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The Mediating Effect of Self-Determined Motivation in Student-Athlete Perceptions of Coaching Behaviors and its Effect on Grit and Mental Toughness

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THE MEDIATING EFFECT OF SELF-DETERMINED MOTIVATION IN STUDENT-
ATHLETE PERCEPTIONS OF COACHING BEHAVIORS AND ITS EFFECT ON
GRIT AND MENTAL TOUGHNESS

Lloyd Scharneck

41 Pages

The aim of this current study was to examine the relationship between coaching behaviors, grit, mental toughness, and motivation. I hypothesized that coaching behaviors would have an indirect influence on grit and mental toughness through the motivational orientations of athletes. To examine these relationships, we surveyed 219 student athletes from Midwestern universities using valid and reliable measures assessing the key constructs in this study. Results revealed significant positive relationships between autonomy-supportive coaching, grit, mental toughness and autonomous motivation. Significant negative relationships between controlling coach, grit, and mental toughness were also found. Path analysis revealed two major findings. A significant positive indirect relationship between autonomy-supportive coaching and mental toughness through autonomous motivation emerged, also controlling coaching had a direct, indirect and total negative effect on grit. I concluded that while modifications need to be made to improve our proposed model, the information found represents important information on how coaching behaviors contribute to mental toughness and grit in athletes.

KEYWORDS: Grit, Mental Toughness, Coaching Behaviors, Self-Determination Theory, Behavioral Regulation, Student-Athletes

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LLOYD SCHARNECK

A Thesis Submitted in Partial
Fulfillment of the Requirements
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MASTER OF SCIENCE

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L. S.

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CHAPTER I: INTRODUCTION

Providing an environment that enables individuals to function optimally is one of the most important and consistent factors behind the success of high performers (Ames, 1992; Deci & Ryan, 2000; Duckworth, 2016; Mahoney, Gucciardi, Ntoumanis & Mallet, 2014). Self-Determination Theory (SDT) states that an environment, which satisfies an individual's basic psychological needs of autonomy, competence and relatedness, is essential for the development of optimally functioning human beings (Deci & Ryan, 2008). In sports, the climate which a coach creates, how athletes' perceive this climate, and how a coach interacts with athletes directly impacts the essential basic psychological needs of an athlete (Coatsworth, & Conroy, 2009; Gagne, 2003; Lafrenière, Jowett, Vallerand, & Carbonneau, 2011; Mahoney et al., 2014). Notable, coaches who develop autonomy-supportive environments and satisfy these psychological needs allow their athletes to better self-regulate stress (Weinstein & Ryan, 2011), develop more self-determined motivation (Coatsworth, & Conroy, 2009; Conroy, & Coatsworth, 2007) and have a more confident sense of self (Deci & Ryan, 2008).

However, despite the robustness of research on the benefits of adapting an autonomy-supportive coaching style (Amorose & Horn, 2001; Conroy, & Coatsworth, 2009; Gagne, 2003; Sheldon & Watson, 2011), many coaches engage in behaviors that are perceived as controlling or abusive by their athletes (Owusu-Sekyere & Gervis, 2014; Yukhymenko-Lescroart, Brown, & Paskus, 2015). In fact, some coaches believe that engaging in this emotionally abusive and overly harsh manner will instill desirable mental qualities in their athletes that will allow them to perform better in stressful contexts (Owusu-Sekyere & Gervis, 2014). This belief system is in part formed by coaches' who have familiarity with of the importance of mental toughness, the personal capacity to perform at high levels despite adversity, challenges or barriers in sport

performance, (Gould, Hodge, Peterson, & Petlichkoff, 1987; Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015), but lack an understanding of how to properly develop it (Owusu-Sekyere & Gervis, 2014).

This “tough-love” belief has been in part validated by research, which has found mental toughness to be significantly related to performance outcomes (Mahoney et al., 2014), early threat detection (Hardy, Bell & Beattie, 2014) and positive affect (Mahoney et al., 2014). However, contrary to the belief of many controlling coaches (Owusu-Sekyere & Gervis, 2014), recent research (Mahoney et al., 2014) states that mental toughness is best cultivated through autonomy-supportive environments that nurtures an athlete’s basic psychological needs. These types of environments also encourage more self-determined forms of motivation (Deci & Ryan, 1987) which theoretically may have a direct impact on other desirable psychological factors related to performance outcomes. Recent research in performance psychology (Duckworth, Peterson, Mathews, & Kelly, 2007; Credé, Tynan, & Harms, 2016; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011) has shown grit, defined as a passion and perseverance for long term goals (Duckworth et al., 2007), to be one of the most potent predictors of success across a variety of populations (Credé, et al., 2016) and may play an important role in sports engagement (Martin, Byrd, Watts, & Dent, 2015).

However, there is currently a lack of research examining the relationship of grit to other important factors related to athlete development such as coaching behaviors, self-determined motivation, and mental toughness in collegiate athletes (Credé et al., 2015; Von Culin et al., 2015; Joseph, 2015). Therefore it is necessary to examine the interrelationships between these factors which are known to allow athletes to perform well. The results of which may better inform coaches and researchers on how to facilitate personal development through, within and

beyond sport (Danish, Nellen & Hale, 1990, 1993). The purpose of this current study is to examine the pathways through which coaching behaviors affect grit and mental toughness. Specifically, we will examine the mediating effect of self-determined motivation between perceived coaching behaviors, grit and mental toughness.

Link between SDT and Coaching

According to SDT motivated behaviors occur across a spectrum determined by the amount of volition which drives individual's actions (Deci & Ryan, 1980, 1985b). Across this spectrum of self-determined motivation are five types of behavioral regulation which drive behavior. These behavioral regulations can be divided into two broad categories: non-self-determined or controlled motivation which is driven by external contingencies and self-determined or autonomous motivation which is more regulated by the individual. The most self-determined form behavioral regulation is intrinsic motivation, defined as participating in an activity for its own sake (Ryan & Deci, 2000). Intrinsic motivation is considered by many researchers (Deci & Ryan, 2000; Ryan & Deci, 2007; Lonsdale, Hodge, & Rose, 2008) to be the primary driver through which athletes engage in sport.

However, individuals may also be inspired to participate in sport through extrinsic motivations, defined as behaviors which are reinforced by external contingent outcomes (Deci & Ryan, 2007). Extrinsic motivation is further separated into four types of regulation: external regulation, introjected regulation, identified regulation and integrated regulation. The least self-determined of is external regulation which occurs when behavior is controlled by desire to obtain a reward, avoid punishment or comply with a demand. Introjected motivation occurs when a behavior is controlled by desire to avoid shame or guilt or to enhance ego. While still considered extrinsic identified regulation and integrated regulation are self-determined forms of motivation

(Lonsdale, Hodge & Rose, 2008). Identified regulation occurs when an athlete deems various components of a sport to be personally important. Integrated regulation is the most autonomous extrinsic element of the spectrum and is defined as a deep compatibility between the goals and values of the individual with the sport (Deci & Ryan, 2007).

Autonomous motivation is important in sport as it facilitates better stress responses, interest-taking and personal growth (Weinstein & Ryan, 2011). This type of motivation is fostered through the satisfaction of psychological needs which Deci and Ryan (2002) describe these needs as psychological nutrients which like oxygen, fats and proteins are essential to the functioning every human individual. Basic psychological needs theory (Deci & Ryan, 2002), a sub theory of SDT, supports that for optimal human functioning to occur the needs of autonomy, competence and relatedness must be fulfilled. The need of autonomy, is defined as the belief that one's choices are their own. The need of relatedness, is described as a feeling of closeness to others. Finally, the need competence refers to the belief that one has the skills to produce a desired outcome.

Because sport participation often stems from more self-determined motivation, creating an environment which facilitates the satisfaction of an athlete's basic psychological needs is important (Conroy & Coatsworth, 2007; Ryan & Deci, 2007). Autonomy-supportive environments, which foster the growth of autonomous motivation, can be developed by coaches through their structuring of practices and feedback (Ames, 1992), and have been found to facilitate positive relationships between athletes and coaches. These relationships are known to be the most impactful determinant of an athlete's motivated behavior (Amorose & Horn, 2000, 2001; Lafrenière, Jowett, Vallerand, & Carbonneau, 2011). As such, coaches have a huge impact in an athlete's life. They not only play an important role in the development of skill (Ericsson et

al., 1993; Vallerand et al., 2008), but also serve as role models which can help to create or destroy motivation and psychological qualities within individuals (Coatsworth, & Conroy, 2009; Conroy, & Coatsworth, 2007; Duckworth, 2016; Gagne, 2003; Lafrenière et al., 2011; Sheldon, & Watson, 2011; Vallerand et al., 2008)

Interestingly, it is the view of some coaches that engaging with their athletes in an authoritarian manner and using various forms of punishment is beneficial (Owusu-Sekyere & Gervis, 2014; Yukhymenko-Lescroart, Brown, & Paskus, 2015). Research suggests, however, that coaches who create a controlling environment through use of extrinsic rewards, intimidation, negative regard for others and devaluation (Bartholomew, Ntoumanis & Cecili, 2010), can thwart need satisfaction and the progress of many important adaptive skills (Mahoney et al., 2015; Weinstein & Ryan, 2011). Notably, coaches who can provide an autonomy supportive environment and give their athletes choices, promote enjoyment of activities, provide reasons for consequences, and use non-controlling feedback can help nourish the needs which lead to the development of autonomous motivation (Coatsworth & Conroy, 2009; Conroy & Coatsworth, 2007) and help facilitate mental toughness (Mahoney et al., 2015). I propose that autonomy-supportive coaching behaviors may also help facilitate grit, a construct which is similar to mental toughness but uniquely beneficial (Credé, Tynan, & Harms, 2016).

Grit

Grit is a non-cognitive personality trait defined as *a perseverance and passion for long-term goals*, and is comprised of one's perseverance of effort and consistency of interests (Duckworth et al., 2007). This construct originated in the education domain from research asking why individuals with similar ability who scored similarly in performance domains (e.g. IQ, Test scores, physical fitness, etc.) were not equally successful at gaining higher levels of education,

performing in academic competitions and prevailing through military training. The results of multiple research studies (Duckworth et al., 2007; Duckworth & Quin, 2009; Duckworth et al., 2011) suggested that the difference in achievement within these populations could be accounted for by how gritty the performers were.

Overall, research on grit has shown that grittier individuals are more likely to obtain higher levels of education, have higher college GPAs, be more optimistic (Robertson-Kraft & Duckworth, 2014), commit to in more hours of deliberative practice (Duckworth et al., 2011) and have higher levels of sport engagement than less gritty individuals (Martin, Byrd, Watts, & Dent, 2015). With the primary goal of many athletic programs, including the National Collegiate Athletics Association (NCAA), being to develop individuals with skills and abilities that allow them to be successful across a myriad of contexts (Danish, Nellen & Hale, 1990, 1993), it is important to look at how grit is developed. While grit has shown, like most personality traits, to be stable across time (Duckworth et al., 2007; Duckworth & Quin 2009), even stable personality traits are malleable to change through maturation (Roberts, Walton, & Veichtbauer, 2006; Duckworth et al., 2007) and the context of impactful life events (Sudom, Lee, & Zamorski, 2014). According to the corresposive principal (Roberts & Capsi, 2003), impactful events can alter the trajectory of personality development by reinforcing elements of the environment which attracted the individual to choose to participate in those experiences. Theoretically, as many athletes enter collegiate sports with the notion that participation will accelerate their abilities to a professional level (Sack, 1987), certain elements of their sporting experience, which encourage a passion, and perseverance for sport may influence how gritty of an individual they become. We propose that coaching behaviors may be a medium by which these elements are encouraged.

In regards to the development of grit, it has been proposed that experiences, which allow individuals to develop optimism, learn how to practice deliberately, generate intrinsic motivation and encourage altruism, may foster an ideal environment for grit to grow (Duckworth, 2016). A study by Steinfort (2015) examined how optimism and grit are linked to performance outcomes in Australian football players. The study used a mental toughness intervention adapted from the Penn Resiliency Program and Master Resilience Training to develop both optimism and grit in players. While results revealed only optimism improved from this intervention, researchers found a significant link between optimism, grit and performance in athletes. That is, grittier players showed more consistency in their performance; consistency scores showed a significant relationship to optimism, which in turn predicted performance. Furthermore, other research examining optimism in athletes showed optimistic athletes are less likely to burnout and less likely to perceive events as stressful (Gufstafsson & Skoog, 2012). This adaptive trait linked to grit also shares similarity in the stress processing of autonomous individuals who remain less anxious and better process challenging or disturbing events (Weinstein & Ryan, 2011).

In athletics, engaging in altruistic behaviors such as sacrifice, defined as a willingness of group members to initiate an action or forfeit privilege for the sake of another (Prapavesis & Carron, 1997), has shown to strengthen team cohesion and lead to more pro-social behavior (Cronin, Arthur, Hardy & Callow, 2015). It is also indicative of a sense of relatedness one of the basic psychological needs linked to optimal human performance (Deci & Ryan, 2002). Another proposed developmental factor of grit, deliberative practice, is a specific type of practice that is contingent on four specific elements. These elements include: an operational definition of a stretch goal, a devoted concentration and effort, immediate informational feedback and reflection then repetition after alterations based on reflection (Eriksson, 2006). Research has shown that not

only do grittier individuals engage in more hours of deliberative practice, but also that deliberative practice serves as a moderator between grit and success (Duckworth et al., 2011). However, this type of practice is not inherently motivating, as the only reward comes from knowledge that you are progressing towards whatever long-term goal you have decided to pursue (Ericsson et al., 1993; Duckworth, 2016; Duckworth et al., 2011; Duckworth et al., 2007).

For this reason we propose that autonomous motivation may have a positive relationship with grit. As the development of interest in anything requires prolonged positive exposure to activities or events before it can become intrinsically motivating (Ryan & Deci, 2000). Intrinsic motivation is not only important in sport (Amorose & Horn, 2000; 2001), but necessary for autonomous interest-taking (Ryan & Deci, 2008) which allows individuals to seek out new experiences and information. It is this type of interest-taking that lays the theoretical cornerstone of gritty behavior (Duckworth, 2016). In sport, coaches can influence the affective experiences of their athletes and play a critical role in how the rewards in these events are perceived and engaged in by athletes (Coatsworth, & Conroy, 2009; Conroy, & Coatsworth, 2007; Deci & Ryan, 1987; Duckworth, 2016; Gagne, 2003; Lafrenière, Jowett, Vallerand, & Carbonneau, 2011; Sheldon, & Watson, 2011; Vallerand, Mageau, Elliot, Dumais, Demers, & Rousseau). It is in this capacity that we believe coaching behaviors may affect grit by shaping the motivational climate and subsequently influencing athletes' autonomous motivation. However, there is a current lack of research examining how the coach-created motivational climate and grit are interrelated. This current study hopes to bridge the void of evidence between the constructs of coaching behaviors and grit by examining the pathways which may connect them.

Mental Toughness

The presence of challenges and barriers are prevalent in lives of most student-athletes. Whether it be, performing on the field or performing in the classroom athletes are constantly expected to produce high levels of work across various achievement settings. This may account for why mental toughness, defined as the personal capacity to perform at high levels despite barriers, challenges and adversity (Gucciardi et al.,2015), has been rated by coaches to be a critical characteristic for athletes to be competitively successful (Gould, Hodge, Peterson & Pelitchkoff,1987). In the past decade, mental toughness has transcended from being just a buzzword used by coaches and the general public to becoming one of the most researched topics in sport psychology (Gucciardi, Sheldon, Hanton, Gordon, Mallett & Temby, 2014). While mental toughness is widely researched, there is little consensus between researchers on the true definition of this construct (Gucciardi et al., 2014; Hardy et al., 2013).

The large majority of researchers do concede that mental toughness is a dispositional trait that represents an assortment of schemas, emotions and cognitions that allow individuals to be successful across stressors (Gucciardi et al., 2014; Hardy et al., 2013). Similar to grit, while mental toughness is a trait which is stable across time, it may be malleable to impactful life events. This is represented in research which suggests that to develop mental toughness, coaches or instructors must expose athletes to challenging or aversive environments (Weinberg, Butt & Culp, 2011; Hardy et al., 2013). Gucciardi et. al. (2014) proposed that regardless of definition there are two primary criteria which truly encapsulate the construct of mental toughness: (1) it must contain an aspect of the personality which has a positive correlation with performance across multiple achievement contexts; (2) and that cognitions, emotions and behaviors are constituted throughout these aspects.

Research in mental toughness which encapsulates the criterion presented by Gucciardi et al., (2014) has shown that individuals with higher levels of mental toughness are less distressed in the face of stressors, allowing them to be more capable of overcoming life's challenges and performing at a higher capacity (Kaiseler, Polman, & Nicholls, 2009; Gucciardi et al., 2014; Hardy et al., 2013). This lower level of distress stems from the way individuals high in mental toughness cope with their stressors (Kaiser et al., 2009; Hardy et al., 2013). Kaiseler, Polman and Nicholls (2009) examined 482 athletes from the UK and found that individuals higher in mental toughness are less distressed in the face of adversity because they perceived stressful events as more controllable and engage in more active coping. This low level of distress is also common in individuals who adopt an autonomous orientation and are more likely to perceive stressful situations as challenges rather than threats (Weinstein & Ryan, 2011).

The bridge in constructs between the coping mechanisms in mental toughness and autonomously orientated individuals have led researchers (Gucciardi, Gordon, Dimmock & Mallett, 2009) to conclude that coaches whose behaviors are perceived to be autonomy-supportive are more likely to facilitate mental toughness in their athletes. Despite the common belief in coaches that the "tough love" approach develops mental toughness (Owusu-Sekyere & Gervis, 2014), abusive or controlling coaching behaviors are actually likely to thwart mental toughness (Gucciardi et al., 2009). To examine the connection between mental toughness and coaching behaviors, Mahoney and colleagues (2015) studied how mental toughness was affected by both coaching behaviors and need satisfaction in 221 Australian athletes. It was observed that coaching behaviors do have an indirect relationship with mental toughness through psychological needs. That is, coaches may be able to influence the mental toughness of their athletes by producing an environment which supports their psychological needs. Additionally,

this study found mental toughness played a mediating role between need satisfaction and performance, positive affect and negative affect. Providing that mental toughness may not only facilitates high performance but may contribute to well-being. In this current study we aim to expand upon this finding by examining the potential mediating effects of self-determined motivation on the relationship between coaching behaviors, mental toughness and grit.

This Current Study

As there is a lack of research examining how coaching behaviors may affect grit in athletes, the aim of this study is to examine how coaching behaviors may influence mental toughness and grit through athlete's self-determined motivation in sport. Additionally, this study aims to re-examine the variance between grit and mental toughness as past research has led to inconsistent findings (Credé et al., 2015; Joseph, 2015). As such, our first hypothesis (H1) is that grit and mental toughness will have a medium significant correlation and unique variances. This hypothesis is based off a meta-analysis by Credé et al. (2015) which found that grit has a unique variance from other positive personality traits and states which share a similar definition. We hypothesize (H2a) that grit and mental toughness will be have significant positive relationships with autonomous forms of motivation. Additionally, we hypothesize (H2b) that both grit and mental toughness will have moderate negative relationships with controlled motivation. This hypothesis is based off empirical evidence that more self-determined forms of motivation encourage interest taking (Ryan & Deci 2008, Deci & Ryan, 2008) which is the proposed cornerstone of gritty behavior (Duckworth, 2016), and research (Mahoney et al., 2014) indicating that need satisfaction which is strongly associated with more self-determined motivation (Lonsdale et al., 2008) has a significant relationship with mental toughness.

Our main interest in this study, based off the findings of Mahoney et al (2015) is to examine if coaching behaviors have an indirect effect on grit and mental toughness through the mediator of self-determined motivation. We hypothesize (H3a) that perceived autonomy-supportive coaching behaviors will have an indirect relationship with grit and mental toughness when mediated by autonomy motivation. Additionally, (H3b) perceived controlling coaching behaviors will have an inverse or no relationship with grit through athlete motivation for sport. These expected patterns of relationships are illustrated in Figure 1b.

CHAPTER II: METHOD

Population

A total of 219 participants were involved in the study, including 141 male ($M_{\text{age}} = 19.55$, $SD = 1.36$) and 78 ($M_{\text{age}} = 19.31$, $SD = 1.06$) female inter-collegiate student athletes from Midwestern colleges and Universities ($n = 220$). This sample population included student-athletes from a variety of sports including volleyball ($n = 2$), tennis ($n = 10$), soccer ($n = 17$), football ($n = 16$), baseball ($n = 50$), swimming ($n = 22$), track and field ($n = 100$), and cross country ($n = 10$) who on average had been participating in their sport for 9.9 years ($SD = 4.63$). For the participants in the study, 89.4% ($n = 194$) of their coaches were male and 10.6% ($n = 23$) were female. In regards to ethnicity 81.8 % ($n = 180$) of participants were white, 8.2% ($n = 18$) were African American, 4.1 % ($n = 9$) were Hispanic, 1.4 % ($n = 3$) were Native American, .9% ($n = 2$) were Asian, and 2.3 % ($n = 5$) reported being more than one ethnicity.

Measures

Short grit scale (Grit-S) This eight-item scale was used to assess grit and has shown to be accurate towards adult populations (Duckworth & Quin, 2009). The eight-item scale contains four items measuring perseverance of effort (e.g. “I am a hard worker”) and four items measuring consistency of interest (e.g. “New ideas and projects sometimes distract me from previous ones”). Each item is assessed on a five-point scale (1= not like me at all, 5= very much like me). Based on Cronbach’s alpha, internal consistency was $\alpha = .70$ for perseverance, $\alpha = .77$ for consistency and $\alpha = .82$ for the whole scale (Duckworth & Quinn, 2009). The Grit-S has convergent validity with BFI Conscientiousness ($r = .77$, $p = <.001$).

Mental toughness index (MTI) This eight-item scale was used to assess mental toughness and has shown to be reliable & valid measure of mental toughness in athletes (Gucciardi,

Hanton, Gordon, Mallett, & Temby, 2015). The MTI contains eight items aimed at testing the unidimensional aspects of MT (self-belief, attentional regulation, emotional regulation, success mindset, context knowledge, buoyancy and optimism). Examples of items include: “I consistently overcome adversity” and “I can find the positive in most situations”. Each item is assessed on a seven-point scale (1= false, 100% of the time, 7 = true, 100% of the time).

Behavioral regulation in sport questionnaire (BRSQ) This 24-item scale was used to assess how athletes are motivated in their sports. This questionnaire asks athletes about the motivation behind why they participate in their sports and has items representing different types of motivational regulation: amotivation (e.g. “but the reasons are not clear to me anymore”), external regulation (e.g. “because people push me to play”), introjected regulation (e.g., “because I would feel guilty if I quit”), identified regulation (e.g. “because the benefits of sport are important to me”), integrated regulation (e.g. “because it’s part of who I am”) and intrinsic motivation (e.g. “because it’s fun”). Each item is rated on a 7-point Likert scale (1 = does true at all, 4 = somewhat true, 7 = very true). Cronbach’s alpha coefficients showed that internal consistency was .78 or higher across items. (Lonsdale et al., 2008).

Controlling coach behaviors scale (CCBS) This 15-item scale was used to assess athlete’s perception of controlling behaviors emitted by coaches. The CCBS contains four- items measuring controlling use of rewards (e.g. “My coach only rewards/praises me to make me train harder.”), four- items measuring negative conditional regard (e.g. “My coach is less accepting of me if I have disappointed him/her.”), four- items measuring intimidation (e.g. “My coach shouts at me in front of others to make me do certain things”), and three-items measuring excessive personal control (e.g. “My coach tries to control what I do in my free time”). All for factors

within this measure have been shown to have composite reliability coefficients ranging between .74 to .85 (Bartholomew, Ntoumanis, & Thogersen-Ntoumani, 2010).

Autonomy-supportive coaching questionnaire (ASCQ) This nine-item questionnaire was used to assess athlete's perception of their coaches' autonomy-supportive behaviors. The ASCQ contains five-items measuring coach's interest in athlete's input (e.g. "My coach offers me choices about what we do in practice") and four-items measuring coaches' praising autonomous behavior (e.g. "My coach praises me for my effort during practice"). Cronbach's alpha coefficients showed internal consistency of interest in athlete's input was .88 and .84 for praising autonomous behavior. (Conroy & Coatsworth, 2007).

Procedure and Setting

Following approval from the university research board, athletic administrators or coaches from across the Midwest and Mid-Atlantic regions of the United States were emailed requesting their teams' participation in the research study. These regions were selected because of convenience and access for the research team. Following subsequent approval, a convenient day and time was scheduled and we met with athletic teams at their training facilities during their regularly scheduled practices. During this meeting an investigator(s) informed the student-athlete of the nature of this study. Before being given the survey, the participants were verbally informed of their rights as participants including: their right to confidentiality, the ability to withdraw at any time for any reason without penalty, that all responses will be kept anonymous, and that acceptance and completion of the survey implied voluntary consent. After agreeing to participate, participants were given the pen and paper survey and completed the survey which lasted approximately 15 - 20 minutes. When collecting data from a team of individuals, the researcher would ensure that any coaches, trainer or non-participant athletes were asked to leave

the research area. After completion, athletes individually handed them to researchers and left the premises.

Data Analysis

SPSS v.22 was used to analyze descriptive statistics and bivariate correlations between all test variables: controlling coaching, autonomy-supportive coaching, behavioral regulations, grit and mental toughness. LISREL 9.2 was used to conduct a Path analysis testing the hypothesized mediational model (Figure 1b) and a non-mediational model (Figure 1a).

CHAPTER III: RESULTS

Correlations and Descriptive Statistics

Table 1 includes descriptive statistics, reliability scores and correlations of the study variables and demographic markers. Initial analysis reveal that in confirmation of our first hypothesis, mental toughness and grit a have moderate positive relationship ($r = .25$) indicative that they are related but significantly different constructs. Bivariate correlational analysis (Table 1) shows that all correlations from study variables were significant ($p < .05$). In confirmation of hypothesis H2a, mental toughness and grit both had significant a positive relationship with autonomous motivation of .63 and .22, respectively. It was predicted in H2b that both grit and mental toughness would have moderate negative correlations with controlled motivation. However, data analysis presented that mental toughness ($r = -.19,$) and grit ($r = -.28,$) only shared weak but significant negative correlation with controlled motivation.

As expected, autonomy supportive coaching had a significant positive moderate relationship with autonomous motivation ($r = .37$), a strong significant negative relationship with controlled coaching ($r = -.56$), and a weak significant negative relationship with controlled motivation ($r = -.18$). Autonomy supportive coaching was also found to share significant positive relationships to grit ($r = .16$) and mental toughness ($r = .33$). Conversely, as expected, controlled coaching had significant negative relationships with both grit ($r = -.30$) and mental toughness ($r = -.21$). Controlled coaching also shared a moderate significant negative relationship with autonomous motivation ($r = -.27$) and significant moderate positive relationship with controlled motivation ($r = .29$).

Main Analyses

Path analysis conducted using LISREL 9.2 was employed to test the main research question. All constructs included in the models are represented as observed score variables, and the data was input using the covariance matrix. A test of the distributional assumptions revealed that the data were reasonably normally distributed, with estimates of the skewness and kurtosis values scores ranging from -1.35 to .88 and -.86 to 2.74, respectively. The tests for multivariate skewness and multivariate kurtosis, however, were significant ($p < .01$). Nevertheless, maximum likelihood (ML) estimation procedures still selected given this approach has demonstrated the ability withstand departure from normality (see Chou & Bentler, 1995).

Multiple fit indices were used to evaluate the adequacy of the estimated path models. A non-significant ($p > .05$) ML χ^2 value indicates a good fit of the model to the data, as does a root mean square error of approximation (RMSEA) $\leq .08$; comparative fit index (CFI) $\geq .90$; goodness of fit index (GFI) $\geq .90$; and standardized root mean square residual (SRMR) $\leq .08$ (see Brown, 2006). When directly comparing two competing models, the difference in χ^2 relative to the change in degrees of freedom (df) was examined. Ideally, a model will have high df and a low χ^2 value. As such, a more restrictive model (i.e., one with greater df) that does not result in a significant change in χ^2 is considered a more appropriate representation of the data.

The first step in testing for mediation required establishing that the predictor variables (i.e., autonomy support and controlling coaching), the potential mediating variables (i.e., autonomous and controlled motivation), and the outcome variables (i.e., mental toughness and grit) were related (Frazier, Tix, & Baron, 2004; Holmbeck, 1997). The bivariate correlations presented in Table 1 supported this requirement, as all relationships were found to be significant ($p < .05$). Thus, it was reasonable to proceed to the main test of mediation, which involved

comparing the fit of 2 models – one specifying both direct and indirect effects of the coaching variables on athletes’ grit and mental toughness (see Figure 1a: non-mediational model), and a second model specifying only an indirect effect of autonomy supportive and controlling behaviors on mental toughness and grit (see Figure 1b: mediational model). If the fit of the mediational model, where the direct effects of perceived autonomy supportive coaching and controlling coaching on mental toughness and grit are constrained to zero, is not significantly different than the non-mediational model, mediation is supported (Frazier, Tix, & Baron, 2004).

Table 2 presents a summary of fit associated with the path models tested and compared. In all cases, the two perceived coaching behaviors were allowed to correlate, as were the athletes’ autonomous and controlled motivation, and their grit and mental toughness. The first model tested (non-mediated model) specified that two perceived coaching behaviors not only predicted the athletes’ autonomous and controlled motivation, but also directly predicted their mental toughness and grit. Given this model is essentially analogous to a multiple regression, the model fit the data perfectly. This model served as the baseline in testing for mediation.

The second model (mediational model) constrained the paths from the coaching variables to mental toughness and grit to a value of zero, thus gaining 4 degrees of freedom. As seen in Table 2, the change in ML χ^2 was significant, indicating that the model did not fit the data well. The lack of fit was also evident in the high RMSEA value. Given this, full mediation was not supported. An examination of the modification indices, however, revealed that the path from controlling coaching behavior to grit was causing some local strain on the model fit. Thus, a modified mediational model was tested where this path was freely estimated. The results are presented in Table 2. Freeing this parameter resulted in significant reduction in c^2 relative to the mediational model ($\Delta ML \chi^2 = 9.62, p < .01$), indicating that model was a better representation of

the data. The modified mediational model also deemed the more parsimonious representation of the data relative to the non-mediational model ($\Delta ML \chi^2 = 4.92, \Delta df = 3, p > .05$). Thus, combined with the acceptable fit indices (see Table 2), this model was considered the best representation of the data.

The specific parameter estimates associated with the modified mediational model are presented in Figure 2. All parameter estimates are presented in standardized form. The curved arrows reflect correlations between variables, whereas straight lines represent the direct effect of a predictor variable on a criterion variable. Path with solid line represent significant relationships ($p < .05$), while those identified by a dashed line reflect non-significant relationships. Values presented in the small circles represent the variance explained (R^2) for the criterion variables.

The specified model accounted for 14.2% of the variance in autonomous motivation and 8.7% of the variance in controlled motivation, while the explained variance in grit was 14.3% and mental toughness was 40.3%. As expected, the autonomy supportive coaching was a significant positive predictor of autonomous motivation and controlling coaching behavior was a significant positive predictor of controlled motivation. The effect of autonomy support on controlled motivation and controlling coaching on autonomous motivation were non-significant, however. Consistent with hypotheses, autonomous motivation was a significant positive predictor of both grit and mental toughness, and controlled motivation was a significant negative predictor of grit. While controlled motivation negatively predicted mental toughness, this relationship was non-significant. The results also revealed that controlling coaching had a significant negative effect on grit directly, suggesting that the effect of this type of coaching behavior on grit was only partially mediated by the motivational variables. Also, illustrated in Figure 2, there was a significant negative correlation between autonomy supportive coaching and

controlling coaching. The relationships between autonomous and controlled motivation ($r=-.10$) and between mental toughness and grit ($r=.09$), however, were non-significant in this model.

Table 3 presents the direct, indirect, and total effects of the coaching variables predicting mental toughness and grit. Autonomy supportive coaching had a significant positive indirect effect on mental toughness, but a non-significant effect on grit. Controlling coaching behavior, on the other hand, had the opposite pattern of relationships. Specifically, controlling coaching behavior was not significantly related to mental toughness, but demonstrated a significant negative direct, indirect, and total effect on grit.

CHAPTER IV: DISCUSSION

Grit and mental toughness are proven predictors of desirable outcomes in many competitive contexts (Bell, Hardy & Beattie, 2013; Duckworth et al., 2007, 2011; Hardy et al., 2014). The examination of grit and mental toughness in relation to the SDT allows for a holistic view of the motivational correlates which may drive athlete performance and well-being. The main purpose of this current study was to explore how coaching behaviors impacted grit and mental toughness through the self-determined motivation of athletes. Additionally, we were interested in examining the relationship between grit, mental toughness, perceptions of coaching behaviors and self-determined motivation.

I hypothesized that grit and mental toughness would have a significant moderate relationship and unique variance. This hypothesis was partially supported by data analysis which showed the relationship between grit and mental toughness were significant but weak. These results show a similar but smaller relationship between grit and mental toughness found in previous research (Credé et al., 2016; Joseph, 2015). However, this difference may be explained through the differences in population and instrumentation. The study by Joseph (2015) used the Grit-R where our study used the Grit-S which may have affected these relationships. Additionally, the meta-analysis by Credé et al. (2016) examined studies measuring grit in relation to student academic performance and retention, whereas, we looked at grit in student athletes. This difference in population and context may have affected the results. Future research may wish to focus on exact replication to provide confirmation and better explore the possible differences in variance among a myriad of populations. This information would help aid in the developing more valid measures of grit and mental toughness in athletes

We also found, as predicted, mental toughness had a significant positive relationship with autonomous motivation and negative relationships with controlled motivation. This supported our hypothesis that grit and mental toughness would be significantly related to autonomous motivation and negatively related to controlled motivation. These findings also correspond with Mahoney et al. (2014), which exhibited the same directional relationship to mental toughness's with known antecedents of autonomous and controlled motivation. To our best knowledge, this is the first study to inspect grit in relation to self-determined motivation. Thus, we present the unique finding that grit shares a significant positive relationship with autonomy motivation and inverse relationship with controlled motivation. Meaning that environments which support autonomy motivation may facilitate the development of grit.

Of note, mental toughness ($r = .63$) had a much stronger association with autonomous motivation than grit ($r = .22$). It was expected that mental toughness would have a strong relationship with autonomous motivation based on past research (Gucciardi et al., 2009; Kaiser et al., 2009; Hardy et al., 2013; Weinstein & Ryan, 2011) as both constructs present similar coping mechanisms which allow individuals to have lower levels of distress. However, it was also hypothesized that, due to the link between interest-taking in both autonomous motivation (Weinstein & Ryan, 2011) and grit (Duckworth, 2016), these constructs would be more strongly related. The strength of correlations may have been affected by wording within the measures, as the MTI was developed with athletes in mind (Gucciardi et al., 2015) whereas the Grit-S measure was crafted with a more general population in mind. Future research may wish to develop a measure of grit specific to sport and re-examine grit's relationship with the study variables from this study.

We also found, as hypothesized, mental toughness was positively associated with autonomy-supportive coaching and inversely related to controlling coaching which confirms previous findings by Mahoney et al. (2014). These same directional relationships were found between grit and coaching behaviors (H2b), which to our knowledge is a unique finding of this study. This suggests that coaches who interact with their athletes in an autonomy-supportive manner may help facilitate grit and mental toughness in their athletes, while controlling coaches may thwart the development of grit and mental toughness. This relationship is important to continue to publicly validate as it is the opinion of many coaches that the perseverance element in the definitions of grit and mental toughness is developed through aversive coaching behaviors must be utilized (Owusu-Sekyere & Gervis, 2014). It may be imperative for developers of coaching education to explicitly describe the benefits of mental toughness and grit in sport. Then detail how providing athletes with choices, non-controlling feedback, reasons for consequences and promoting enjoyment can help facilitate the growth of these beneficial traits.

The most practically significant findings of this study come from our modified mediational model (Figure 2) which examined the potential mediation effects of self-determined motivation, grit, mental toughness and coaching behaviors. In agreement with past research (Mahoney et al., 2014), autonomy supportive coaching was found to have an indirect effect on mental toughness. As expected autonomy-supportive coaching predicted both mental toughness and grit. These findings indicate that coaches who wish to positively impact their athlete's levels of mental toughness and grit should adopt an autonomy-supportive coaching style. We also found that the results (Figure 2) did not support the predicted indirect effect of autonomy-supportive coaching behavior on grit. However, uniquely our model did show a significant direct, indirect and total negative effect of controlling coaching behaviors on grit. This is a

meaningful finding as it indicates that controlling coaching behaviors may thwart grit. Past research has shown that controlling coaching behaviors can undermine intrinsic motivation (Amorose & Horn, 2000) and may pair sports with negative experiences (Conroy & Coatsworth, 2007). This de-satiation of sport from positive experiences may cause athletes to have a decreased interest and passion which theoretically may thwart development of grit. Future research may wish to examine how specific outcomes of controlling coaching may effect grit as these impacts may be impactful to athlete development.

A final important finding of this study was that our model showed mental toughness was not significantly affected directly or indirectly by controlling coaching behaviors. This is a noticeable finding as it suggests proposals by previous research that mental toughness can alter how athletes' perceptions of coaching behaviors influence their performance (Nicholls, Morley & Perry, 2016; Gucciardi et al., 2009) may be true. In concordance with other studies (Bell et al., 2013; Kaiseler, et al., 2009; Hardy et al., 2013; Mahoney et al., 2014) we propose that this lack of an effect may be attributed to the ability of mentally tough individuals to successfully navigate stressors and prepare coping responses to potentially punishing events before that are affected by them (Hardy et al., 2013). This theory is based of Hardy et al. (2013)'s neuropsychological model of mental toughness which further explains the neurological mechanisms of mental toughness. Through testing of their model, Hardy et al. (2013) discovered that mental toughness is significantly and positively related to an individual's punishment sensitivity when their reward sensitivity was low. What this information suggests is that mentally tough people may be more sensitive to punishment and less sensitive to rewards than their counterparts may. Enabling those with greater levels of mental toughness to detect threat at quicker rate than less mentally tough people. This early detection of threat allows for a greater amount of time to prepare and

implement effective coping strategies (Hardy et al, 2013). In line with this theory we propose that mental toughness may have a potential protective qualities on undesirable outcomes associated with controlling coaching behavior. Specifically, we suggest that an important line of future research would be to re-examine the variables within this study how mental toughness may moderate the effect of coaching behavior on self-determined motivation and grit.

Limitations

The greatest limitation of this study is that it was a cross-sectional study, as such it is possible the study variables have different directions of relationships than those examined by this study. As stated above, the ordering of variables within the modified-mediational model also may better explain some aspects of this research which due to time constraint we were unable to analyze. Future research may wish to re-examine the ordering and potential bi-directional nature of grit, mental toughness, self-determined motivation and coaching behaviors. Another limitation of this current study include the disproportionate ratio of male to female participants which if balanced may present difference in strength of relationships found in this study. Past research (Amorose & Horn, 2000) suggests that female athletes have lower reported levels of self-determined motivation and are more impacted by certain elements of controlling coaching behavior. However, the differences found between male and female perceptions of coach's behaviors had mean level differences and shared directionality. Future research in this area with proportionate gender ratios is needed to rule out or include gender as factor which may affect the study variables and model, however, given the nature of the study variables it is unlikely any significant differences would be found.

This was a study which utilized self-report data as such it is possible that individuals may have responded in a less than true manner to make themselves appear more socially desirable.

Future research should focus on examining the inter-rater reliability of teammates to confirm self-reported responses. Additionally, as these authors have no knowledge of existing research examining the inter-rater reliability of the Grit-S measure exploring this connection may be of some interest to other researchers. Additionally, participants in this study were recruited from a convenience sample of Midwestern student-athletes whose ideals and perceptions may be different than individuals of other geographical areas. As Bandura (2002), states while globalization is allowing for a greater generalizability of motivational and affective human processes a cross-cultural variance still exists. Theoretically, this may alter the manner in which perceptions of coaching behavior are formed and perceived coaching behavior effects self-determined motivation, grit and mental toughness. This merits future research examining the variables from this study with populations from different cultures to expand upon the generalizability of this research.

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Table 1

Descriptive Statistics and Bivariate Correlations (N = 220)

	1.	2.	3.	4.	5.	6.
1. Autonomy Supportive Coaching	.95					
2. Controlling Coaching	-.56	.95				
3. Autonomous Motivation	.37	-.27	.80			
4. Controlled Motivation	-.18	.29	-.18	.89		
5. Mental Toughness	.33	-.21	.63	-.19	.92	
6. Grit	.16	-.30	.22	-.28	.25	.70
<i>M</i>	5.09	2.66	23.51	14.85	5.75	3.55
<i>SD</i>	1.47	1.40	4.02	5.96	.96	.56
<i>Possible range</i>	1-7	1-7	4-28	4-28	1-7	1-5

Note. Alpha coefficients are presented along the diagonal. Correlations are presented in the lower diagonal. All correlations are significant at $p < .05$.

Table 2

Summary of Fit Indices for Path Analysis Models

<i>Model</i>	<i>df</i>	<i>ML χ^2</i>	<i>p <</i>	<i>ML</i>	<i>RMSEA</i>	<i>CFI</i>	<i>GFI</i>	<i>SRMR</i>
				<i>χ^2 difference</i>				
1. Non-Mediational Model	0	0.00	1.00	-- ^a	--	--	--	--
2. Full Mediation Model	4	14.54	.01	14.54 ^b	.11	.96	.98	.05
3. Modified Mediation Model	3	4.92	.18	4.92 ^a	.05	.99	.99	.02

Note. $ML\chi^2$ = Maximum likelihood χ^2 ; *df* = degrees of freedom; RMSEA = root mean square error of approximation; CFI = comparative fit index; GFI = goodness of fit index; SRMR = standardized root mean square residual. Non-similar superscripts indicates a significant ($p < .05$) difference in $ML\chi^2$ between models.

Table 3

Standardized Direct, Indirect, and Total Effects of the Coaching Variables on Mental Toughness and Grit

	Direct Effect	Indirect Effect	Total Effect
Autonomy Supportive Coaching → Mental Toughness	--	.13*	.13*
Autonomy Supportive Coaching → Grit	--	.02	.02
Controlling Coaching → Mental Toughness	--	-.05	-.05
Controlling Coaching → Grit	-.21*	-.03*	-.11*

Note. * = significant parameter estimate ($p < .05$).

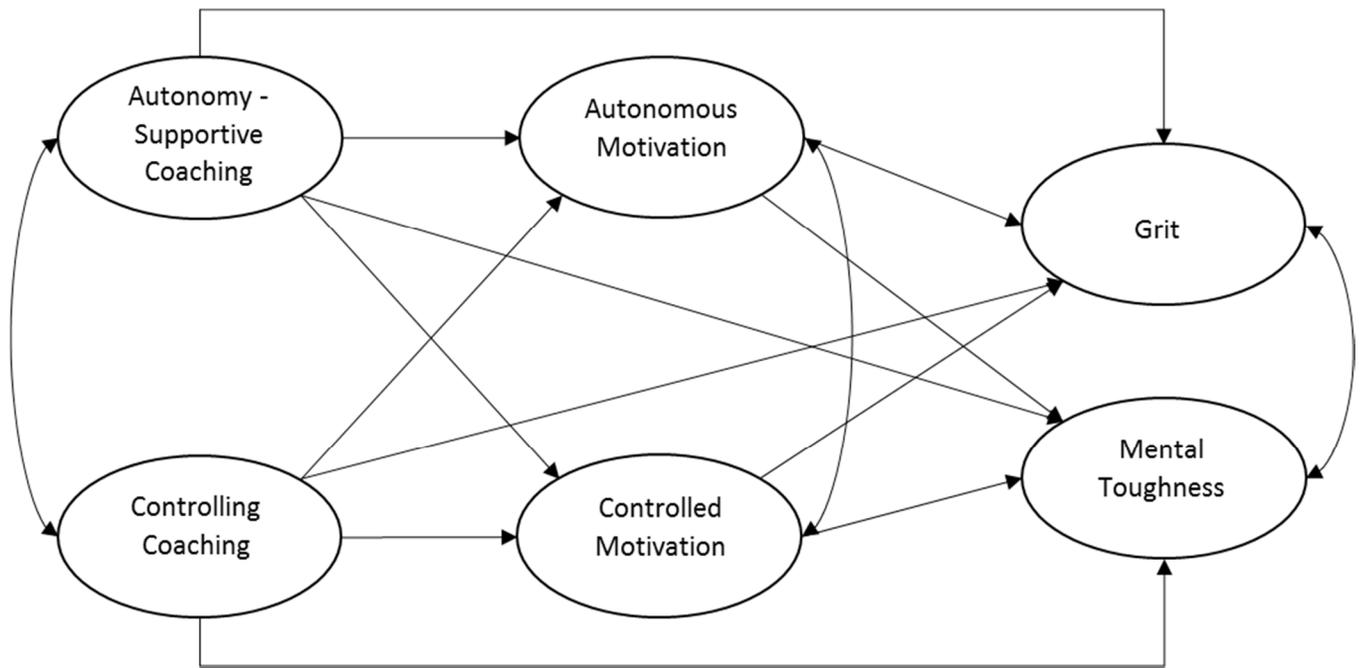


Figure 1. Non-Mediational Model

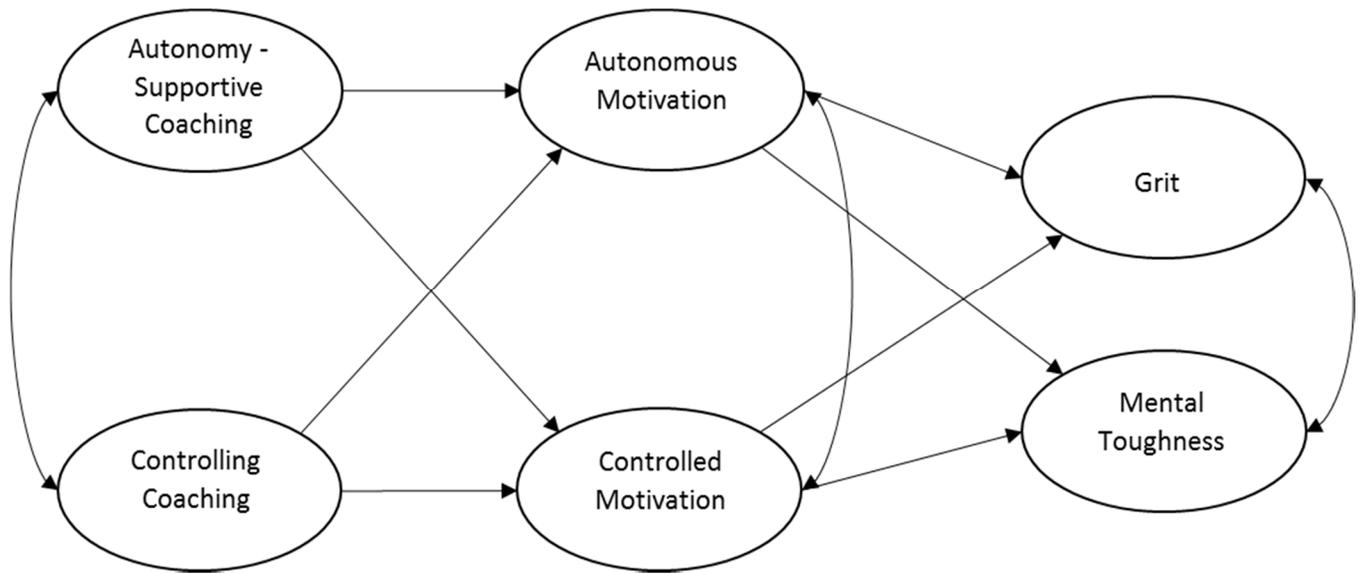


Figure 2. Mediational Model

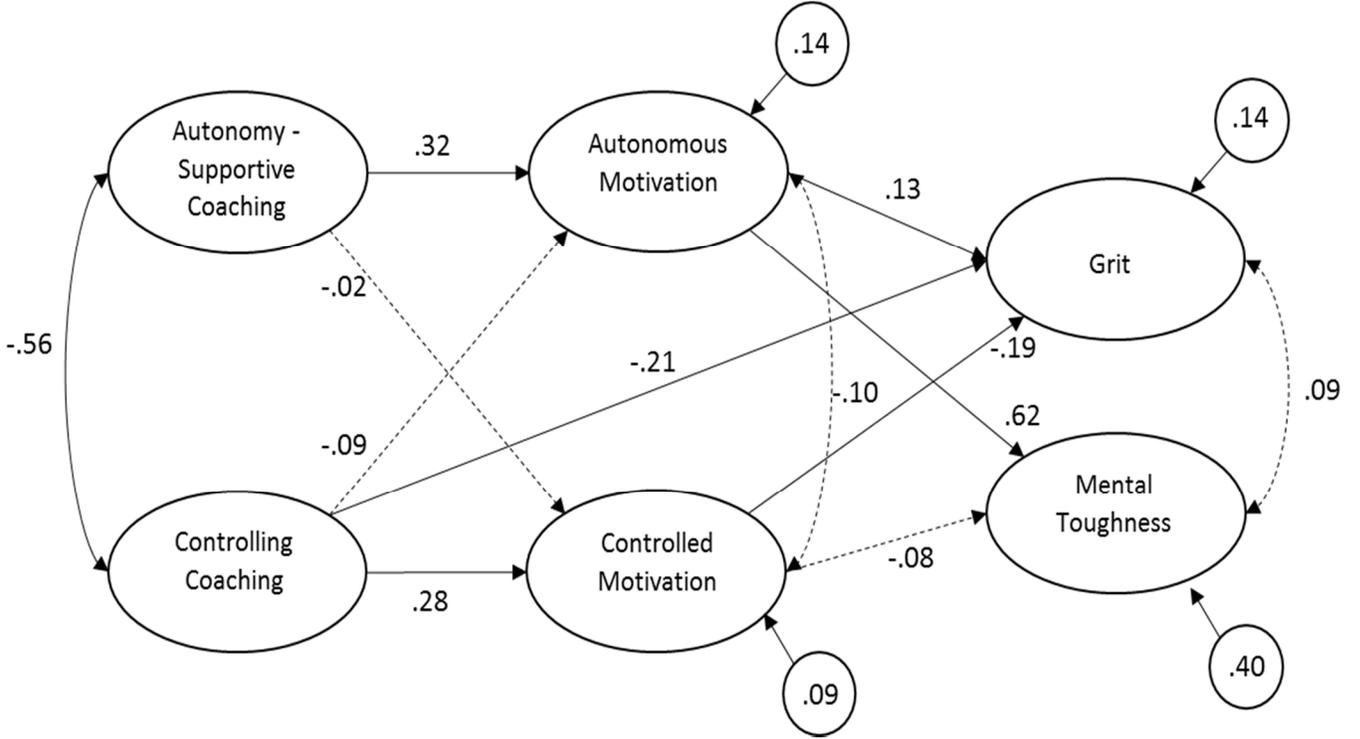


Figure 3. Modified Mediational Model. All parameter estimates are presented in standardized form. The curved arrows reflect correlations between variables, whereas straight lines represent the direct effect of a predictor variable on a criterion variable. Path with solid line represent significant relationships ($p < .05$), while those identified by a dashed line reflect non-significant relationships. Values presented in the small circles represent the variance explained (R^2) for the criterion variables.