operationalized by Tracey, 1987)” (Tracey, 2004, p. 1220). The order of relations

of the hypothesized 6 level simplex structure was evaluated, using RANDALL (Tracey, 1997), across the level subscales within each domain area. A simplex structure was evidenced by high correlations among conceptually related motivational concepts and demonstrated an ordering of amotivation to extrinsic motivation to intrinsic motivation.

Chapter 4

RESULTS

Descriptive Analyses

A series of questions were asked to better understand the training and racing patterns of the participants in this sample (See Table 1). This section provides an overview of these results after explaining the process of assessing patterns of missing data.

Missing Data. An analysis of missing data yielded 38 unique patterns of missingness. Most cases ($N = 333$) contained no missing values. There were five other patterns that categorized the response patterns of between three and six participants. After examining the questions that contained missing values, it does not appear that there was any systematic reasoning behind the choice not to respond to these particular items. Of the five unique items that were skipped across these five patterns, each item represented a unique form of motivation. MLR employs full information estimation procedures such that no cases were deleted from the data set due to missingness. No additional procedures were utilized to handle missing data.

Table 1

Descriptive Statistics for Demographic Questions and Persistence Scale Items

	<i>N</i>	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
Attitude toward running (screener)	403	4.12	.695	-.164	-.926
Age	398	31.53	11.569	1.011	.622
Running Training Patterns					
Average weekly mileage	399	20.90	81.816	19.036	373.889
Average days run per week	400	3.62	3.731	13.221	215.297
Average daily mileage	399	4.61	4.842	9.441	124.087
Current longest mileage	400	8.97	8.471	4.781	44.802
Type of Running (percentage out of 100)					
Treadmill	386	20.84	31.729	1.474	.820
Trail	388	15.07	23.882	1.870	2.914
Outside (canal paths, streets, or pavement)	395	64.34	34.697	-.660	-.946
Time Running (months)	392	73.16	92.274	2.548	7.793
Number of Competitive Races (past 12 months)	394	4.18	6.269	3.499	18.974
Competitive Races in past 12 months (by type)					
5K	403	1.41	3.223	6.991	69.021
10K	403	.52	1.228	3.605	15.803
Half marathon	403	.87	1.667	4.133	26.539
Full marathon	403	.41	1.219	6.661	63.001
Marathon Relay	403	.03	.170	5.554	28.987
Ultra marathon	403	.10	.641	9.190	96.176
Other race	403	.72	1.928	3.986	19.647
Competitive Races in past 3 months (by type)					

5K	403	.40	.968	3.858	19.734
10K	403	.18	.632	5.728	42.022
Half marathon	403	.31	.967	7.531	78.023
Full marathon	403	.20	.797	8.129	83.299
Marathon Relay	403	.01	.111	8.843	76.574
Ultra marathon	403	.04	.270	7.658	63.282
Other race	403	.24	.878	8.880	113.987
Persistence Scale Items					
I will continue to run regularly	398	6.17	1.492	-2.106	3.864
I can't imagine anything stopping me from running	396	5.18	1.789	-.709	-.574
Running will remain constant in my life	399	5.64	1.571	-1.048	.285
I am signed up to compete in future races	380	4.84	2.321	-.503	-1.357
I will make time for running in the future	400	6.05	1.441	-1.682	2.207

Running Patterns. Participants ($N=392$) reported having run for an average of six years ($M = 73.16$ months, $SD = 92.27$ months) with a range from zero to 50 years and a median time spent running of three years. Two participants responses were excluded from this analysis because they indicated an amount that exceeded their age. Half the sample (49.4%) reported running between zero and 14 miles a week; approximately 10 percent of participants report averaging 20 miles a week and 9 percent report logging between 30 and 50 miles a week. Average weekly mileage equated to just over 16 miles ($M = 16.95$, $SD = 14.58$) with a maximum mileage of 110. Most participants stated they run a few times a week ($M = 3.4$ days, $SD = 1.44$) at low mileage ($M = 4.2$ miles, $SD = 2.4$) and incorporate a longer run into their routine of approximately 9 miles ($M = 8.73$ miles, $SD = 6.94$). The largest proportion of participants (27%) reported a long run of more than 10 miles; a portion of participants (5%) reported a long run of more than 20 miles (and two participants reported a long run of 50 miles). Participants were asked to indicate the percent of time they spend running on a treadmill, on a trail, or outside to total 100 percent. The most time, on average, was spent running outside ($M = 64.34\%$, $SD = 34.7\%$) and the least amount of time, on average, was spent trail running ($M = 15\%$, $SD = 23.88\%$).

Race History. Participants were asked to report on the number of competitive races they had completed in the past 12 months ($M = 4.18$, $SD = 6.3$). Further, they were asked to indicate the number of those races that were 5K ($M = 1.41$, $SD = 3.2$), 10K ($M = 1.41$, $SD = 3.2$), half marathon ($M = 0.87$, $SD = 1.67$),

full marathon ($M = .41$, $SD = 1.22$), marathon relay ($M = 0.03$, $SD = -0.17$), ultra marathon ($M = 0.10$, $SD = -0.64$), and other ($M = 0.72$, $SD = 1.93$) distances.

Upcoming Races. Participants indicated which types of races they were planning to complete in the next three months: 5K ($M = 0.40$, $SD = 0.97$), 10K ($M = 0.18$, $SD = 0.63$), half marathon ($M = 0.31$, $SD = 0.96$), full marathon ($M = 0.20$, $SD = 0.80$), marathon relay ($M = 0.01$, $SD = -0.11$), ultra marathon ($M = 0.04$, $SD = -0.27$), and other ($M = 0.24$, $SD = 0.89$). Participants reported that they were currently training for a 5K (12.2%), 10K (9.4%), half marathon (20.1%), full marathon (14.6%), marathon relay (0.7%), ultra marathon (2.7%), or other type of race (16.9%). Given that sampling included triathlons groups, it is likely that “other” included triathlon or cycling events. Further, it is worth noting that at the time of this study, the triathlon season had just begun which may explain the high percentage of participants reporting “other” races.

Persistence. On a scale of 1 (*very unlikely*) to 7 (*very likely*), participants were asked to indicate their intent to continue running in the future. Participants were most likely to believe they would continue to run regularly ($M = 6.17$, $SD = 1.49$) and make time for running in the future ($M = 6.05$, $SD = 1.44$). They were moderately likely to indicate they didn’t believe anything would stop them from running ($M = 5.18$, $SD = 1.79$) and that running would remain constant in their lives ($M = 5.64$, $SD = 1.57$). The most variable item was whether individuals believed they would compete in future events ($M = 4.84$, $SD = 2.32$), which suggests that competition may only explain a portion of what contributes to long-term running behavior. The persistence scale was conceptualized as

unidimensional and coefficient alpha was computed as an internal consistency estimate of reliability; there was support for strong internal consistency of these items ($a = .89$).

Inter-item correlations were calculated to establish evidence of discriminant validity. There was a significant strong positive relationship between an individual's likelihood to continue to run regularly and the likelihood that he or she would make time for running in the future ($r = .775, p < .001$). Similarly, an individual's likelihood to continue to run regularly was significantly positively related to his or her belief that running would remain a constant in his or her life ($r = .736, p < .001$). Individuals who were likely to believe that nothing would stop them from running were also more likely to report a belief that running would remain constant in their life ($r = .785, p < .001$) and that they would make time for running in the future ($r = .730, p < .001$). Further, for those who believed that running would remain constant in their lives, they were significantly more likely to believe they would make time for running ($r = .839, p < .001$). Overall, correlations between an individual's likelihood to sign up to compete in future races and any other item in this set were low, but statistically significant (See Table 2).

Table 2

Inter-item Correlations for Persistence Scale Items

Item	Continue to run regularly	Nothing will stop me from running	Running will remain a constant	Sign up to compete in future races
Nothing will stop me from running	.653**			
Running will remain a constant	.736**	.785**		
Sign up to compete in future races	.464**	.512**	.547**	
Make time for running in the future	.775**	.730**	.839**	.564**

Note: ** $p < .001$

Motivation for Running. Item level descriptive statistics for the SMS-6 for the current sample of runners can be found in Table 3 and Table 4. Skewness and kurtosis values ranged from -.02 to 2.40 and -1.30 to 5.50, respectively. An examination of the histogram plots for all items revealed that skew values above 1.0 for questions 5, 12, 17, 22, and 24 were indicative of high disagreement with these items. Items 5, 12, 17, and 22 are all associated with amotivation and item 24 was associated with external regulation; item content is located in Table 3. The remaining items had skew values close to 1.0.

All items were measured on a scale of 1 (*does not correspond at all*) to 7 (*corresponds exactly*), with no reverse scored items, such that high values on any of the original subscales indicates high levels of domain specific motivation. The mean scores across items in this sample suggested that participants do not identify

as being amotivated; the highest mean scores were on items associated with more value driven types of extrinsic motivation and intrinsic motivation. These values further suggest a slightly negatively skewed distribution of scores; in other words, motivation was not normally distributed for this population.

Table 3

Item-level Descriptive Statistics for SMS-6

Item (Original Subscale)	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
Q5: I don't know anymore; I have the impression of being incapable of succeeding at running (AM)	1.75	1.34	1.95	3.14
Q12: I don't know if I want to continue to invest my time and effort as much in running anymore (AM)	1.65	1.13	2.02	4.04
Q17: It is not clear to me anymore; I don't really think my place is in running (AM)	1.58	1.16	2.40	5.50
Q22: I don't seem to be enjoying running as much as I previously did (AM)	1.96	1.46	1.60	1.77
Q4: Because running allows me to be well regarded by people that I know (EXT)	3.24	1.82	.41	-.96
Q11: For the prestige of being a runner (EXT)	2.94	1.67	.49	-.83
Q19: For the material and/or social benefits of being a runner (EXT)	3.31	1.89	.33	-1.13
Q24: To show others how good I am at running (EXT)	2.15	1.48	1.31	.86
Q7: Because it is absolutely necessary to run if one wants to be in shape (ITJ)	4.24	1.89	-.31	-1.05
Q10: Because I must run to feel good about myself (ITJ)	3.99	1.87	-.02	-1.18
Q16: Because I would feel bad if I was not taking time to run (ITJ)	4.12	1.80	-.13	-1.15
Q23: Because I must run regularly (ITJ)	3.97	1.83	.003	-1.13
Q3: Because running is a good way to learn lots of	4.27	1.89	-.18	-1.22

things which could be useful to me in other areas of my life (IDT)				
Q8: Because running is one of the best ways I have chosen to develop other aspects of my life (IDT)	4.33	1.79	-.18	-1.03
Q15: Because running is one of the best ways to maintain good relationships with my friends (IDT)	3.08	1.88	.50	-.97
Q20: Because training hard will improve my performance (IDT)	4.54	1.78	-.41	-.91
Q2: Because running part of the way in which I've chosen to live my life (ING)	4.99	1.79	-.66	-.66
Q9: Because running is an extension of me (ING)	4.11	1.97	-.14	-1.30
Q13: Because running is consistent with my deepest principles (ING)	3.47	1.90	.33	-1.10
Q21: Because running is an integral part of my life (ING)	4.52	1.97	-.32	-1.20
Q1: For the excitement I feel when I am really involved in running (IM)	4.76	1.77	-.59	-.71
Q6: Because I feel a lot of personal satisfaction from mastering certain difficult training techniques (IM)	4.49	1.84	-.44	-.10
Q14: For the satisfaction I experience when I am perfecting my abilities to run (IM)	4.52	1.73	-.48	-.77
Q18: For the pleasure of discovering new running performance strategies (IM)	3.39	1.82	.19	-1.18

Note: Abbreviations based on original subscales (Mallett et al., 2007) of amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

Table 4

Sport Motivation Scale-6 Inter-item Correlations

SMS-6 Inter-Item Correlations								
Item (Subscale)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Q1 (IM)	1							
Q2 (ING)	.696**	1						
Q3 (IDT)	.618**	.595**	1					
Q4 (EXT)	.485**	.348**	.492**	1				
Q5 (AM)	-.199**	-.253**	-0.047	.117*	1			
Q6 (IM)	.452**	.463**	.445**	.380**	-.138**	1		
Q7 (ITJ)	0.065	0.071	0.082	.203**	.142**	.162**	1	
Q8 (IDT)	.542**	.623**	.701**	.416**	-0.09	.449**	.189**	1
Q9 (ING)	.707**	.737**	.641**	.402**	-.202**	.394**	0.066	.664**
Q10 (ITJ)	.315**	.304**	.247**	.364**	0.044	.196**	.364**	.415**
Q11 (EXT)	.458**	.324**	.359**	.635**	0.043	.367**	.228**	.375**
Q12 (AM)	-.330**	-.377**	-.177**	-.118*	.537**	-.251**	0.007	-.236**
Q13 (ING)	.530**	.592**	.635**	.402**	-0.035	.375**	.131**	.655**
Q14 (IM)	.557**	.500**	.426**	.352**	-.197**	.587**	0.075	.486**
Q15 (IDT)	.375**	.395**	.362**	.453**	0.059	.341**	.147**	.442**
Q16 (ITJ)	.441**	.447**	.289**	.331**	-0.017	.316**	.311**	.439**
Q17 (AM)	-.337**	-.430**	-.175**	-0.083	.529**	-.223**	0.036	-.210**
Q18 (IM)	.508**	.449**	.464**	.385**	-0.067	.627**	.111*	.529**
Q19 (EXT)	.421**	.313**	.325**	.435**	.114*	.344**	0.096	.382**
Q20 (IDT)	.432**	.413**	.352**	.365**	-0.09	.571**	.218**	.474**
Q21 (ING)	.587**	.787**	.550**	.330**	-.245**	.444**	0.084	.651**
Q22 (AM)	-.221**	-.280**	-.112*	-0.086	.486**	-.230**	0.004	-.184**
Q23 (ITJ)	.349**	.479**	.295**	.310**	-0.094	.328**	.363**	.452**

Q24 (EXT)	.255**	.144**	.176**	.491**	.182**	.213**	.149**	.176**
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Note. ** indicates p-value < .001; * indicates p-value < .05; Abbreviations for subscales are as follows: amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

SMS-6 Inter-Item Correlations (continued)								
Item (Subscale)	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Q9 (ING)	1							
Q10 (ITJ)	.362**	1						
Q11 (EXT)	.462**	.443**	1					
Q12 (AM)	-.315**	-.116*	-0.09	1				
Q13 (ING)	.658**	.314**	.392**	-.171**	1			
Q14 (IM)	.529**	.303**	.370**	-.272**	.471**	1		
Q15 (IDT)	.441**	.307**	.417**	-0.072	.417**	.321**	1	
Q16 (ITJ)	.411**	.491**	.365**	-.147**	.371**	.368**	.464**	1
Q17 (AM)	-.300**	-.101*	-0.098	.692**	-.189**	-.271**	-0.058	-.159**
Q18 (IM)	.539**	.245**	.432**	-.144**	.491**	.561**	.427**	.357**
Q19 (EXT)	.384**	.243**	.455**	-0.012	.379**	.338**	.635**	.363**
Q20 (IDT)	.416**	.289**	.382**	-.201**	.427**	.553**	.350**	.338**
Q21 (ING)	.747**	.344**	.387**	-.331**	.643**	.525**	.470**	.526**
Q22 (AM)	-.218**	-.125*	-0.099	.604**	-.149**	-.228**	-0.027	-0.085
Q23 (ITJ)	.438**	.445**	.366**	-.168**	.459**	.359**	.318**	.538**
Q24 (EXT)	.252**	.263**	.520**	0.032	.203**	.245**	.303**	.224**

Note. ** $p < .001$; * $p < .05$; Abbreviations for subscales are as follows: amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

SMS-6 Inter-Item Correlations (continued)								
Item (Subscale)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
Q18 (IM)	-.147**	1						
Q19 (EXT)	0.004	.489**	1					
Q20 (IDT)	-.178**	.574**	.359**	1				
Q21 (ING)	-.355**	.501**	.386**	.550**	1			
Q22 (AM)	.550**	-.108*	0.019	-.177**	-.264**	1		
Q23 (ITJ)	-.214**	.381**	.318**	.457**	.594**	-.137**	1	
Q24 (EXT)	0.034	.282**	.359**	.296**	.232**	0.071	.288**	1

Note. ** $p < .001$; * $p < .05$; Abbreviations for subscales are as follows: amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

Alternative Measurement Models

Global fit indices for the models are shown in Table 5. Some of the proposed models demonstrated adequate fit, while others did not fit the data. The unidimensional model did not adequately fit the data, $\chi^2(252) = 2946.58, p < .001$; WRMR = 2.90; RMSEA = .164; CFI = .802. A two-factor model of motivation to account for a factor of amotivation and a combined factor of intrinsic/extrinsic motivation also poorly fit the data, $\chi^2(251) = 1864.29, p < .001$; WRMR = 2.12; RMSEA = .127; CFI = .881; however, it was an improvement over the unidimensional model, $\chi^2(1) = 170.81, p < .001$. Consistent with Figure 6, a three-factor model was built to evaluate whether motivation was best explained by amotivation, extrinsic motivation, and intrinsic motivation wherein all factors were allowed to correlate with each other. This model resulted in similarly poor fit, $\chi^2(249) = 1807.339, p < .001$; WRMR = 2.06; RMSEA = .125; CFI = .885, although it demonstrated improvement in fit over the two-factor model, $\chi^2(2) = 48.83, p < .001$. Amotivation was moderately negatively correlated with both extrinsic motivation ($r = -.398, p < .001$) and intrinsic motivation ($r = -.487, p < .001$). There was a strong and positive correlation between extrinsic motivation and intrinsic motivation ($r = .874, p < .001$).

Table 5

Global Fit Indices of Alternative Measurement Models for the SMS-6

Model	χ^2	df	CFI	WRMR	RMSEA
Unidimensional	2946.58	252	.802	2.90	.164
Two-factor	1864.29	251	.881	2.12	.127
Three-factor	1806.339	249	.885	2.06	.125
Six-factor	1143.86	237	.933	1.53	.098
Four-factor	1342.88	246	.919	1.71	.106
Second-order factor model	1807.340	249	.885	2.06	.125
Bi-factor with six specific factors	1227.78	228	.926	1.60	.105
Bi factor with three specific factors	1309.17	228	.920	1.59	.109

Note: CFI = comparative fit index; WRMR = weighted root mean square residual; RMSEA = root mean square error of approximation

To examine the structure of motivation found by Mallett et al. (2007), a six-factor model with underlying factors of amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation was estimated next. This model produced adequate model fit, $\chi^2(237) = 1143.86, p < .001$; WRMR = 1.53; RMSEA = .098; CFI = .933 and demonstrated improvement in fit over the three-factor model, $\chi^2(12) = 421.023, p < .001$. As shown in Table 6, there was a strong correlation between identified regulation and integrated regulation ($r = .926, p < .001$), which suggested these factors may not be distinct types of motivation.

Table 6

Inter-factor Correlations for the Six-factor Model of Motivation

Factor	Amotivation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation
External Regulation	-.011				
Introjected Regulation	-.262*	.639*			
Identified Regulation	-.328*	.796*	.706*		
Integrated Regulation	-.555*	.582*	.702*	.926*	
Intrinsic Motivation	-.486*	.704*	.597*	.910*	.841*

Note: * $p < .001$

Similarly, there were high correlations between identified regulation and intrinsic motivation ($r = .910, p < .001$) and between integrated regulation and intrinsic motivation ($r = .841, p < .001$). A closer examination of the standardized factor loadings indicated that all items loaded strongly on their respective factors except for Item 7 ($\lambda = .331, p < .001$) on introjected regulation; this item had a

residual variance of .89. Item 7 reads, “Because it is absolutely necessary to run if one wants to be in shape;” this item may be more closely associated with aspects of identified regulation, which encompass behavioral actions done because they hold some value to the individual. In contrast, identified regulation explains behaviors done because of external contingencies. Perhaps being in shape is interpreted as more value-driven than reward-based for this population. One other area of misfit was noted on item 24 (external regulation) which had a residual variance of .65. Standardized parameter estimates for this model can be seen in Figure 12.

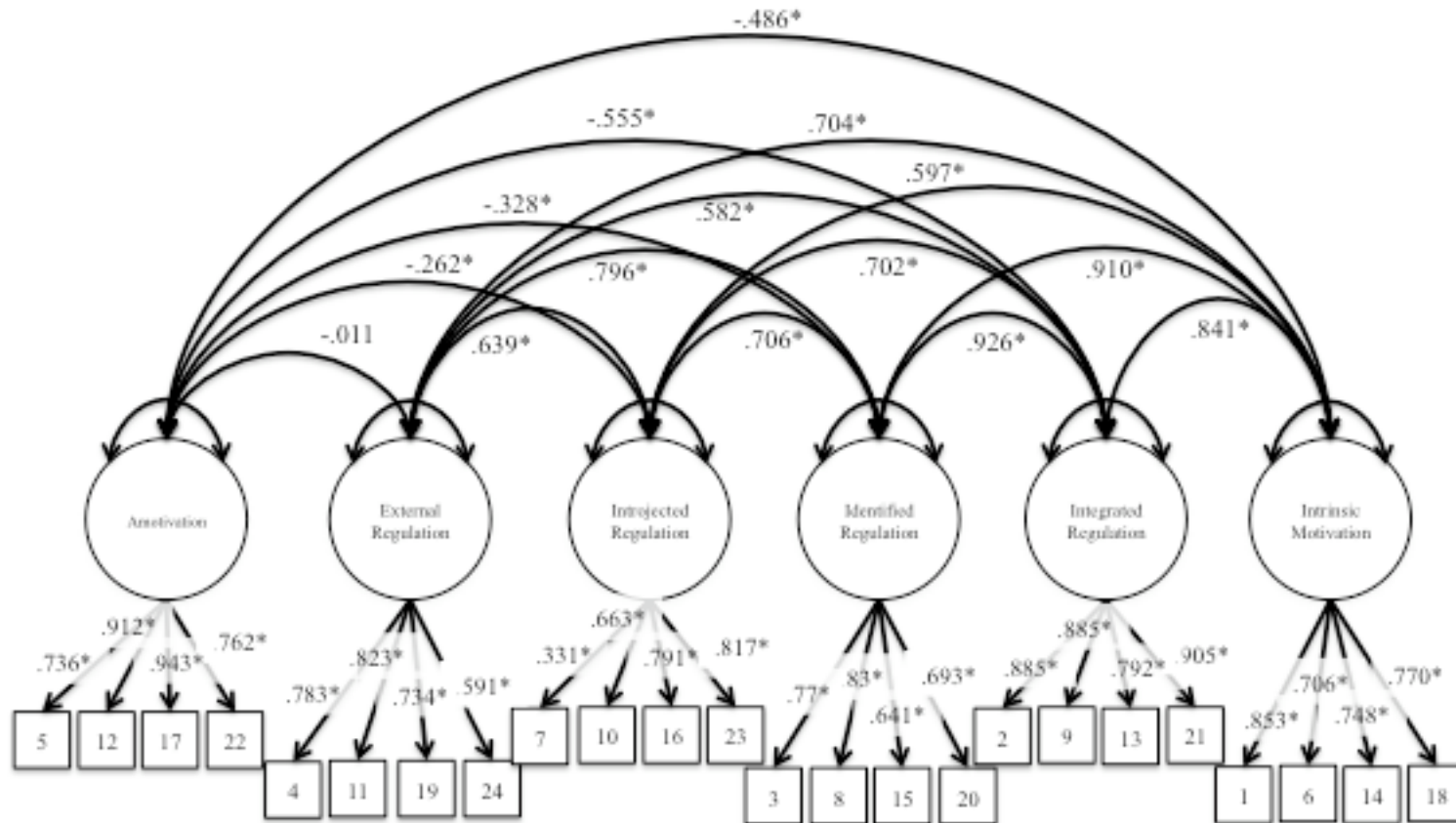


Figure 12. A six-factor model of motivation with standardized parameter estimates. All factor loadings and factor correlations with * were significant at $p < .001$. Error terms were excluded for simplicity.

Given the strong correlations among identified regulation, integrated regulation, and intrinsic motivation, a four-factor model (Figure 13) wherein identified regulation, integrated regulation, and intrinsic motivation were collapsed into one factor with twelve indicators, and amotivation, external regulation and introjected regulation were kept the same as in the previous model. This model also produced poor model fit, $\chi^2(246) = 1342.879, p < .001$; WRMR = 1.708; RMSEA = .106; CFI = .919. The combined factor of identified regulation, integrated regulation and intrinsic motivation was negatively correlated with amotivation ($r = -.495, p < .001$) and positively correlated with external regulation ($r = .71, p < .001$) and introjected regulation ($r = .70, p < .001$). Furthermore, there was a strong positive correlation between external regulation and introjected regulation ($r = .639, p < .001$). There was a low, but statistically significant negative relationship between amotivation and introjected regulation ($r = -.262, p < .001$). Residual variances were above .89 for item7 (introjected regulation) and above .61 for items 24 (external regulation) and item 15 (identified regulation).

Next, a hierarchical model was tested with three first-order factors (amotivation, extrinsic motivation, and intrinsic motivation) and a second-order general factor of motivation (Figure 8). This model yielded poor model fit, $\chi^2(249) = 1807.340, p < .001$; WRMR = 2.063; RMSEA = .125; CFI = .885. Given the poor fit indices, no further examination of this model was conducted.

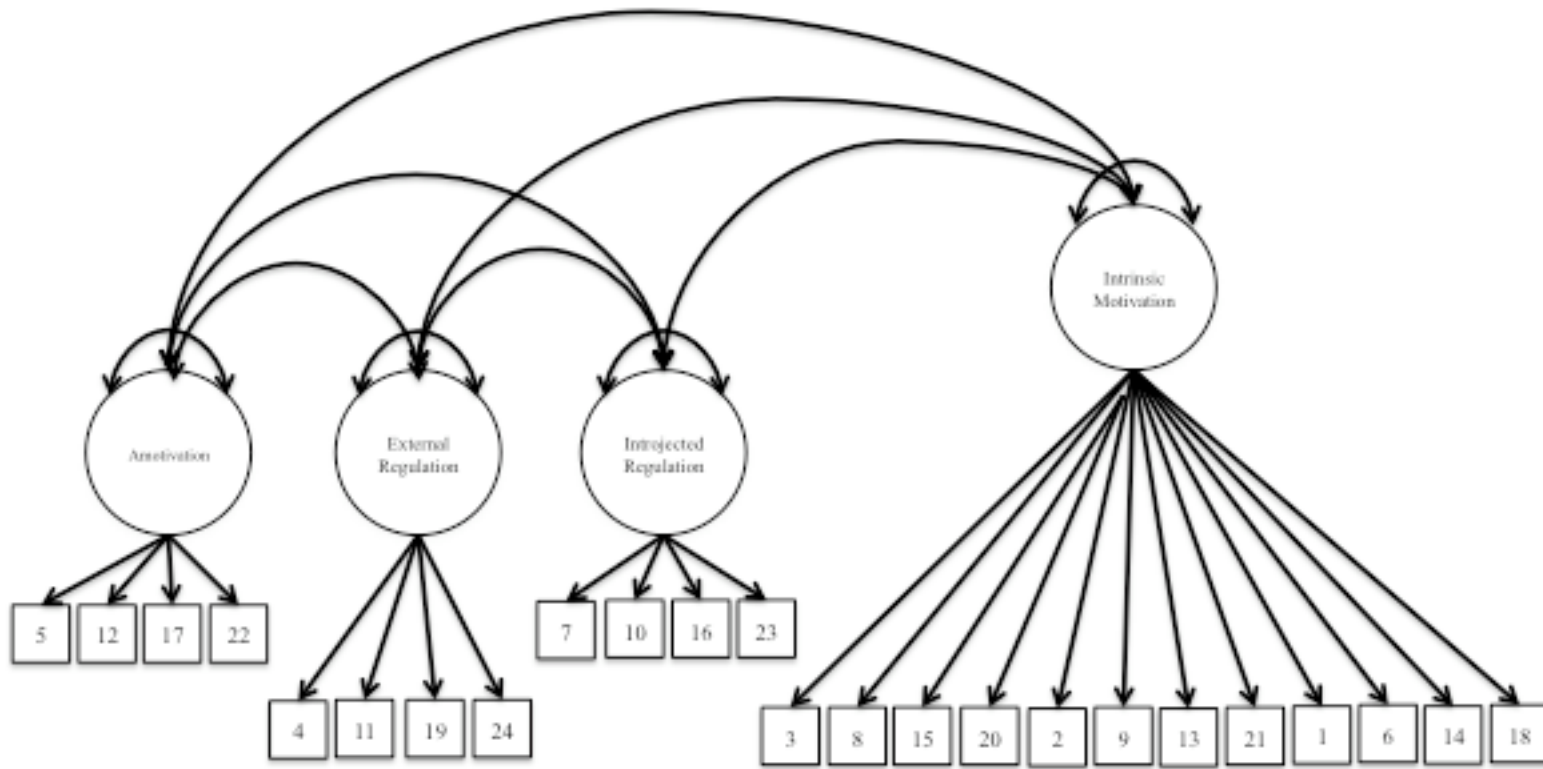


Figure 13. A four-factor model of motivation (specified post hoc). Error terms were excluded for simplicity.

A bi-factor model with one general factor of motivation that underlies all items and six domain specific factors was tested next (Figure 9). This model produced adequate overall model fit, $\chi^2(228) = 1227.78, p < .001$; WRMR = 1.60; RMSEA = .105; CFI = .936, and comparable fit indices to the six-factor model (Figure 7). Despite reasonable fit, the factor loading of item 3, “because running is a good way to learn lots of things which could be useful to me in other areas of my life,” on integrated regulation had a negative residual variance, which suggested misfit. Further, item 15, “because running is one of the best ways to maintain good relationships with my friends” had a nonsignificant factor loading on integrated regulation. Item 1 on intrinsic motivation, “for the excitement I feel when I am really involved in running” also had a nonsignificant factor loading. All parameter estimates for this model can be seen in Figure 14.

An alternative bi-factor model with only three specific factors and one general factor was examined (Figure 10) and also yielded adequate fit, $\chi^2(228) = 1309.17, p < .001$; WRMR = 1.59; RMSEA = .109; CFI = .920. By examining the factor loadings, the extrinsic motivation factor appeared bipolar because it consisted of both negative and positive loadings; however, only one of the negatively correlated factor loadings was significant. This makes sense given that the four distinct types of extrinsic motivation were collapsed into one factor in this model and the items associated with more internal forms of extrinsic motivation (i.e., items related to lifestyle choices and values) had stronger positive factor loadings. The general underlying factor of motivation was also bipolar and ranged from negative to positive factor loadings (-.171 to .856).

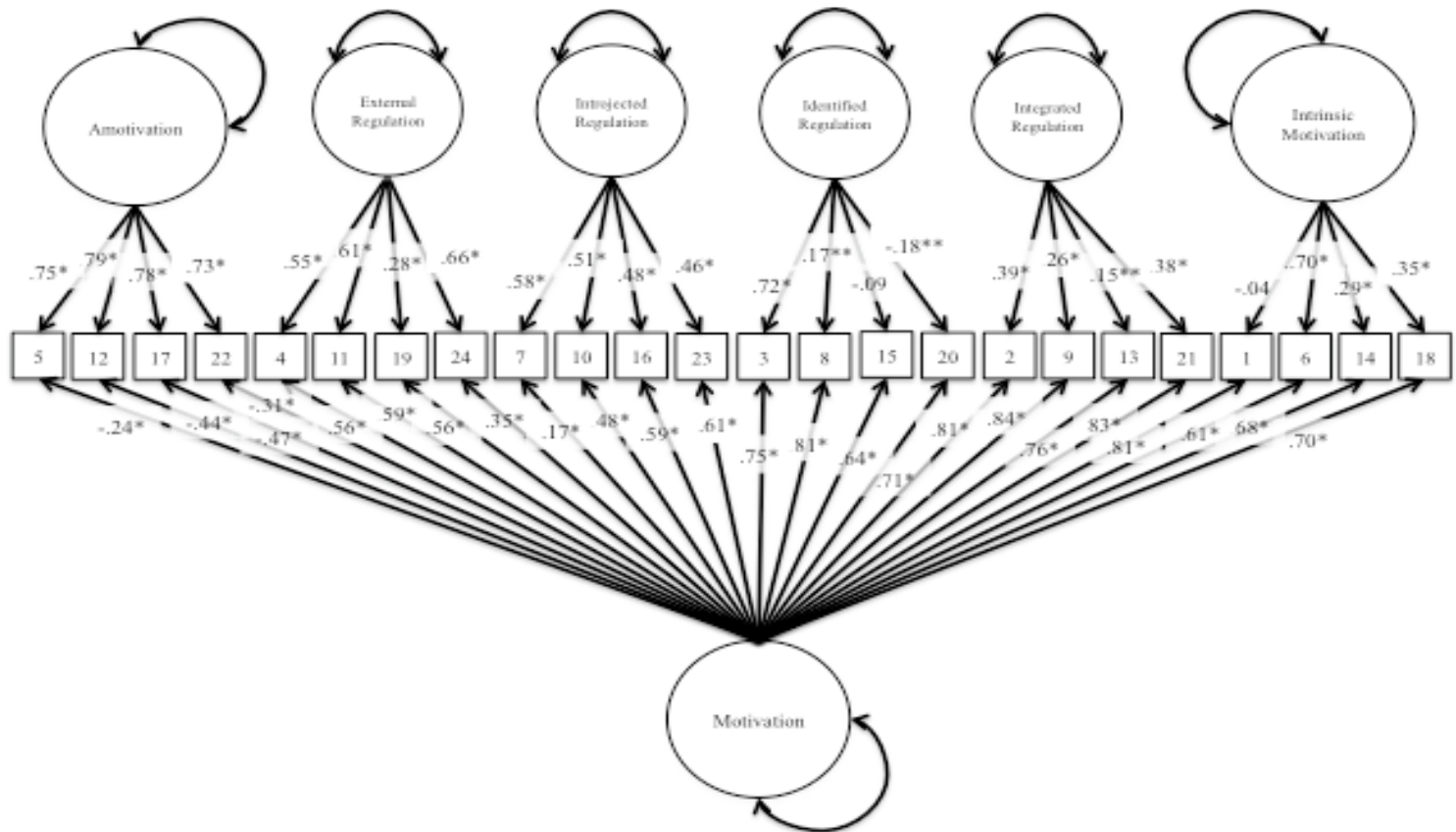


Figure 14. A bi-factor model of motivation with one general factor and six specific factors with parameter estimates. For clarification, * indicates factor loadings were significant at $p < .001$ and ** $p < .01$.

Simplex Structure

Given the adequate, yet marginal, overall fit of the six-factor model, it was inappropriate to examine the presence of a simplex pattern. Therefore, Hypothesis 2 for this sample was not tested and the procedures set forth previously for evaluating this structure were not followed.

Motivation for Future Running

A goal of this study was to determine the practical utility of using the SMS-6 with runners and so it was hypothesized that the most appropriate structure of motivation would help to discriminate these runners based on their likelihood to persist in the future. Given that the six-factor structure of motivation proposed by previous researchers (Mallett et al., 2007) produced adequate, yet still only marginal model fit for this sample, no subsequent analyses were conducted to examine the correlations between motivation and intention to run in the future (Hypothesis 3).

Post-hoc Exploratory Analyses

Although the six-factor model of motivation (Figure 7) and the bi-factor model with one general factor and six specific factors (Figure 9) were the best fitting models of all alternative models examined, they did not produce good enough fit (Hu & Bentler, 1999) to explain motivation appropriately for this sample. To better understand motivation among runners, a series of exploratory factor analytic procedures were conducted using SPSS Version 20 (IBM, 2011).

First, exploratory factor analysis using principal axis factoring with direct oblimin rotation was conducted on all 24 items. Four criteria were used to

determine the number of factors to retain: a priori knowledge of the theory underlying this measure, the scree plot, parallel analysis, and the interpretability of the factor solution. A priori theory warranted an initial extraction of six factors wherein the first three factors accounted for the largest amount of variance, 38%, 10% and 4.6%, respectively. A parallel analysis using principal axis factoring permutations of the raw data set because of the non-normal distribution of scores was conducted in SPSS (O'Connor, 2000). This procedure was examined at the 95th percentile and suggested a three-factor solution and it was unclear in combination with the scree plot whether a two- or three-factor solution would be most appropriate. Parallel analysis with principal axis factoring can have a tendency to over factor, which can include additional, non-meaningful factors (Crawford et al., 2010). Further, knowledge of self-determination theory (Deci & Ryan, 1985, 2000) further justified exploring both a two- and three-factor solution using principal axis factoring with direct oblimin rotation.

The two-factor rotated solutions are located in Table 7 and 8. Table 7 contains the factor coefficients from the structure matrix, which shows the variance in a measured variable explained by a factor on both a unique and common contributions basis. In contrast, Table 8 contains the factor loadings from the pattern matrix, which only account for unique contributions of the variables. It is expected that as more factors are retained, the factor loadings contained in the pattern matrix will be lower as there will be less unique contributions. It is important to use both the structure and pattern matrix when making interpretations based on oblique rotations. In the two-factor model, the

most interpretable explanation of the factors is that motivation is best defined for this sample in terms of a general motivation factor and an external contingencies/accolades factor. The general motivation factor accounted for 50 percent of the variance in these scores and it included aspects of doubt/questioning (amotivation) to health/relationships (extrinsic motivation) to personal satisfaction (intrinsic motivation). The external contingencies/accolades factor explained an additional 3.7 percent of the variance and accounts for motivation based on prestige, social benefits, improved abilities, and a deeper sense of self.

Table 7

*Structure Coefficients for Exploratory Factor Analysis with Direct Oblimin
Rotation of SMS-6 – Two-factor solution*

Item (Original Subscale)	General Motivation	External Accolades
Q5: I don't know anymore; I have the impression of being incapable of succeeding at running (AM)	.649	.579
Q17: It is not clear to me anymore; I don't really think my place is in running (AM)	.791	.749
Q22: I don't seem to be enjoying running as much as I previously did (AM)	.736	.523
Q4: Because running allows me to be well regarded by people that I know (EXT)	.601	.545
Q24: To show others how good I am at running (EXT)	.988	.758
Q7: Because it is absolutely necessary to run if one wants to be in shape (ITJ)	.686	.639
Q16: Because I would feel bad if I was not taking time to run (ITJ)	.717	.514
Q23: Because I must run regularly (ITJ)	.513	.404
Q3: Because running is a good way to learn lots of things which could be useful to me in other areas of my life (IDT)	.596	.451
Q8: Because running is one of the best ways I have chosen to develop other aspects of my life (IDT)	.989	.759
Q15: Because running is one of the best ways to maintain good relationships with my friends (IDT)	.693	.653
Q20: Because training hard will improve my performance (IDT)	.584	.552
Q2: Because running is part of the way in which I've chosen to live my life (ING)	.772	.591
Q1: For the excitement I feel when I am really involved in running (IM)	.692	.527
Q6: Because I feel a lot of personal satisfaction from mastering certain difficult training techniques (IM)	.696	.538
Q18: For the pleasure of discovering new running performance strategies (IM)	.618	.490
Q12: I don't know if I want to continue to invest my time and effort as much in running anymore (AM)	.573	.816
Q11: For the prestige of being a runner (EXT)	.612	.636
Q19: For the material and/or social benefits of being a runner (EXT)	.516	.576
Q10: Because I must run to feel good about myself (ITJ)	.755	.783
Q9: Because running is an extension of me (ING)	.724	.878
Q13: Because running is consistent with my deepest principles (ING)	.554	.566
Q21: Because running is an integral part of my life (ING)	.614	.807
Q14: For the satisfaction I experience when I am perfecting my abilities to run (IM)	.629	.714

Note: Abbreviations based on original subscales (Mallett et al., 2007) of amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

Table 8

Factor Loadings for Exploratory Factor Analysis with Direct Oblimin Rotation of SMS-6 – Two-factor solution

Item (Original Subscale)	General Motivation	External Accolades
Q5: I don't know anymore; I have the impression of being incapable of succeeding at running (AM)	.500	.195
Q17: It is not clear to me anymore; I don't really think my place is in running (AM)	.526	.345
Q22: I don't seem to be enjoying running as much as I previously did (AM)	.814	-.102
Q4: Because running allows me to be well regarded by people that I know (EXT)	.445	.203
Q24: To show others how good I am at running (EXT)	.990	-.002
Q7: Because it is absolutely necessary to run if one wants to be in shape (ITJ)	.474	.275
Q16: Because I would feel bad if I was not taking time to run (ITJ)	.786	-.089
Q23: Because I must run regularly (ITJ)	.493	.026
Q3: Because running is a good way to learn lots of things which could be useful to me in other areas of my life (IDT)	.610	-.018
Q8: Because running is one of the best ways I have chosen to develop other aspects of my life (IDT)	.989	-.001
Q15: Because running is one of the best ways to maintain good relationships with my friends (IDT)	.466	.295
Q20: Because training hard will improve my performance (IDT)	.390	.252
Q2: Because running is part of the way in which I've chosen to live my life (ING)	.775	-.004
Q1: For the excitement I feel when I am really involved in running (IM)	.701	-.012
Q6: Because I feel a lot of personal satisfaction from mastering certain difficult training techniques (IM)	.690	.008
Q18: For the pleasure of discovering new running performance strategies (IM)	.589	.038
Q12: I don't know if I want to continue to invest my time and effort as much in running anymore (AM)	-.131	.917
Q11: For the prestige of being a runner (EXT)	.302	.405
Q19: For the material and/or social benefits of being a runner (EXT)	.180	.438
Q10: Because I must run to feel good about myself (ITJ)	.373	.497
Q9: Because running is an extension of me (ING)	.121	.785
Q13: Because running is consistent with my deepest principles (ING)	.291	.343
Q21: Because running is an integral part of my life (ING)	-.014	.818
Q14: For the satisfaction I experience when I am perfecting my abilities to run (IM)	.198	.561

Note: Abbreviations based on original subscales (Mallett et al., 2007) of amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

The three-factor rotated solutions (Table 9 and 10) explained the data slightly differently. In this model, the best explanation of motivation is that it is defined by a general factor, an external contingencies/accolades factor, and an isolation/solitude factor; items had strong positive cross loadings between the first two factors and low and/or moderately negative correlations with the third factor. The general motivation factor explained 50.19 percent of the variance, the external contingencies/accolades factor explained 3.7 percent, and the isolation/solitude factor accounted for an additional 3.15 percent of the variance in motivation among runners. The third factor appeared to account for an absence of concern toward gaining prestige or recognition from others, maintaining relationships, or staying in shape. The highly cross-loaded items on the third factor suggest that there may be some residual variance explained. Interpretation of this third factor should be done with caution.

Table 9

Structure Coefficients for Exploratory Factor Analysis with Direct Oblimin Rotation of SMS-6 – Three-factor Solution

Item (Original Subscale)	General Motivation	External Accolades	Isolation – Solitude
Q5: I don't know anymore; I have the impression of being incapable of succeeding at running (AM)	.655	.541	-.373
Q17: It is not clear to me anymore; I don't really think my place is in running (AM)	.798	.704	-.316
Q22: I don't seem to be enjoying running as much as I previously did (AM)	.736	.538	-.486
Q4: Because running allows me to be well regarded by people that I know (EXT)	.605	.507	-.361
Q24: To show others how good I am at running (EXT)	.988	.795	-.056
Q7: Because it is absolutely necessary to run if one wants to be in shape (ITJ)	.689	.605	-.378
Q16: Because I would feel bad if I was not taking time to run (ITJ)	.717	.543	-.024
Q23: Because I must run regularly (ITJ)	.512	.428	-.005
Q3: Because running is a good way to learn lots of things which could be useful to me in other areas of my life (IDT)	.595	.473	-.031
Q8: Because running is one of the best ways I have chosen to develop other aspects of my life (IDT)	.988	.794	-.059
Q15: Because running is one of the best ways to maintain good relationships with my friends (IDT)	.694	.629	-.318
Q20: Because training hard will improve my performance (IDT)	.587	.515	-.362
Q2: Because running is part of the way in which I've chosen to live my life (ING)	.771	.610	-.095
Q1: For the excitement I feel when I am really involved in running (IM)	.692	.553	-.036
Q6: Because I feel a lot of personal satisfaction from mastering certain difficult training techniques (IM)	.696	.571	-.003
Q18: For the pleasure of discovering new running performance strategies (IM)	.616	.511	-.047
Q12: I don't know if I want to continue to invest my time and effort as much in running anymore (AM)	.568	.787	-.316
Q11: For the prestige of being a runner (EXT)	.609	.683	.039
Q19: For the material and/or social benefits of being a runner (EXT)	.511	.617	.028
Q9: Because running is an extension of me (ING)	.719	.848	-.369
Q10: Because I must run to feel good about myself (ITJ)	.751	.838	.018
Q13: Because running is consistent with my deepest principles (ING)	.551	.614	.066
Q21: Because running is an integral part of my life (ING)	.609	.773	-.365
Q14: For the satisfaction I experience when I am perfecting my abilities to run (IM)	.623	.770	.035

Note: Abbreviations based on original subscales (Mallett et al., 2007) of amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM).

Table 10

Factor Loadings for Exploratory Factor Analysis with Direct Oblimin Rotation of SMS-6 – Three-factor Solution

Item (Original Subscale)	General Motivation	External Accolades	Isolation – Solitude
Q5: I don't know anymore; I have the impression of being incapable of succeeding at running (AM)	.589	.034	-.287
Q17: It is not clear to me anymore; I don't really think my place is in running (AM)	.627	.152	-.376
Q22: I don't seem to be enjoying running as much as I previously did (AM)	.815	-.102	-.004
Q4: Because running allows me to be well regarded by people that I know (EXT)	.529	.048	-.281
Q24: To show others how good I am at running (EXT)	.950	.062	.084
Q7: Because it is absolutely necessary to run if one wants to be in shape (ITJ)	.549	.129	-.283
Q16: Because I would feel bad if I was not taking time to run (ITJ)	.758	-.041	.073
Q23: Because I must run regularly (ITJ)	.459	.079	.071
Q3: Because running is a good way to learn lots of things which could be useful to me in other areas of my life (IDT)	.585	.022	.053
Q8: Because running is one of the best ways I have chosen to develop other aspects of my life (IDT)	.951	.061	.080
Q15: Because running is one of the best ways to maintain good relationships with my friends (IDT)	.516	.190	-.218
Q20: Because training hard will improve my performance (IDT)	.467	.104	-.282
Q2: Because running is part of the way in which I've chosen to live my life (ING)	.761	.015	.012
Q1: For the excitement I feel when I am really involved in running (IM)	.673	.035	.061
Q6: Because I feel a lot of personal satisfaction from mastering certain difficult training techniques (IM)	.648	.078	.098
Q18: For the pleasure of discovering new running performance strategies (IM)	.563	.076	.042
Q12: I don't know if I want to continue to invest my time and effort as much in running anymore (AM)	-.136	.863	-.193
Q11: For the prestige of being a runner (EXT)	.193	.556	.154
Q19: For the material and/or social benefits of being a runner (EXT)	.075	.579	.130
Q9: Because running is an extension of me (ING)	.131	.708	-.239
Q10: Because I must run to feel good about myself (ITJ)	.248	.668	.158
Q13: Because running is consistent with my deepest principles (ING)	.186	.495	.170
Q21: Because running is an integral part of my life (ING)	.000	.733	-.249
Q14: For the satisfaction I experience when I am perfecting my abilities to run (IM)	.053	.754	.162

Note: Abbreviations based on original subscales (Mallett et al., 2007) of amotivation (AM), external regulation (EXT), introjected regulation (ITJ), identified regulation (IDT), integrated regulation (ING), and intrinsic motivation (IM)

Given these two exploratory models, it seems most appropriate to conclude that motivation among runners, particularly in this sample is most adequately explained by three factors, although this interpretation should be made with caution. This structure was different from the theoretically derived three-factor model tested in the first phase of this study in that there were not clear factors of amotivation, extrinsic motivation, and intrinsic motivation. With the exception of two items, all other items associated with amotivation and intrinsic motivation loaded onto the general motivation factor in the post-hoc exploratory model. The external contingencies/accolades factor in this new model consisted mostly of items pertaining to extrinsic motivation; these items loaded on the extrinsic motivation factor in the a priori model. Individuals are motivated by general health and personal satisfaction, by external recognition and friendships, and by an opportunity to gain solitude and peace in an otherwise demanding life.

Subscale scores on general motivation were moderately positively correlated with the belief that nothing would prevent future running ($r = .492, p < .001$) and that running would remain constant in one's life ($r = .476, p < .001$). Scores on the external accolades subscale was slightly more strongly positively correlated with the belief that nothing would prevent future running ($r = .529, p < .001$) and that running would remain constant in one's life ($r = .512, p < .001$) than the previous subscale scores. Low, but significant correlations existed between the isolation/solitude factor and the persistence scale items. Table 11 includes inter-subscale correlations as well as additional inter-scale correlations between these three factors and the persistence scale items.

Table 11

Correlations between Persistence Scale Items and Motivation Subscale Scores based on Three-factor EFA solution

Item	General Motivation	External Accolades	Isolation – Solitude
Continue to run regularly	.413**	.389**	.324**
Nothing will stop me from running	.492**	.529**	.374**
Running will remain a constant	.476**	.516**	.364**
Sign up to compete in future races	.443**	.473**	.362**
Make time for running in the future	.440**	.430**	.317**
General Motivation	--	.866**	.917**
External Accolades	--	--	.830**

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

Chapter 5

DISCUSSION

Review of Previous Research

The most widely used model for explaining sport and exercise motivation are both grounded in self-determination theory (Deci & Ryan, 1991; Vallerand, 1997, 2000). Both of these models assert a relationship among intrinsic motivation, extrinsic motivation, and amotivation in explaining behavior choice and outcomes. The complexity of these models has evolved over time to suggest that motivation can be defined more narrowly as consisting of six unique elements along a continuum from low to high of amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. Deci and Ryan (1991) suggested that intrinsic motivation could be defined even more specifically to encompass three additional regulatory points: IM to know, IM to accomplish things, and IM to experience stimulation.

In an effort to afford practical utility to this theory, several scales have been created to measure sport motivation (Li, 1999; Mallett et al., 2007; Pelletier et al., 1995). Of these, the Sport Motivation Scale-6 (Mallett et al., 2007) offers a more parsimonious view of motivation because it retained only six subscales and condensed the aforementioned three regulatory points of intrinsic motivation into one subscale (intrinsic motivation). This model of motivation produced good fit when used to explain sport motivation among a large sample of elite and university athletes across a variety of sports. No sport-specific group difference

analyses were conducted in the original study. As such, I aimed to examine the structure of motivation for one particular type of athlete: the runner.

Review of Current Findings

Unlike past research on sport motivation, I targeted my investigation to understand the particular structure of motivation for runners by sampling a broad group of recreational and endurance athletes. Participants who reported running less than one time in the past four weeks were excluded from the sample and the majority of participants identified as regular runners, logging several low mileage runs weekly. For this population, the structure of motivation proposed by past researchers (Mallett et al., 2007) as consisting of six distinct factors of amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation was not well-supported. One explanation for a poor fitting model could be that the items developed for this scale, when applied to runners, don't adequately distinguish the six types of motivation. An alternative explanation is that motivation cannot be so narrowly defined and that a more broad understanding of it for runners is more practical.

Post-hoc exploratory procedures revealed that motivation for running in this sample is better explained by three factors: a general motivation factor that includes general health and personal satisfaction; an external contingencies/accolades factor that explains external recognition and social supports; and, an isolation/solitude factor that explains the pursuit of peace, tranquility and the absence of external reinforcement. The largest amount of variance in motivation among runners is explained by the general motivation

factor, suggesting that people who are highly motivated to run are likely to experience personal satisfaction whereas those who report moderate levels of motivation may sustain their running behavior because it keeps them healthy. This model requires some caution when interpreting the third factor and subsequent studies should test the fit of this model in other populations of runners and other athletes.

Limitations

Although recruitment was conducted both online and in person to generate a large and representative sample of runners, the majority of participants resided in the southwest region of the United States. It is possible that the training pattern of these individuals during the time of data collection was unique from runners in other parts of the country. Additionally, participants were sampled from both running and triathlon groups; it is possible that given the demand of training simultaneously for three sports that the motivations of a triathlete are slightly different from that of an individual who only runs. There were no specific demographic questions that asked whether any of these participants were training for triathlons. In future studies on this population, more specific demographic questions about pace and training goals (beyond type of race) would be important in conducting more sophisticated tests of group differences. Further, it's worth considering the non-independence of these participants as many of them were sampled from the same running or triathlon groups; again, asking more specific demographic questions to determine their group memberships would be useful for future analyses and interpretations.

The scale measure of sport motivation itself was a limiting factor in this study. Past researchers created item content for the SMS (Pelletier et al., 1995) and SMS-6 (Mallett et al., 2007) to fit a theory-driven model of motivation (Deci & Ryan, 1985) and attempted to distinguish between the different aspects of motivation. No exploratory procedures were conducted during the scale development phase to examine the factor structure of these items or to re-work the content of these items. In subsequent studies by Mallett and colleagues (2007), exploratory and confirmatory analyses were conducted on the same sample, which limited the strength of interpretation of the structure of motivation and its generalizability across new samples of athletes.

An additional limitation of this study was the choice to treat the observed variables as continuous when they may be more appropriately modeled as ordered categorical variables. Consistent with previous researchers (Mallett et al., 2007), I estimated each model using robust maximum likelihood. However, there is considerable debate as to when, based on the number of scale points, it is appropriate to assume continuous variables. Given that the observed variables are not quite continuous or categorical, using the robust weighted least means squared (WLMSV) estimator would have considered these variables, perhaps more appropriately, as ordered categorical variables.

Lastly, interpretation of the relationship between the original subscales scores and the persistence scale items developed for this study should be interpreted with caution because of the overall poor fit of those subscales to

motivation for runners. Examining item-level correlations rather than subscale correlations may be more useful in understanding intention for future running.

Future Research

Future directions should include determining the most conceptually relevant “types” of runners to examine; gathering more specific demographic information would be one way of establishing these groups and conducting meaningful follow-up analyses.

Although exploratory factor analytic procedures were helpful in understanding the characteristics of this specific sample, it is unclear without conducting subsequent confirmatory analyses on a new sample whether the identified three-factor structure is an appropriate model for motivation in runners. More importantly, given the high factor cross-loading among items substantial item level rewrites may be an appropriate first step before conducting follow-up analyses. An important consideration in modifying the structure of these subscales is how to calculate and interpret scale scores. In the original scale, no items were reverse scored because high scores across all subscales indicated high amounts of the domain specific motivation; if amotivation items are added to a general factor of motivation, these item scores will need to be reverse scored to ensure proper score interpretation.

In summary, motivation constructs identified previously with a broader pool of athletes may not generalize to runners, suggesting domains of motivation may be unique across different types of athletes. A comprehensive study to examine group differences by sport type would be useful in understanding

different types of athletes so as to take a more sport-specific approach to their mental processes toward engaging in their sport.

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APPENDIX A
RECRUITMENT MATERIALS

Appendix A1

Informed Consent (email sent to participants)

Structural validity of the Sport Motivation Scale-6 (SMS-6) among runners

Date

Dear Participant:

I am a graduate student under the direction of Dr. Terence Tracey in the Department of Counseling and Counseling Psychology and Dr. Marilyn Thompson in the School of Social and Family Dynamics at Arizona State University. I am conducting a research study to evaluate motivation in runners.

I am inviting your participation, which will involve completing an online survey for an expected duration of 15-20 minutes. You have the right not to answer any question, and to stop the interview at any time.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study. In return for your participation, you will be entered into a drawing for one of ten \$20 gift cards to Sole Sports, a running store.

The process of reflecting on your training goals and motivation for running can spark new training goals and motivation. It is anticipated that as a result of participating in this study, you may rethink your performance and set new goals for yourself in the future. There are no foreseeable risks or discomforts to your participation.

No personal identifying information will be collected during this study. Your responses will remain anonymous. The results of this study may be used in reports, presentations, or publications but your name will not be known, as no personally identifying information will be collected from you.

If you have any questions concerning the research study, please contact the research team at: Erin.Kube@asu.edu, Terence.Tracey@asu.edu, and/or M.Thompson@asu.edu. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

If you would like to be a part of the study, please click the link below to access the online survey: <http://edu.surveygizmo.com/s3/870949/motivation-to-run>

Sincerely,

Erin Kube
Terence Tracey, PhD
Marilyn Thompson, PhD

Appendix A2

Informed Consent (first page of online survey link)

Structural validity of the Sport Motivation Scale-6 (SMS-6) among runners

Date

Dear Participant:

I am a graduate student under the direction of Dr. Terence Tracey in the Department of Counseling and Counseling Psychology and Dr. Marilyn Thompson in the School of Social and Family Dynamics at Arizona State University. I am conducting a research study to evaluate motivation in runners.

I am inviting your participation, which will involve completing an online survey for an expected duration of 15-20 minutes. You have the right not to answer any question, and to stop the interview at any time.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study. In return for your participation, you will be entered into a drawing for one of ten \$20 gift cards to Sole Sports, a running store.

The process of reflecting on your training goals and motivation for running can spark new training goals and motivation. It is anticipated that as a result of participating in this study, you may rethink your performance and set new goals for yourself in the future. There are no foreseeable risks or discomforts to your participation.

No personal identifying information will be collected during this study. Your responses will remain anonymous. The results of this study may be used in reports, presentations, or publications but your name will not be known, as no personally identifying information will be collected from you.

If you have any questions concerning the research study, please contact the research team at: Erin.Kube@asu.edu, Terence.Tracey@asu.edu, and/or M.Thompson@asu.edu. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Sincerely,

Erin Kube
Terence Tracey, PhD
Marilyn Thompson, PhD

I have read the above informed consent and I agree to participate. I understand that my participation is voluntary and I may opt-out at any time with no penalty.

Yes
No

Appendix A3

Email request to CED250 instructors:

Dear CED 250 Instructor,

I am a graduate student under the direction of Dr. Terence Tracey in the Department of Counseling and Counseling Psychology and Dr. Marilyn Thompson in the School of Social and Family Dynamics at Arizona State University. I am conducting a research study to evaluate motivation in runners.

I would like to invite you and your students to participate in this study by responding to a brief, anonymous online survey, expected to take 15-20 minutes. You and your students have the right not to answer any question, and to stop the interview at any time.

To be eligible for participation in this study, all participants must be age 18 or older.

Participation is voluntary and you and your students may opt out at any time. The survey should take approximately 15-20 minutes to complete. Credit for student participation may be given at your own discretion. If you choose to do this, you may opt to have your students provide you with a screenshot of the final survey submission page. As I will not have access to their personal information, this will be the only way to verify participation in my study.

I have enclosed the informed consent form at the end of this message, which includes a link to the online survey. I greatly appreciate your assistance in sharing this with your students.

Feel free to contact me at Erin.Kube@asu.edu or my committee chairs, Terence.Tracey@asu.edu or M.Thompson@asu.edu if you have any questions.

Sincerely,

Erin Kube
Terence Tracey, PhD
Marilyn Thompson, PhD

Appendix A5

Online Facebook Posting to Run Group Pages (to be posted weekly)

Attention Runners: I'm a graduate student at Arizona State University and I am conducting a study to investigate some of the variables that may contribute to motivation for running. I would like to invite you to participate in this study by responding to a brief, anonymous online survey.

Please click or copy this link to another browser to access this survey

<http://edu.surveymoz.com/s3/870949/motivation-to-run>

Participation is voluntary and you may opt out at any time. All participants must be 18 years or older participate. You will be entered into a raffle to win a \$20 gift card to Sole Sports in exchange for your participation. Thank you in advance for your help with my study!

Have questions? Please contact me at motivation2runstudy@gmail.com.

Appendix A5

In-person script to be announced at local running group runs (to be announced twice weekly by Erin Kube)

Hello!

My name is Erin Kube, and I am a graduate student at Arizona State University. I am conducting a study to investigate some of the variables that may contribute to motivation for running. I would like to invite you to participate in this study by responding to a brief, anonymous online survey.

Please use the following link to access this survey (*hand out small strip of paper with web address and my email address*). If you are interested in participating today, I have my iPad with me and I can set you up to take the survey.

Participation is voluntary and you may opt out at any time. All participants must be 18 years or older participate. You will be entered into a raffle to win a \$20 gift card to (insert name of local running store) in exchange for your participation. Thank you in advance for your help with my study!

Please feel free to ask me any questions now or to contact me via email at motivation2runstudy@gmail.com.

Appendix A6

In-person script to be announced at local running group runs (to be announced twice weekly by run group coordinators at regional group sites)

Hello!

A graduate student and fellow runner, Erin Kube, at Arizona State University is conducting a study to investigate some of the variables that may contribute to motivation for running. She would like to invite you to participate in this study by responding to a brief, anonymous online survey.

Please use the following link to access this survey (*hand out small strip of paper with web address and my email address*)

Participation is voluntary and you may opt out at any time. All participants must be 18 years or older participate. You will be entered into a raffle to win a \$20 gift card to (insert name of local running store) in exchange for your participation. Thank you in advance for your help!

Please feel free to contact Erin Kube with any questions via email at motivation2runstudy@gmail.com.

APPENDIX B
MEASURES

Inclusion/Exclusion Screening Question

Please indicate which of the following statements best describes your attitude toward running: (select only one)

I hate running – I wouldn't run if someone paid me!

I don't run – I would only run if someone or something chased me.

I run sometimes – I have run at least once in the past 4 weeks.

I run regularly – I run between one and 3 times a week.

I run all the time – I might even run more than I walk!

Demographic Form

1. How many miles in a week do you currently run?
2. How many days per week do you currently run?
3. On days that you run, how many miles, on average do you run?
4. What is the longest mileage you currently run on any given day?
5. Are you currently affiliated with any running groups?
6. What percentage of your running is spent (total to 100):
 - a. On a treadmill?
 - b. Trail running?
 - c. Outside (canal paths, streets, or pavement)?
7. How long have you been running (in months)? (For example, if you've been running for 2 years and 5 months, you would respond "29")
8. In the past 12 months, how many competitive races have you completed?
 - a. Please indicate the distances associated with the race(s) you indicated in the previous question. (Give each race distance category a numerical value for how many you've completed in the past 12 months; for example, 5K, 10K, ½ marathon, marathon relay, marathon, ultra marathon)
 - b. Indicate the number of these races that have taken place in the past 3 months.
9. Are you currently training for an event? If so, indicate the distance.
 - a. Please indicate the distance of the event for which you are training (check all that apply)
 - i. 5K
 - ii. 10K
 - iii. ½ marathon
 - iv. marathon relay
 - v. marathon
 - vi. ultra marathon
 - vii. other
10. Please indicate your gender (M/F/T)
11. Please indicate your age

Using the scale below, please respond to the following statements:

Very unlikely		Somewhat unlikely		Somewhat likely		Very likely
1	2	3	4	5	6	7

I will continue to run regularly.

I can't imagine anything stopping me from running.

Running will remain a constant in my life.

I am signed up to compete in future races.

I will make time for running in the future.

Using the scale below, please indicate to what extent each of the following items corresponds to one of the reasons for which you are presently running.

Does not correspond at all	Corresponds	A little	Corresponds moderately	Corresponds	A lot	Corresponds exactly
1	2	3	4	5	6	7

Why do you run?

1. For the excitement I feel when I am really involved in running
2. Because running is part of the way in which I've chosen to live my life
3. Because running is a good way to learn lots of things which could be useful to me in other areas of my life
4. Because running allows me to be well regarded by people that I know
5. I don't know anymore; I have the impression of being incapable of succeeding at running.
6. Because I feel a lot of personal satisfaction from mastering certain difficult training techniques
7. Because it is absolutely necessary to run if one wants to be in shape
8. Because running is one of the best ways I have chosen to develop other aspects of my life
9. Because running is an extension of me
10. Because I must run to feel good about myself
11. For the prestige of being a runner
12. I don't know if I want to continue to invest my time and effort as much in running anymore
13. Because running is consistent with my deepest principles
14. For the satisfaction I experience when I am perfecting my abilities to run
15. Because running is one of the best ways to maintain good relationships with my friends
16. Because I would feel bad if I was not taking time to run
17. It is not clear to me anymore; I don't really think my place is in running
18. For the pleasure of discovering new running performance strategies
19. For the material and/or social benefits of being a runner
20. Because training hard will improve my performance
21. Because running is an integral part of my life
22. I don't seem to be enjoying running as much as I previously did
23. Because I must run regularly
24. To show others how good I am at running

