

5-18-2014

Disordered Eating in Female Collegiate Athletes: Investigating the Relationships Among Coaching and Parenting Styles, Psychological Needs, and Self-Determined Motivation

Parisa Renée Kaliush
Dickinson College

Follow this and additional works at: http://scholar.dickinson.edu/student_honors

 Part of the [Psychiatry and Psychology Commons](#), and the [Sports Sciences Commons](#)

Recommended Citation

Kaliush, Parisa Renée, "Disordered Eating in Female Collegiate Athletes: Investigating the Relationships Among Coaching and Parenting Styles, Psychological Needs, and Self-Determined Motivation" (2014). *Dickinson College Honors Theses*. Paper 143.

This Honors Thesis is brought to you for free and open access by Dickinson Scholar. It has been accepted for inclusion by an authorized administrator. For more information, please contact scholar@dickinson.edu.

Disordered Eating in Female Collegiate Athletes: Investigating the Relationships among
Coaching and Parenting Styles, Psychological Needs, and Self-Determined Motivation

Parisa R. Kaliush

Submitted in fulfillment of Honors Requirements for the Department of Psychology,
Dickinson College

Dr. Suman Ambwani, Supervisor

Dr. Michele Ford, Reader

Dr. Anthony Rauhut, Reader

May 7, 2014

Author Note

This project received grant funding from the Stephen D. Benson '56 Research Fund, Department of Psychology, Dickinson College, and the Psi Chi Undergraduate Research Fund. The author would like to thank her advisor, Dr. Suman Ambwani, and her committee members, Dr. Michele Ford and Dr. Anthony Rauhut, for their guidance and valuable feedback. The author would also like to thank her fellow research lab members, Sara Moss, Lea Simms, and Megan Snider, as well as John MacArthur for their assistance and comments throughout this project.

Abstract

Female collegiate athletes are at significantly greater risk than their non-athlete peers for developing eating disorders. One plausible explanation for this increased risk is offered by Self-Determination Theory (SDT), according to which athletes who perceive themselves to be experiencing high levels of autonomy, competency, and relatedness will experience greater self-determined motivation (SDM) and ultimately less disordered eating behaviors (DE). The present study employed a combined survey-experimental design through an online questionnaire to investigate mediational relationships among coaching and parenting styles, psychological need satisfaction (PNS), SDM, and DE, as well as the causal impact of PNS on athletes' SDM and DE. Participants were varsity female athletes ($N = 113$) at a Division III liberal arts college in the Mid-Atlantic United States. Mediational analyses revealed a significant indirect effect of coaching style on SDM through psychological need satisfaction, as well as significant total and direct effects of parenting style on SDM. Results from a factorial ANOVA indicated a significant effect of direction of psychological need satisfaction on SDM. Although no significant findings were evident for DE, the present study offers empirical support for the associations among coaching and parenting styles, PNS, and SDM, and suggests the implementation of longitudinal designs to more accurately assess the relationships among those variables and DE.

Keywords: eating disorders, female athletes, self-determined motivation, psychological needs, mediation

Disordered Eating in Female Collegiate Athletes: Investigating the Relationships among Coaching and Parenting Styles, Psychological Needs, and Self-Determined Motivation

Research indicates that female collegiate athletes are two to three times more likely than the general population and their college-aged peers to meet *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV*; American Psychiatric Association, 1994) criteria for eating disorders (Black, Larkin, Coster, Leverenz, & Abood, 2003). A meta-analysis of 34 studies revealed that significantly more disordered eating patterns were self-reported among female collegiate athletes than among collegiate non-athlete controls (Smolak, Murnen, & Ruble, 2000). Further studies reveal that up to 88 percent of female collegiate athletes believe themselves to be overweight, 62 percent engage in pathogenic weight control behaviors, and 25 percent meet the criteria for disordered eating (Black et al., 2003; Greenleaf, Petrie, Carter, & Reel, 2009). Thus, research in the fields of clinical and sport psychology suggests a unique vulnerability of female athletes, as opposed to non-athletes, in developing disordered eating behaviors. Disordered eating behaviors are defined broadly as subclinical, maladaptive eating patterns that share many symptoms with eating disorders, such as restrictive dieting and binge eating, yet do not meet the threshold for a clinical diagnosis (Stirling & Kerr, 2012). Such strikingly high prevalence rates of disordered eating in female collegiate athletes warrant a deeper investigation of the factors which leave this population more at-risk than their non-athlete peers. Furthermore, growing knowledge of the short- and long-term consequences of disordered eating, which include increased susceptibility to dehydration, amenorrhea, osteoporosis, muscle atrophy, cardiac arrhythmia, and a predisposition to developing a full-blown eating disorder, demands that researchers more thoroughly investigate this topic (Stirling & Kerr, 2012).

Although there are common risk factors, such as negative interpersonal relationships, negative mood states, low self-esteem, and perfectionism, for disordered eating among all persons, there appear to be several *internal* and *external* risk factors which are specific to the female collegiate athlete population (Arthur-Cameselle & Quatromoni, 2010; Stirling & Kerr, 2012). External risk factors for disordered eating in athletes include their sport's focus on appearance and the physical body, as well as media portrayals of sports models as not only thin, but toned and fit (Stirling & Kerr, 2012). Female athletes also experience intense competition among their teammates to restrict food and/or lose weight, and this competition may be exaggerated if teammates who are losing weight are concurrently performing well in their sport (Arthur-Cameselle & Quatromoni, 2010; Stirling & Kerr, 2012). Such a combination of losing weight and performing well reinforces the common belief that losing weight will improve athletic performance, thus offering an additional external risk factor among female athletes (Arthur-Cameselle & Quatromoni, 2010). In contrast to external risk factors, internal risk factors for disordered eating encompass personality types and attitudes which are specific to the female collegiate athlete population. Internal risk factors include hyper-competitiveness, or an abnormally high drive to compete, as well as tendencies to be more self-absorbed than the general population because of a constant need to focus on the mental and physical self (Stirling & Kerr, 2012). Athletes also exhibit a uniquely high tolerance for, and even enjoyment in the hunger pains which are associated with restrictive eating (Stirling & Kerr, 2012). According to these athletes, hunger pains serve as positive reinforcement for their disordered eating behaviors (Stirling & Kerr, 2012).

In addition to the aforementioned internal and external risk factors, athletes may be subjected to lowered levels of autonomy, competency, and relatedness, which are often referred

to as the three basic psychological needs, as established by Deci and Ryan's (1985) Self-Determination Theory (SDT). Specifically, *autonomy* refers to the need to feel in control of one's actions and, to an extent, surrounding situational factors, *competency* refers to the need to feel physically and mentally capable of mastering a task, and *relatedness* describes the need to feel cared for and to belong to others (Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012; Schüler & Kuster, 2011). Whether these three needs are satisfied or thwarted (i.e., hindered) influences one's physical and psychological well-being, including eating behaviors (Verstuyf et al., 2012). When these needs are thwarted, for example, people develop the associated processes of need substitutes (i.e., goals to compensate for a lack of satisfied needs) and compensatory behaviors (i.e., subsequent actions when stripped of those needs) to make up for a lack of need satisfaction (Verstuyf et al., 2012). As an example, to achieve the need substitute of a perfectly thin body, one may practice the compensatory behavior of a strict low-calorie diet.

Recent research suggests that women who experience psychological need thwarting through a loss of feelings of autonomy, competency, and relatedness report more disordered eating and eating disorder symptoms (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009; Mack et al., 2011; Schüler & Kuster, 2011; Scoffier, Maïano, & d'Arripe-Longueville, 2010; Verstuyf et al., 2012; Verstuyf, Vansteenkiste, Soenens, Boone, & Mouratidis, 2013). For example, one study employing diary methodology reported that young adult women experienced more binge-eating symptoms on the days that their psychological needs were frustrated as compared to days on which their needs were met (Verstuyf et al., 2013). Researchers theorized that binge-eating symptoms may have occurred because the women felt depleted of energy on the days when their needs were frustrated and therefore were unable to exert control over their eating (Verstuyf et al., 2013). Schüler and

Kuster (2011) similarly reported a negative association between need satisfaction and one's ability to regulate impulsivity and binge-eating. However, they offered an alternative mechanism to explain this relationship: specifically, they proposed that participants may have initially compensated for their unfulfilled needs through restrictive eating (i.e., to regain a sense of control in their lives), which then contributed to emotional arousal and eventually transformed into binge-eating symptoms, thereafter triggering a negative spiral of thwarting their own psychological needs (Schüler & Kuster, 2011). In other words, participants established restrictive dieting goals, which resulted in interpersonal problems and socially alienating situations (reduced sense of relatedness), as well as eventual failures to remain in control and achieve such goals (reduced sense of autonomy). Feelings of inferiority and inadequacy (reduced sense of competency) naturally stemmed from their inability to achieve their dieting goals, and resulted in binge-eating symptoms (Schüler & Kuster, 2011; Verstuyf et al., 2012). Thus, research consistently indicates a negative relationship between psychological need satisfaction and disordered eating symptoms; however, the factors that contribute to this relationship remain unclear.

Sport psychologists posit that the association between psychological needs (i.e., autonomy, competency, and relatedness) and disordered eating behaviors is mediated by levels of self-determined motivation (Bartholomew et al., 2009; Blanchard et al., 2009; Scoffier, Gernigon, & d'Arripe-Longueville, 2012). Specifically, feelings of autonomy, competency, and relatedness positively influence self-determined motivation, which in turn increases holistic well-being and protects against disordered eating behaviors (see Figure A1). According to SDT, *self-determined motivation* is present when one engages in an activity because s/he finds the activity to be intrinsically interesting or even personally important, whereas *controlled motivation* is

present when one acts with the feeling of pressure, whether such pressure stems from a sense of guilt or obligation, coercive demands, or reward contingencies (Bartholomew et al., 2009).

Although both forms of motivation result in behavioral responses and may be present concurrently, the degree to which one attends to these types of motivation influences the presence of disordered eating symptoms (Bartholomew et al., 2009; Verstuyf et al., 2012). Specifically, individuals who report more self-determined (as opposed to controlled) motivation report more positive outcomes, such as increased vitality, self-esteem, physical well-being, and less disordered eating (Verstuyf et al., 2012; Bartholomew et al., 2009). On the other hand, individuals who have been stripped of their feelings of autonomy, competency, and relatedness rely on controlled motivation as a way to cope with their unfulfilled needs, thereby contributing to unhealthy compensatory behaviors, such as restrictive and/or binge-eating.

Decreased levels of autonomy, competency, and relatedness, and their effects on self-determined motivation, are particularly potent risk factors for disordered eating behaviors in female athletes because athletes are exposed to need thwarting situations more so than any other population (Bartholomew et al., 2009). On a daily basis, athletes are placed in subordinate positions to authority figures, such as coaches and parents. Because coaches and parents are situated in these authority positions, they serve as significant social agents who can facilitate or hinder athletes' psychological need satisfaction and ultimately athletes' self-determined motivation (Bartholomew et al., 2009; Blanchard et al., 2009; see Figure A2). For example, psychologically controlling parenting (involving guilt-induction, shaming, and conditional regard) has been shown to predict disturbed eating attitudes and bulimic symptoms among adolescents and athletes, whereas supportive parenting predicts greater need satisfaction and fewer unhealthy eating behaviors, such as purging and skipping meals (Verstuyf et al., 2012).

These findings suggest that controlling parents thwart children's sense of autonomy by forcing them to comply with parental agendas, hinder their children's sense of competency when they fail to meet rigid and unreasonable expectations, and damage children's sense of relatedness by the coldness of the parent-child relationship (Verstuyf et al., 2012).

A direct example of this negative parent-child relationship in the context of sport is evidenced by one qualitative study which examined the specific internal and external factors that predict eating disorders in female athletes (Arthur-Cameselle & Quatromoni, 2010). Interviews with athletes revealed that parental pressures play a crucial role in lowering self-esteem and feelings of adequacy, as well as driving desires for perfection (Arthur-Cameselle & Quatromoni, 2010). For example, one participant disclosed that, with the intention of improving performance on the playing field, her mother promised her 100 dollars if she lost ten pounds (Arthur-Cameselle & Quatromoni, 2010). Unfortunately, this bet resulted in not only playing ability, but weight becoming a measure of the athlete's competency in her sport (Arthur-Cameselle & Quatromoni, 2010). Because this mother stripped her daughter of feelings of autonomy and competency, the daughter developed a controlled sense of motivation and eventually found herself to be suffering from anorexia nervosa. Thus, as a result of critical and cold parent-child relationships, athletes may resort to such compensatory behaviors as restrictive eating to maintain control over their lives and improve athletic performance, or binge eating to fill the overbearing emotional void.

Even more so than parents, coaches have the opportunity to play a significant role in their athletes' levels of psychological need satisfaction and self-determined motivation (Scoffier et al., 2010). This greater level of influence applies chiefly to collegiate varsity athletes who spend every day while in-season, as well as many days during the off-season, with their coaches.

Similar to the categorization of parenting styles, coaching interpersonal styles have been defined by sport psychologists as *autonomy-supportive* or *controlling*. Whereas autonomy-supportive coaching styles take athletes' opinions and feelings into consideration and foster environments that allow athletes to experience choice and volition in their playing situations, controlling coaching styles create environments in which athletes are pressured or coerced to think and behave in ways which coincide with the coach's authoritarian views (Bartholomew et al., 2009). Research suggests that autonomy-supportive coaching styles augment athletes' feelings of autonomy, competency, and relatedness, thus increasing their levels of self-determined motivation and protecting them against disordered eating behaviors (Bartholomew et al., 2009; Blanchard et al., 2009). In contrast, the loss of autonomy which is inherent in controlling coaching environments naturally subjects athletes to a depletion of psychological needs and a lowering of self-determined motivation. Consequently, athletes may feel a need to satisfy their coach's rigid and unreasonable expectations by further thwarting their own psychological needs (Bartholomew et al., 2009).

Controlling coaching environments may be directly linked with disordered eating behaviors in that coaches may make direct comments about an athlete's weight or body shape. However, even coaches who do not make such directly critical comments can impact an athlete's disordered eating behaviors (Arthur-Cameselle & Quatromoni, 2010). For example, one collegiate female athlete admitted that she developed disordered eating symptoms, which eventually escalated into anorexia nervosa, out of an attempt to gain control over her coach, who would scream at her for everything she did wrong on the playing field (Arthur-Cameselle & Quatromoni, 2010). Thus, coaches and their interpersonal coaching styles, as well as parents and their parenting styles, play a crucial role in athletes' levels of psychological needs. As a result of

influencing athletes' psychological need satisfaction, coaches and parents ultimately play an indirect, yet significant role in altering the self-determined motivation of athletes and their subsequent development of disordered eating behaviors.

Study Aims and Hypotheses

The purpose of the present study was threefold: 1) to provide further empirical evidence in support of the mediating role of psychological need satisfaction in the relationship between coaching and parenting styles and self-determined motivation, 2) to investigate the mediating role of self-determined motivation in the relationship between psychological need satisfaction (levels of autonomy, competency, and relatedness) and disordered eating behaviors, and 3) to investigate the causal impact of psychological need satisfaction on self-determined motivation and disordered eating behaviors among female collegiate athletes.

With regard to the first two aims, the present study adhered to previous literature and proposed two mediational pathways as exhibited by previously mentioned Figures A1 and A2. The first pathway (Figure A1) predicted that increased psychological need satisfaction among athletes would result in less disordered eating behaviors by means of increasing self-determined motivation. Conversely, decreased psychological need satisfaction would result in greater levels of disordered eating by means of decreasing self-determined motivation. The second pathway (Figure A2) predicted that coaching and parental interpersonal styles that are perceived by athletes to be more autonomy-supportive would increase athletes' self-determined motivation by means of increasing their psychological need satisfaction (i.e., levels of autonomy, competency, and relatedness). Conversely, coaching and parenting styles that are perceived by athletes to be more controlling (i.e., less autonomy-supportive) would decrease athletes' self-determined motivation by means of decreasing their psychological need satisfaction.

The third stated purpose of the present study, to investigate the causal impact of psychological need satisfaction on self-determined motivation and disordered eating, aimed to shed light on the importance of maintaining high levels of these needs to foster self-determined motivation and less disordered eating behaviors. Thus, it was hypothesized that athletes who are experimentally exposed to high levels of autonomy, competency, and relatedness would report higher levels of self-determined motivation and less disordered eating symptoms than would athletes who are exposed to low levels of psychological needs. For this hypothesis, disordered eating symptoms were operationalized as intention to engage in dietary restraint because of Schüler and Kuster's (2011) theory that people initially compensate for unfulfilled psychological needs through restrictive eating. The present study investigated the relative impact of the individual psychological needs on athletes' self-determined motivation and disordered eating. Given previous research which suggests that many disordered eating behaviors stem from a desire to compensate for a lack of control, it was hypothesized that levels of autonomy would influence self-determined motivation and disordered eating behaviors more significantly than would levels of competency or relatedness.

Method

Participants

Participants were varsity-level female collegiate athletes ($N = 113$), aged 18 to 22 years ($M = 19.39$, $SD = 1.19$), at a Division III liberal arts college in the Mid-Atlantic United States. Regarding racial/ethnic composition, 95% identified as White (including European, Middle East, or North African origins), 1.8% identified as Black or African American, and 1.8% identified as of Hispanic or Spanish origins. Eligibility requirements included the following: at least 18 years of age, participation in a varsity collegiate sport for at least one full season, and current

participation on a varsity sport team. Thus, because data collection occurred during the Spring 2014 season, senior Fall sport and first-year Spring sport athletes were ineligible. Participants represented a total of ten varsity collegiate sports, including basketball ($n = 7$), field hockey ($n = 16$), golf ($n = 3$), lacrosse ($n = 15$), soccer ($n = 20$), softball ($n = 8$), swimming ($n = 16$), tennis ($n = 5$), track-and-field ($n = 21$), and volleyball ($n = 2$). Representation of athletes across a wide range of sports, as opposed to solely aesthetic sports (i.e., track-and-field, swimming), was necessary given previous findings that disordered eating behaviors are present in a multitude of sports, including soccer, volleyball, and golf (Stirling & Kerr, 2012; Nagel, Black, Leverenz, & Coster, 2000). Participants' BMI scores ranged from 17.43 to 35.04 ($M = 22.71$, $SD = 2.95$) and 3.5% of participants indicated histories of eating disorder diagnoses.

Recruitment. The researcher contacted coaches so that participants could be recruited on a team-basis. The researcher met with about half the teams to advertise the study in-person; however, if an in-person team meeting could not be scheduled, the researcher received an updated team roster from the coach and emailed athletes individually.

Compensation. Athletes who participated in the present study were compensated financially with \$5.00 and were entered into a lottery system to win one of fifteen possible \$20.00 gift cards to various local restaurants.

Measures

Coach-athlete relationship scale (CARS). A self-developed 12-item questionnaire assessed athletes' perceptions of the extent to which their coaches are autonomy-, competency-, and relatedness-supportive (see Appendix B). In order to self-develop items, the researcher defined autonomy-, competency-, and relatedness-supportive coaching and created items directly from these definitions. Each of the three psychological needs was assessed by four items. Four

of the 12 items (two relatedness and two competency) were taken directly from the *Sport Friendship Quality Scale (SFQS)* (Weiss & Smith, 1999) and modified in the same way as was done by Scoffier et al. (2010) so that the word ‘friend’ was replaced by the word ‘coach.’ In the present study, the *CARS* demonstrated good internal consistency (Cronbach’s $\alpha = 0.90$).

Sport Friendship Quality Scale (SFQS; Weiss & Smith, 1999) – Modified for Mother-child and Father-child Relationships (Ullrich-French & Smith, 2006). The modified *SFQS* is a 17-item self-report questionnaire that assesses parental influences on athletes’ perceived levels of autonomy, competency, and relatedness (see Appendix C). A confirmatory factor analysis supported a multidimensional factor structure; the six factors were *self-esteem enhancement and supportiveness, loyalty and intimacy, things in common, companionship, conflict resolution, and conflict* (Ullrich-French & Smith, 2006). Fourteen items attend to positive relationships and three items attend to conflict relationships (Ullrich-French & Smith, 2006). Ullrich-French and Smith (2006) asserted that their modified *SFQS* yielded good internal consistency scores in all six dimensions. In the present study, responses to the 14 positive dimension items were summated to obtain a unidimensional parent relationship quality score. Participants were instructed to complete the modified *SFQS* for the one parent who they perceived to have the most significant influence on the sporting aspect of their lives. In the present study, the modified *SFQS* demonstrated good internal consistency (Cronbach’s $\alpha = 0.89$).

Perception of need satisfaction scale (PNSS). A self-developed nine-item questionnaire assessed participants’ perceived levels of autonomy, competency, and relatedness in the context of their sport (see Appendix D). Following the same procedure as for the development of the *CARS*, items were created based on established definitions of autonomy, competency, and relatedness. Each psychological need was represented by three items, and one

item from each of the psychological needs was taken directly from Blanchard et al.'s (2009) Perception of Need Satisfaction Scale. In the present study, the *PNSS* demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.80$).

Sport Motivation Scale – Revised (*SMS-II*; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). The *SMS-II*, an 18-item Likert-type scale, assesses various reasons why athletes may participate in their sports (see Appendix E). Items represent the six types of motivation, as established by Deci and Ryan (1985), which include *intrinsic*, *integrated*, *identified*, *introjected*, *external*, and *amotivated*. Responses to the nine items attending to intrinsic, integrated, and identified motivation were summated to obtain a unidimensional score of self-determined motivation. The *SMS-II* has previously yielded good reliability values (Cronbach's α was greater than or equal to 0.70) for each subscale (Pelletier et al., 2013). In the present study, this scale exhibited good internal consistency (Cronbach's $\alpha = 0.90$).

The Eating Attitudes Test - 26 (*EAT-26*; Garner, Olmsted, Bohr, & Garfinkel, 1982). The *EAT-26* is a 26-item self-report questionnaire that assesses various characteristics of eating disorders, such as avoidance of fattening foods, preoccupation with weight and shape, and pressure from others to gain weight (see Appendix F). Items are grouped into three factors which include *dieting*, *bulimia and food preoccupation*, and *oral control*; however, the present study utilized the *EAT-26* as a unidimensional measure of disordered eating such that higher scores reflected greater disordered eating attitudes (Brannan & Petrie, 2008; Wood & Petrie, 2010). In the present study, the *EAT-26* was scored on a one to six scale (as opposed to a zero to three scale) to generate greater variability in participants' final scores (Compeau & Ambwani, 2013). The *EAT-26* has previously yielded a high sensitivity rating of 83.6% (Garner et al., 1982). In a sample of primarily non-clinical female undergraduates, Cronbach's α was 0.86

(Brannan & Petrie, 2008). In the present study, the *EAT-26* demonstrated good internal consistency (Cronbach's $\alpha = 0.92$).

Personality Assessment Inventory - Positive Impression Management (*PAI-PIM*; Morey, 2007). The *PAI-PIM* is a nine-item questionnaire that assesses the degree to which participants minimize common flaws and present themselves in an overly favorable manner (see Appendix G). The researcher administered the *PAI-PIM* to determine socially desirable response styles that might warrant exclusion of participant data to minimize distortion of test results. Participants were considered for exclusion if they received a score of 18 or above (Peebles & Moore, 1998). Items on the *PAI-PIM* were not expected to correlate highly with each other because they assess acknowledgement of personal faults across multiple content areas (Ambwani & Chmielewski, 2013); thus, in the present study, Cronbach's α was 0.61.

Shortened version of the *SMS-II*. This shortened scale was comprised of seven items, all of which had the highest factor loadings in each of the six motivation factors from the original *SMS-II* (see Appendix H). Responses to the four items attending to intrinsic, integrated, and identified motivation were summated to obtain a unidimensional score of self-determined motivation. In the present study, this scale exhibited good internal consistency (Cronbach's $\alpha = 0.90$).

Dietary Intent Scale (*DIS*; Stice, Shaw, & Nemeroff, 1998). The *DIS* is a nine-item self-report questionnaire that assesses reduced intake of food, abstention from eating, and consumption of low-calorie foods. Although the original scale assesses these behaviors over a six-month time period, participants in the current study completed this scale post-experimental manipulation and were therefore instructed to consider the frequency of such behaviors during the period of one sport season (see Appendix I). Stice, Mazotti, Krebs, and Martin (1998)

indicated that in a study of 320 participants, the Cronbach's alpha for the *DIS* was 0.95. In the present study, the *DIS* exhibited good internal consistency (Cronbach's $\alpha = 0.94$).

Manipulation check questions. Two manipulation check questions followed each vignette to confirm participants' comprehension of the material and to ensure that the vignettes manipulated participants' perceptions of psychological need satisfaction in the desired direction. In order to pass the manipulation check, participants had to answer both questions correctly. Please see Appendix J for further clarification as to how participants passed the manipulation check.

Materials

Experimental vignettes. Six short stories (vignettes) were designed to manipulate participants' feelings of autonomy, competency, and relatedness in relation to their sport (see Appendix J). Vignettes were structured to address all essential components of autonomy-, competency-, and relatedness-supportive coaching as operationalized by Bartholomew et al. (2009). Three of the vignettes increased participants' perceptions of these psychological needs, and three decreased participants' perceptions. A separate set of six vignettes with different terminology (i.e., game, meet, or match; play, swim, or run) was made for each of the ten sports represented so that participants could more vividly envision themselves in the scenarios.¹

Procedure

¹ Prior to commencing data collection for the present study, the experimental vignettes were evaluated with a small within-subjects pilot study with undergraduate women athletes who were not eligible to participate in the present study ($N = 19$). Participants viewed the vignettes in randomized order and were asked to assess their vividness and accuracy in portraying realistic scenarios. Results supported the use of these vignettes in the current study and indicated that no revisions were necessary.

Athletes who met with the researcher in-person and expressed an interest to participate signed consent forms and provided email addresses on-site so that the researcher could contact them to schedule data collection sessions. Athletes who were recruited via email signed up online for data collection sessions and signed consent forms upon arriving to the testing site. Upon arriving to the testing site, participants completed questionnaires assessing coaching interpersonal and parenting styles, perceived psychological need satisfaction, self-determined motivation, and disordered eating behaviors. Then, participants completed an experimental manipulation. Following a 2 (Direction of need satisfaction: Increased vs. Decreased) x 3 (Psychological need: Autonomy vs. Competency vs. Relatedness) between-subjects design, participants were randomly assigned to read one of six vignettes to increase or decrease their perceived levels of autonomy, competency, or relatedness. After reading the vignettes, participants completed brief questionnaires to assess self-determined motivation and disordered eating. The study took approximately 15 minutes to complete. Upon completing all questionnaires, participants received a debriefing form which described in more detail the purpose of the study and included relevant scholarly sources, as well as contact information for the college's Wellness Center.

Data Analysis

The potential mediation of psychological need satisfaction on coaching and parenting styles and self-determined motivation, as well as of self-determined motivation on psychological need satisfaction and disordered eating behaviors were analyzed via PROCESS, a computational procedure that generates direct and indirect effects in simple mediation models (Hayes, 2012). For the indirect effects of each mediation analysis, bias-corrected 95% confidence intervals were

constructed through 10,000 bootstrap samples. Indirect effects were deemed significant if zero was not between the lower and upper bounds of the confidence intervals (Hayes, 2009).

Participant exclusion. Although four participants exceeded the cut-off score for the *PAI-PIM*, their exclusion from data analyses yielded no significant differences in results; thus, they were included in all data analyses in an effort to increase sample size. Thirty-one participants failed to pass the manipulation check and were therefore excluded from data analyses in the experimental portion (i.e., Hypothesis 3) of the study.

Results

Hypothesis 1

It was hypothesized that psychological need satisfaction would mediate the relationship between coaching and parenting styles and self-determined motivation. Specifically, coaching and parenting interpersonal styles that were perceived by athletes to be more autonomy-supportive than controlling would increase athletes' self-determined motivation by means of increasing their psychological need satisfaction. Separate simple mediation analyses were conducted for coaching and parenting styles using ordinary least squares path analysis (Model 4 in the PROCESS SPSS macro; Hayes, 2013).

Results indicated that perceived coaching style predicted psychological need satisfaction ($a = 0.5280, t = 8.08, p < 0.001$) and psychological need satisfaction predicted self-determined motivation ($b = 0.3101, t = 2.58, p = 0.01$). The direct effect of coaching style on self-determined motivation was not significant ($c' = -0.1059, t = -1.02, p = 0.31$; see Figure A3); however, the indirect effect ($ab = 0.1637$) yielded a confidence interval from 0.0239 to 0.3750 ($n = 113$) and was thus significant. The significant indirect effect indicated that coaching style

indirectly affected self-determined motivation through perceived psychological need satisfaction (see Figure A4).

Results indicated that perceived parenting style did not predict psychological need satisfaction ($a = 0.1604$, $t = 1.55$, $p = 0.12$), but psychological need satisfaction did predict self-determined motivation ($b = 0.2010$, $t = 2.14$, $p = 0.03$). The direct effect of parenting style on self-determined motivation was significant ($c' = 0.2633$, $t = 2.54$, $p = 0.01$; see Figure A5); however, the indirect effect ($ab = 0.0322$) yielded a confidence interval from -0.0025 to 0.1302 ($n = 113$) and was therefore not significant. Thus, psychological need satisfaction did not mediate the relationship between parenting style and self-determined motivation.²

Hypothesis 2

It was hypothesized that self-determined motivation would mediate the relationship between psychological need satisfaction and disordered eating behavior. Specifically, it was predicted that psychological need satisfaction would result in less disordered eating behaviors by means of increasing self-determined motivation. Results from the simple mediation analysis indicated that psychological need satisfaction predicted self-determined motivation ($a = 0.2358$, $t = 2.47$, $p = 0.01$), but self-determined motivation did not predict disordered eating behaviors ($b = 0.0299$, $t = 0.14$, $p = 0.89$). The direct effect of psychological need satisfaction on disordered eating behaviors was not significant ($c' = -0.1741$, $t = -0.79$, $p = 0.43$; see Figure A6), and the indirect effect ($ab = 0.0070$) yielded a confidence interval from -0.1129 to 0.1428 ($n = 113$) and was therefore not significant. Thus, self-determined motivation did not mediate the relationship between psychological need satisfaction and disordered eating behaviors.

² An examination of the distribution of parenting style scores revealed two outliers; however, results of the simple mediation analysis did not change significantly after the removal of these outliers.

Hypothesis 3

It was hypothesized that athletes who were experimentally exposed to increased levels of psychological need satisfaction would report higher levels of self-determined motivation and less disordered eating behaviors than would athletes who were exposed to decreased levels of psychological need satisfaction. Given the small correlation between the dependent variables of interest (self-determined motivation and disordered eating behaviors: $r = 0.01$, $p = 0.92$) which did not fall between the recommended range of correlation coefficients (0.30 to 0.70; Maxwell, 2001), two separate one-way analyses of variance were conducted for the dependent variables.

A 2 (Direction of need satisfaction: Increased vs. Decreased) x 3 (Psychological need: Autonomy vs. Competency vs. Relatedness) between-subjects ANOVA indicated a main effect of direction of need satisfaction, $F(1,76) = 44.43$, $p < 0.001$, $\eta^2 = 0.37$, such that regardless of psychological need, participants who experienced increased psychological need satisfaction ($M = 22.57$, $SD = 0.69$) exhibited greater self-determined motivation than did those who experienced decreased psychological need satisfaction ($M = 14.73$, $SD = 0.95$). Results indicated no other significant main or interaction effects (see Table 1). A 2 (Direction of need satisfaction: Increased vs. Decreased) x 3 (Psychological need: Autonomy vs. Competency vs. Relatedness) between-subjects analysis of variance indicated no significant main or interaction effects for disordered eating behaviors (see Table 2).

Two simple planned contrasts (autonomy vs. competency, autonomy vs. relatedness) were conducted to assess whether levels of autonomy had a greater impact on self-determined motivation and disordered eating behaviors than did levels of competency or relatedness. Results indicated no significant differences between psychological needs in their relative influence on participants' self-determined motivation (autonomy vs. competency: $p = 0.05$;

autonomy vs. relatedness: $p = 0.96$) and disordered eating behaviors (autonomy vs. competency: $p = 0.75$; autonomy vs. relatedness: $p = 0.88$).

Discussion

Previous research suggests coaches and parents are significant social agents who can satisfy or thwart athletes' psychological needs and ultimately self-determined motivation (Bartholomew et al., 2009; Blanchard et al., 2009); however, the relationship between psychological need satisfaction and disordered eating symptomatology remains unclear. Thus, the overarching goal of the present study was to expand upon previous research on eating disorders among female collegiate athletes through empirical examination of developing theories, such as self-determined motivation as a mediator between psychological need satisfaction and disordered eating. More specifically, the current study assessed the mediating role of psychological need satisfaction in the relationship between coaching/parenting styles and self-determined motivation, as well as the mediating role of self-determined motivation in the relationship between psychological need satisfaction and disordered eating behaviors among female collegiate athletes. The addition of an experimental component in the present study facilitated an examination of the causal effects of psychological need satisfaction on self-determined motivation and disordered eating behaviors. Thus, by implementing both mediation analyses and an experimental manipulation, the present study sought to answer the greater question of *how* eating disorders develop in female collegiate athletes.

Present results did not support the hypothesis that psychological need satisfaction mediates the relationship between coaching style and self-determined motivation; however, the data did indicate a significant indirect effect. This finding suggests that coaching style does affect athletes' self-determined motivation, but only indirectly by first affecting athletes'

perceptions of psychological need satisfaction. Consistent with previous research, this finding implies that athletes who experience autonomy-supportive coaching styles will have greater feelings of autonomy, competency, and relatedness than will those who experience controlling coaching styles (Bartholomew et al., 2009; Blanchard et al., 2009). These increased levels of psychological need satisfaction may then lead athletes to participate in their sports out of self-determined, as opposed to controlled, motivation (Bartholomew et al., 2009; Blanchard et al., 2009). Although some researchers would still refer to this relationship as mediational, it is recommended that the term ‘indirect effect’ be used because mediation implies that there is a direct effect between the antecedent variable (i.e., coaching style) and the criterion variable (i.e., self-determined motivation) when the mediator (i.e., psychological need satisfaction) is not present (Hayes, 2009; Mathieu & Taylor, 2006), which was not evident in the present study.

Present results also did not support the hypothesis that psychological need satisfaction would mediate the relationship between parenting style and self-determined motivation. Although results supported the direct relationship between psychological need satisfaction and self-determined motivation, it was unexpected that parenting style did not directly predict psychological need satisfaction as did coaching style. There are several possible explanations for the absence of this effect. First, according to Mathieu and Taylor (2006), causal sequences cannot be confirmed solely by statistical significance as researchers must also take into account temporal precedence. In other words, because mediational relationships imply a time-based sequence of events, it is imperative that the antecedent variable occur and develop before the mediator. Although mediation analyses can determine the statistical significance of relationships between variables, they cannot predict the amount of time it may take for each variable to develop and change (Mathieu and Taylor, 2006). Thus, the present study may not have

accurately determined the relationship between parenting style and psychological need satisfaction because the present study implemented a cross-sectional design in which constructs (i.e., parenting style and psychological need satisfaction) were measured almost simultaneously. Thus, a longitudinal design may have been more appropriate for allowing perceptions of parenting style to develop and change before affecting psychological need satisfaction. In addition to the issue of temporal precedence, it is important to note that the current study's sample included collegiate athletes who rarely spend time with their parents. In fact, most studies which examine the relationships among parenting style, psychological need satisfaction, and disordered eating in athletes involve adolescent athletics in which parents are heavily involved (Francisco, Narciso, & Alarcão, 2013). Collegiate athletes spend significantly more time with their coaches than with their parents in a sporting context, which would explain why coaching style was found to significantly predict psychological need satisfaction.

One study that did examine parental relationships and eating psychopathology in collegiate-aged athletes found that parent-athlete relationships were indirectly related to disordered eating behaviors through mediators of low self-esteem, increased self-critical perfectionism, and depression (Shanmugam, Jowett, & Meyer, 2013). Thus, further investigations are warranted to examine the possibility of intervening variables (i.e., mediators and moderators) other than psychological need satisfaction in the relationship between parenting style and self-determined motivation. Future studies may also consider investigating the effects that relationship quality with teammates have on athletes' self-determined motivation and disordered eating; however, the few studies which have addressed these variables found no significant relationships (Shanmugam et al., 2013). Overall, research on the relationship between parenting style and self-determined motivation is limited and inconsistent. Future

studies should continue to explore the mediating role of psychological need satisfaction for its limited, yet strong theoretical foundation, as well as for the benefits of study replication.

Present results did not support the hypothesis that self-determined motivation would mediate the relationship between psychological need satisfaction and disordered eating behaviors. Although results confirmed again the direct relationship between psychological need satisfaction and self-determined motivation, the remaining effects of the mediation were not significant. Taking into account the aforementioned issue of temporal precedence, it is possible that these variables needed more time to develop and change in order to affect each other, especially in the younger athletes who may have just finished their first season of collegiate sport (Mathieu & Taylor, 2006). Thus, a longitudinal design would be more appropriate for future studies. In addition to temporal precedence, Mathieu and Taylor (2006) assert that theoretical rationales must be considered before statistical significance in mediation analyses, especially for non-experimental studies with simultaneous measurements of the antecedent, mediator, and criterion variables. Therefore, despite a lack of statistical significance, researchers should not ignore the fact that previous studies propose self-determined motivation as a mediator of the relationship between psychological need satisfaction and disordered eating behaviors (Bartholomew et al., 2011; Blanchard et al., 2009; Mack et al., 2011). Most of these studies, however, measured general well-being in athletes and included lack of disordered eating as only one indicator of well-being (Bartholomew et al., 2011; Blanchard et al., 2009; Mack et al., 2011). Future studies should employ more comprehensive measures of disordered eating to better assess the relationships among psychological need satisfaction, self-determined motivation, and disordered eating behaviors among female collegiate athletes.

Similarly, another possibility for the failure to observe a significant mediating effect of self-determined motivation on the psychological need satisfaction and disordered eating relationship is the use of non-specific measurement for the criterion variable. Although the present study employed a widely-used measure of eating disorder symptoms (*Eating Attitudes Test - 26*; Garner et al., 1982), that has previously yielded high sensitivity (Garner et al., 1982), sport psychologists recommend that such measures as the *Physiologic Screening Test (PST)*; Black et al., 2003) and the *Athletic Milieu Direct Questionnaire (AMDQ)*; Nagel et al., 2000) may be more appropriate tools to detect eating disorders in collegiate athlete populations. Both of these scales include sport-specific items and therefore were designed specifically to detect eating disorders/disordered eating in female collegiate athletes. In fact, the *PST* includes four physiologic measurements (i.e., percentage of body fat, waist-to-hip ratio, standing diastolic blood pressure, and size of parotid/salivary glands) and is designed to be administered by athletic trainers so it is masked as a routine physical check-up (Black et al., 2003). Both of these scales have yielded significantly higher sensitivity, specificity, false-positive, false-negative, positive predictive, and negative predictive values than have other commercial tests not normed for athletes, such as the *Eating Disorder Inventory - 2* and the *Bulimia Test - Revised* (Black et al., 2003; Nagel et al., 2000). Thus, future studies employing the *PST* and/or the *AMDQ* in addition to more general eating disorder questionnaires may offer more comprehensive and accurate assessments of disordered eating among female collegiate athletes. The inclusion of these comprehensive measures may then lead to a more accurate assessment of the mediating role of self-determined motivation in the relationship between psychological need satisfaction and disordered eating behaviors.

Experimental results indicated a causal effect of direction of psychological need satisfaction (increased vs. decreased) on self-determined motivation such that athletes who experienced increased levels of autonomy, competency, and relatedness expressed greater self-determined motivation than did those who experienced decreased levels of psychological needs. In other words, participants expressed more intrinsic desires to participate in their sports when they perceived themselves to be in control, physically and mentally capable of performing well, and better able to relate to their coaches. More importantly, due to the structure of the study, psychological need satisfaction affected participants' self-determined motivation instantaneously. The greater implication of this finding is that athletes who are subjected to psychological need thwarting throughout an entire sport season may experience severe damage to their levels of self-determined motivation.

Although experimental results failed to support the direct impact of psychological need satisfaction on disordered eating behaviors, the present study highlights the need to explore other intervening variables, such as achievement motivation (Schüler & Kuster, 2011), contextual body image (Karin de Bruin, Oudejans, Bakker, & Woertman, 2011), mindfulness (McCarthy, 2011), and degree of athletic involvement (Madison & Ruma, 2003), in the relationship between psychological need satisfaction and disordered eating among female collegiate athletes. Future studies may also utilize a different scale from the present study's *Dietary Intent Scale (DIS)* (Stice et al., 1998) to measure the effect of psychological need satisfaction on disordered eating behaviors. The *DIS* was used in the present study, however, because of its shortened length, which attended to potential participant fatigue, and because it measures dietary intent, which was the primary construct of interest in the present study. Previous research suggests that people initially compensate for unfulfilled psychological needs through restrictive eating or dieting

(Schüler & Kuster, 2011). Furthermore, dieting, including dietary intent and restraint, is one of the most important risk factors for the development of clinical eating disorders in athlete populations (Greenleaf, Petrie, Reel, & Carter, 2010; Sundgot-Borgen & Torstveit, 2010).

The interpretation of present findings was limited by several design-related study limitations. First, the relatively small sample size, while it may not have affected the results of the mediation analyses, lowered the power of the experimental analyses. Future researchers examining athletes at small, Division III, liberal arts colleges should consider recruiting athletes from multiple colleges in order to achieve a sufficient sample size. Second, as stated earlier, future researchers examining disordered eating symptomatology among female collegiate athletes should employ the *PST* (Black et al., 2003) and/or the *AMDQ* (Nagel et al., 2000) in addition to general eating disorder measures to more accurately assess disordered eating behaviors. Third, about one-fourth of participants failed to pass the experimental manipulation check and over half of those participants were assigned randomly to the relatedness (as opposed to the autonomy and competency) vignettes. Although the researcher conducted a brief pilot study before the present study to assess the vividness and realism of the vignettes, it is possible that the relatedness vignettes did not convincingly portray controlling or supportive coaching relationships. Future researchers should consider reviewing and revising the present study's vignettes so that perhaps a significant effect of psychological need satisfaction on disordered eating behaviors may be found. Finally, future researchers investigating the relationships among coaching/parenting styles, psychological need satisfaction, self-determined motivation, and disordered eating among female collegiate athletes should consider employing a longitudinal design to account for the temporal precedence of the variables. Ultimately, researchers may also

consider combining the mediational models of the present study (see Figures A1 and A2) to create a greater model that illustrates the relationships among all the variables (see Figure A7).

Conclusions

Eating disorders are among the most debilitating psychiatric disorders and are especially prevalent in female collegiate athlete compared to non-athlete populations (Black et al., 2003; Smolak et al., 2000). Furthermore, research is beginning to evidence the presence of eating disorder symptomatology in not only aesthetic, but non-aesthetic sports (i.e., golf, soccer, volleyball; Stirling & Kerr, 2012; Nagel et al., 2000). In fact, participants in the present study who indicated histories of eating disorder diagnoses represented such sports as basketball, track-and-field, soccer, and swimming. Eating disorders in non-aesthetic sports are often overlooked and understudied, which leaves these athletes vulnerable to the unforgiving long-term consequences of the disorders. It is imperative that female athletes are made aware of their increased risk, as well as the fact that engaging in disordered eating behaviors is a crucial risk factor for developing full-blown eating disorders (Black et al., 2003). Similarly, coaches must understand the influential roles they play in shaping their athletes' self-determined motivation through fostering or hindering their athletes' needs to feel in control and competent in their sports.

Although the present study did not find a significant relationship between psychological need satisfaction and disordered eating behaviors, previous research established that decreased levels of autonomy, competency, and relatedness drive athletes to develop disordered eating behaviors (Schüler & Kuster, 2011; Verstuyf et al., 2012). Thus, future researchers should continue to explore this relationship because the intervening variable(s) between psychological need satisfaction and disordered eating behaviors remains unclear. Future studies should also

continue to explore mediation models in the development of eating disorders among female collegiate athletes because they explain *how* phenomena occur (Hayes, 2012). Recognizing and understanding the antecedents to the development of eating disorders among female athletes will cultivate more effective preventative measures to ensure healthy eating and holistic well-being among athletes. For example, present findings suggest that coaches should assess their athletes' levels of psychological needs and self-determined motivation regularly throughout their sport seasons to foster the healthiest and most successful playing environments. The current study contributes to the limited research on eating disorders and disordered eating among female collegiate athletes by revealing crucial antecedent variables (i.e., coaching style, psychological need satisfaction, self-determined motivation) and by providing foundational evidence upon which to build longitudinal designs.

References

- Ambwani, S., & Chmielewski, J. F. (2013). Weighing the evidence: Social desirability, eating disorder symptomatology, and accuracy of self-reported body weight among men and women. *Sex Roles, 68*, 474-483. doi: 10.1007/s11199-012-0244-1
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (4th ed.)*, DSM-IV. Washington: American Psychiatric Association.
- Arthur-Cameselle, J. N., & Quatromoni, P. A. (2010). Factors related to the onset of eating disorders reported by female collegiate athletes. *The Sport Psychologist, 25*, 1-17.
- Bartholomew, K. J., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2009). A review of controlling motivational strategies from a self-determination theory perspective: Implications for sports coaches. *International Review of Sport and Exercise Psychology, 2*, 215-233. doi: 10.1080/17509840903235330
- Black, D. R., Larkin, L. J. S., Coster, D. C., Leverenz, L. J., & Abood, D. A. (2003). Physiologic screening test for eating disorders/disordered eating among female collegiate athletes. *Journal of Athletic Training, 38*, 286-297.
- Blanchard, C. M., Amiot, C. E., Perreault, S., Vallerand, R. J., & Provencher, P. (2009). Cohesiveness, coach's interpersonal style and psychological needs: Their effects on self-determination and athletes' subjective well-being. *Psychology of Sport and Exercise, 10*, 545-551. doi: 10.1016/j.psychsport.2009.02.005
- Brannan, M. E., & Petrie, T. A. (2008). Moderators of the body dissatisfaction-eating disorder symptomatology relationship: Replication and extension. *Journal of Counseling Psychology, 55*, 263-275. doi: 10.1037/0022-0167.55.2.263

- Compeau, A., & Ambwani, S. (2013). The effects of fat talk on body dissatisfaction and eating behavior: The moderating role of dietary restraint. *Body Image, 10*, 451-461. doi: 10.1016/j.bodyim.2013.04.006
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Francisco, R., Narciso, I., & Alarcão, M. (2013). Parental influences on elite aesthetic athletes' body image dissatisfaction and disordered eating. *Journal of Child and Family Studies, 22*, 1082-1091. doi: 10.1007/s10826-012-9670-5
- Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: Psychometric features and clinical correlates. *Psychological Medicine, 12*, 871-878.
- Greenleaf, C., Petrie, T. A., Carter, J., & Reel, J. J. (2009). Female collegiate athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health, 57*, 489-495.
- Greenleaf, C., Petrie, T., Reel, J. J., & Carter, J. (2010). Psychosocial risk factors of bulimic symptomatology among female athletes. *Journal of Clinical Sport Psychology, 4*, 177-190.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guildford Publishers, Inc.
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling. Retrieved from <http://www.afhayes.com/public/process2012.pdf>

- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76*, 408-420. doi: 10.1080/03637750903310360
- Karin de Bruin, A. P., Oudejans, R. R. D., Bakker, F. C., & Woertman, L. (2011). Contextual body image and athletes' disordered eating: The contribution of athletic body image to disordered eating in high performance women athletes. *European Eating Disorders Review*, *19*, 201-215.
- Mack, D. E., Wilson, P. M., Oster, K. G., Kowalski, K. C., Crocker, P. R. E., & Sylvester, B. D. (2011). Well-being in volleyball players: Examining the contributions of independent and balanced psychological need satisfaction. *Psychology of Sport and Exercise*, *12*, 533-539. doi: 10.1016/j.psychsport.2011.05.006
- Madison, J. K., & Ruma, S. L. (2003). Exercise and athletic involvement as moderators of severity in adolescents with eating disorders. *Journal of Applied Sport Psychology*, *15*, 213-222. doi: 10.1080/10413200390213353
- Mathieu, J. E., & Taylor, S. R. (2006). Clarifying conditions and decision points for mediational type inferences in organizational behavior. *Journal of Organizational Behavior*, *27*, 1031-1056.
- Maxwell, S. E. (2001). When to use MANOVA and significant MANOVAs and insignificant ANOVAs or vice versa. *Journal of Consumer Psychology*, *10*, 5-35.
- McCarthy, J. J. (2011). Exploring the relationship between goal achievement orientation and mindfulness in collegiate athletes. *Journal of Clinical Sport Psychology*, *5*, 44-57.
- Morey, L. C. (2007). Personality assessment inventory professional manual, 2nd Edition. Lutz, FL: Psychological Assessment Resources.

- Nagel, D. L., Black, D. R., Leverenz, L. J., & Coster, D. C. (2000). Evaluation of a screening test for female college athletes with eating disorders and disordered eating. *Journal of Athletic Training, 35*, 431-440.
- Peebles, J., & Moore, R. J. (1998). Detecting socially desirable responding with the personality assessment inventory: The positive impression management scale and defensiveness index. *Journal of Clinical Psychology, 54*, 621-628.
- Pelletier, L. G., Rocchi, M. A., Vallerand, R. J., Deci, E. L., & Ryan, R. M. (2013). Validation of the revised sport motivation scale (SMS-II). *Psychology of Sport and Exercise, 14*, 329-341. doi: 10.1016/j.psychsport.2012.12.002
- Schüler, J., & Kuster, M. (2011). Binge eating as a consequence of unfulfilled basic needs: The moderating role of implicit achievement motivation. *Motivation and Emotion, 35*, 89-97. doi: 10.1007/s11031-010-9200-y
- Scoffier, S., Gernigon, C., & d'Arripe-Longueville, F. (2012). Effects of achievement goals on self-regulation of eating attitudes among elite female athletes: An experimental study. *Psychology of Sport and Exercise, 13*, 201-207. doi: 10.1016/j.psychsport.2011.11.005
- Scoffier, S., Maïano, C., & d'Arripe-Longueville, F. (2010). The effects of social relationships and acceptance on disturbed eating attitudes in elite adolescent female athletes: The mediating role of physical self-perceptions. *International Journal of Eating Disorders, 43*, 65-71. doi: 10.1002/eat.20597
- Shanmugam, V., Jowett, S., & Meyer, C. (2013). Eating psychopathology amongst athletes: The importance of relationships with parents, coaches, and teammates. *International Journal of Sport and Exercise Psychology, 11*, 24-38. doi: 10.1080/1612197X.2012.724197

- Smolak, L., Murnen, S. K., & Ruble, A. E. (2000). Female athletes and eating problems: A meta-analysis. *International Journal of Eating Disorders, 27*, 371-380. doi: 10.1002/(SICI)1098-108X(200005)27:4<371::AID-EAT>3.0.CO;2-Y
- Stice, E., Mazotti, L., Krebs, M., & Martin, S. (1998). Predictors of Adolescent Dieting Behaviors. *Psychology of Addictive Behaviors, 12*, 195-205.
- Stice, E., Shaw, H., & Nemeroff, C. (1998). Dual pathway model of bulimia nervosa: Longitudinal support for dietary restraint and affect-regulation mechanisms. *Journal of Social and Clinical Psychology, 17*, 129-149.
- Stirling, A., & Kerr, G. (2012). Perceived vulnerabilities of female athletes to the development of disordered eating behaviors. *European Journal of Sport Science, 12*, 262-273. doi: 10.1080/17461391.2011.586437
- Sundgot-Borgen, J., & Torstveit, M. K. (2010). Aspects of disordered eating continuum in elite high-intensity sports. *Scandinavian Journal of Medicine and Science in Sports, 20*, 112-121. doi: 10.1111/j.1600-0838.2010.01190.x
- Ullrich-French, S., & Smith, A. L. (2006). Perceptions of relationships with parents and peers in youth sport: Independent and combined prediction of motivational outcomes. *Psychology of Sport and Exercise, 7*, 193-214. doi: 10.1016/j.psychsport.2005.08.006
- Verstuyf, J., Patrick, H., Vansteenkiste, M., & Teixeira, P. J. (2012). Motivational dynamics of eating regulation: A self-determination theory perspective. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 1-16.
- Verstuyf, J., Vansteenkiste, M., Soenens, B., Boone, L., & Mouratidis, A. (2013). Daily ups and downs in women's binge eating symptoms: The role of basic psychological needs,

general self-control, and emotional eating. *Journal of Social and Clinical Psychology*, 32, 335-361.

Weiss, M. R., & Smith, A. L. (1999). Quality of youth sport friendships: Measurement development and validation. *Journal of Sport and Exercise Psychology*, 21, 145-166.

Wood, N. A. R., & Petrie, T. A. (2010). Body dissatisfaction, ethnic identity, and disordered eating among African American women. *Journal of Counseling Psychology*, 57, 141-153. doi: 10.1037/a0018922

Table 1

Direction of Need Satisfaction by Psychological Need Factorial ANOVA for Self-Determined

Motivation

Source	<i>Df</i>	<i>F</i>	η^2	<i>p</i>
(A) Direction of Need Satisfaction	1	44.43	0.37	<0.001
(B) Psychological Need	2	2.63	0.07	0.08
A x B (interaction)	2	1.01	0.03	0.37
Error (within groups)	76			

Table 2

*Direction of Need Satisfaction by Psychological Need Factorial ANOVA for Disordered Eating**Behaviors*

Source	<i>Df</i>	<i>F</i>	η^2	<i>p</i>
(A) Direction of Need Satisfaction	1	0.42	0.01	0.52
(B) Psychological Need	2	0.05	0.00	0.95
A x B (interaction)	2	0.72	0.02	0.49
Error (within groups)	76			

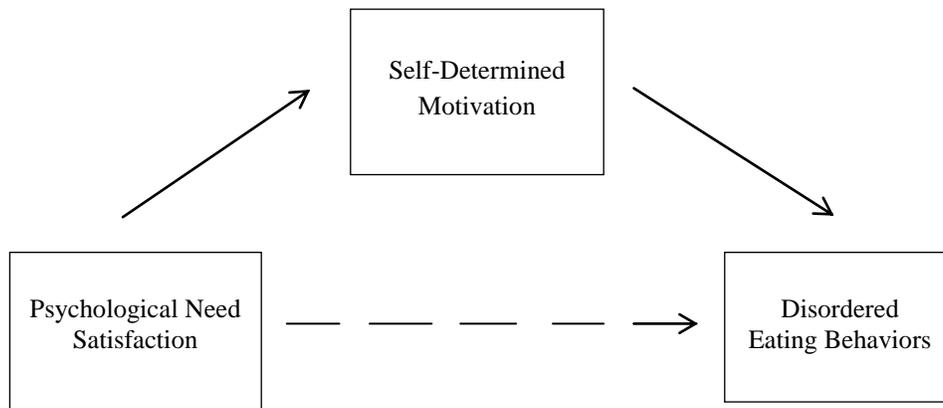
Appendix A: Figures

Figure A1. Theorized model in which levels of self-determined motivation mediate the relationship between psychological need satisfaction and disordered eating behaviors among athletes.

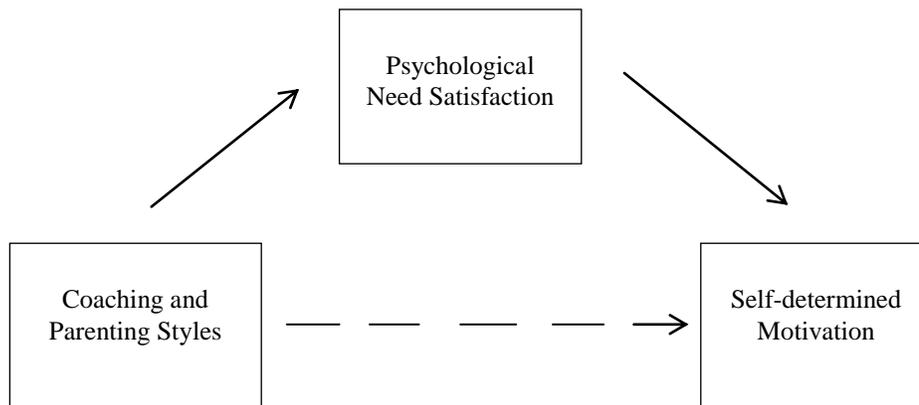


Figure A2. Theorized model in which the relationship between coaching and parenting styles and athletes' levels of self-determined motivation is mediated by athletes' psychological need satisfaction.

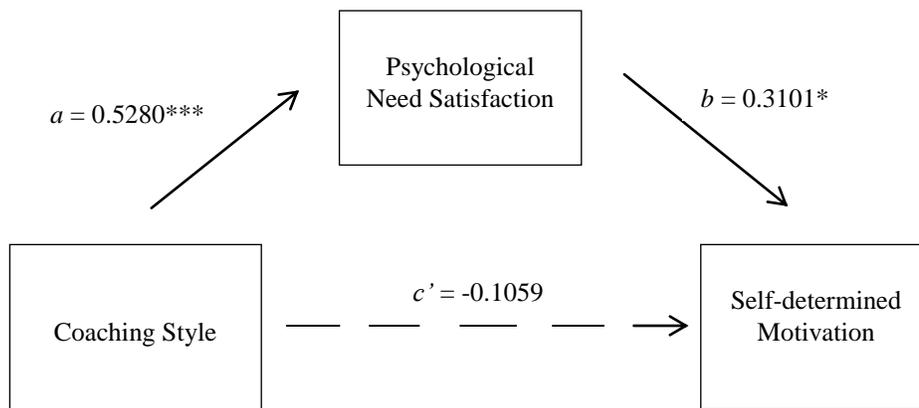


Figure A3. Statistical model representing the results of the simple mediation analysis of the mediating effect of psychological need satisfaction on the relationship between coaching style and self-determined motivation. Coaching style significantly predicts psychological need satisfaction and psychological need satisfaction significantly predicts self-determined motivation. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

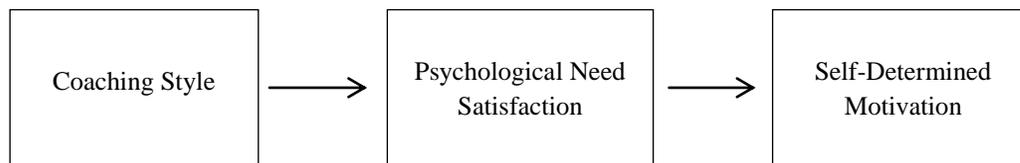


Figure A4. Conceptual model in which coaching style affects self-determined motivation indirectly through psychological need satisfaction.

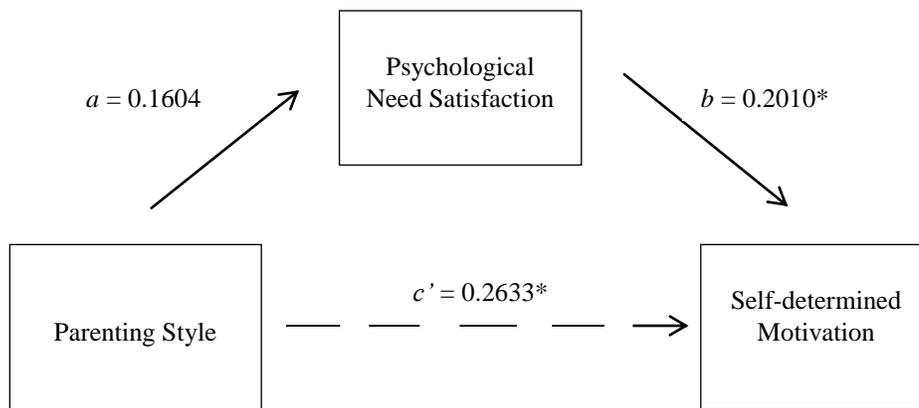


Figure A5. Statistical model representing the results of the simple mediation analysis of the mediating effect of psychological need satisfaction on the relationship between parenting style and self-determined motivation. There is a significant direct effect of parenting style on self-determined motivation and psychological need satisfaction significantly predicts self-determined motivation. $*p < 0.05$.

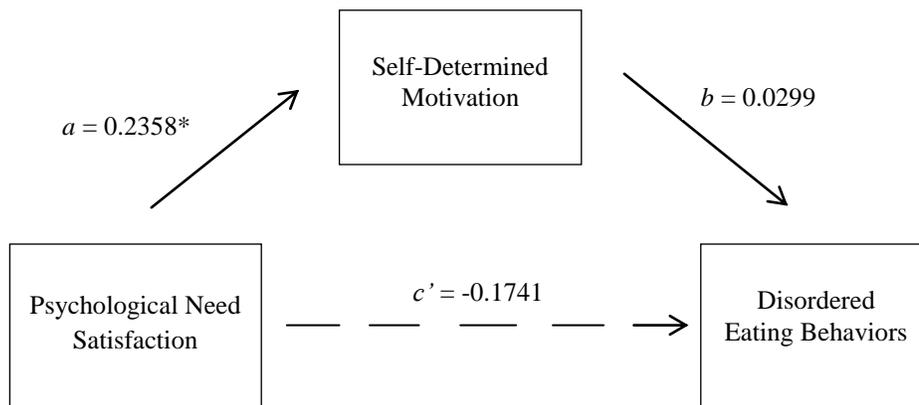


Figure A6. Statistical model representing the results of the simple mediation analysis of the mediating effect of self-determined motivation on the relationship between psychological need satisfaction and disordered eating behaviors. Psychological need satisfaction significantly predicts self-determined motivation. $*p < 0.05$.

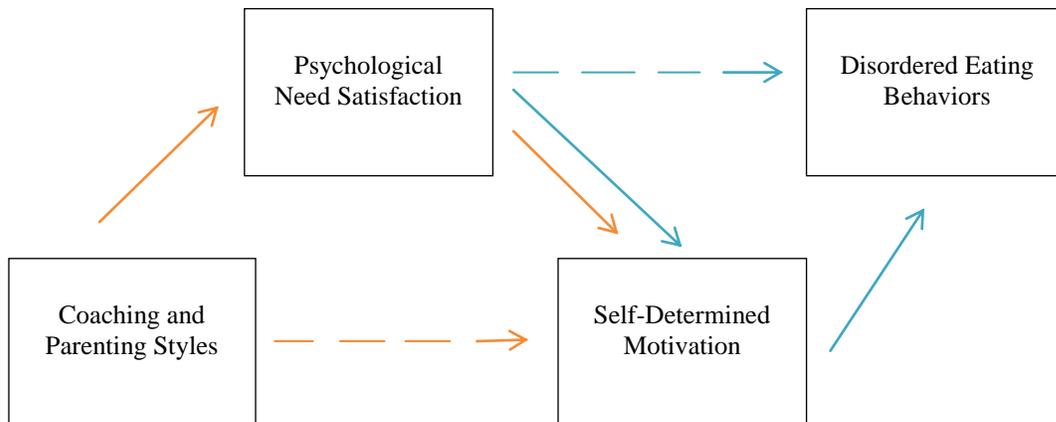


Figure A7. Theorized model in which psychological need satisfaction mediates the relationship between coaching and parenting styles and self-determined motivation, which mediates the relationship between psychological need satisfaction and disordered eating behaviors.

Appendix B: Coach-Athlete Relationship Scale

Psychological Need	Items
Autonomy	<p>My coach controls the extent to which I participate in activities outside my sport. **</p> <p>Because of my coach, I do not feel like I have any control over my playing time. **</p> <p>My coach asks for and values my opinions.</p> <p>My coach allows me to decide when I can and cannot participate in my sport (i.e. if I have an injury, if I have class).</p>
Competency	<p>After I make a mistake, my coach encourages me. *</p> <p>My coach has confidence in me during my sport. *</p> <p>My coach makes me feel that I am an important member of the team.</p> <p>During practices, my coach provides me with feedback that is constructive and helpful.</p>
Relatedness	<p>My coach and I can talk about anything. *</p> <p>My coach and I think the same way. *</p> <p>My coach and I share the same goals for the team each season.</p> <p>I feel comfortable to meet with my coach individually if I have concerns about my position on the team.</p>

Items assessed on a 5-point Likert scale (1=Not at all true; 2=A little true; 3=Somewhat true; 4=Pretty true; 5=Really true)

* Items taken from the *SFQS* as modified by Scoffier et al. (2010)

** Items reverse-scored during data analysis

Appendix C: Sport Friendship Quality Scale – Modified for Mother-child and Father-child relationships

SFQS (Weiss & Smith, 1999) – *Modified for Mother-child and Father-child Relationships* (Ullrich-French & Smith, 2006)

“When responding to the items, keep in mind the **one parent** who has the most significant influence on your life in regards to your sport.”

Parent-Child Relationship Dimension	Items
-------------------------------------	-------

Self-Esteem Enhancement and Supportiveness	After I make a mistake, my parent encourages me. My parent has confidence in me during my sport.
Loyalty and Intimacy	My parent and I can talk about anything. My parent looks out for me. My parent and I tell each other secrets.
Things in Common	My parent and I have common interests. My parent and I do similar things. My parent and I have the same values. My parent and I think the same way.
Companionship	My parent and I do fun things. My parent and I spend time together.
Conflict Resolution	My parent and I make up easily when we have a fight. My parent and I try to work things out when we disagree. When we have an argument, my parent and I talk about how to reach a solution.
Conflict	My parent and I get mad at each other. * My parent and I fight. * My parent and I have arguments. *

Items assessed on a 5-point Likert scale (1=Not at all true; 2=A little true; 3=Somewhat true; 4=Pretty true; 5=Really true)

* Items excluded from data analysis

Appendix D: Perception of Need Satisfaction Scale

“Usually, when I play my sport ...”

Psychological Need	Items
Autonomy	I feel obligated to play. * I feel in control of my playing time. My opinions are valued by my team and coach.
Competency	I feel that I am good. * I feel that I am an important member of the team. I receive compliments and positive reinforcement.
Relatedness	I feel appreciated by other players. * I share values with my teammates and coach. I feel comfortable to be myself around my team.

Items assessed on a 7-point Likert scale (1=Strongly disagree; 2=Fairly disagree; 3=Somewhat disagree; 4=Neutral; 5=Somewhat agree; 6=Fairly agree; 7=Strongly agree)

* Items taken from Blanchard et al.'s (2009) perception of need satisfaction scale

Appendix E: Sport Motivation Scale – Revised

Sport Motivation Scale – Revised (SMS-II; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013)

“Why do you participate in your sport?”

Motivation Type	Items
Intrinsic	<p>Because it gives me pleasure to learn more about my sport.</p> <p>Because I find it enjoyable to discover new performance strategies.</p> <p>Because it is very interesting to learn how I can improve.</p>
Integrated	<p>Because practicing my sport reflects the essence of who I am.</p> <p>Because participating in my sport is an integral part of my life.</p> <p>Because through my sport, I am living in line with my deepest principles.</p>
Identified	<p>Because I have chosen this sport as a way to develop myself.</p> <p>Because I have found it is a good way to develop aspects of myself that I value.</p> <p>Because it is one of the best ways I have chosen to develop other aspects of myself.</p>
Introjected	<p>Because I would feel bad about myself if I did not take the time to do it. *</p> <p>Because I feel better about myself when I do. *</p> <p>Because I would not feel worthwhile if I did not. *</p>
External	<p>Because people I care about would be upset with me if I didn't. *</p> <p>Because I think others would disapprove of me if I did not. *</p> <p>Because people around me reward me when I do. *</p>
Amotivated	<p>I used to have good reasons for participating in my sport, but now I am asking myself if I should continue. *</p> <p>So that others will praise me for what I do. *</p>

It is not clear to me anymore; I don't really think my place
is in this sport. *

Items assessed on a 7-point Likert scale (1=Strongly disagree; 2=Fairly disagree; 3=Somewhat disagree; 4=Neutral; 5=Somewhat agree; 6=Fairly agree; 7=Strongly agree)

* Items excluded from data analysis

Appendix F: The Eating Attitudes Test - 26

EAT-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982)

1. Am terrified about being overweight.
2. Avoid eating when I am hungry.
3. Find myself preoccupied with food.
4. Have gone on eating binges where I feel that I may not be able to stop.
5. Cut my food into small pieces.
6. Aware of the calorie content of foods that I eat.
7. Particularly avoid foods with high carbohydrate content (e.g. bread, rice, potatoes, etc.).
8. Feel that others would prefer if I ate more.
9. Vomit after I have eaten.
10. Feel extremely guilty after eating.
11. Am preoccupied with a desire to be thinner.
12. Think about burning up calories when I exercise.
13. Other people think that I am too thin.
14. Am preoccupied with the thought of having fat on my body.
15. Take longer than others to eat my meals.
16. Avoid foods with sugar in them.
17. Eat diet foods.
18. Feel that food controls my life.
19. Display self-control around food.
20. Feel that others pressure me to eat.
21. Give too much time and thought to food.
22. Feel uncomfortable after eating sweets.
23. Engage in dieting behavior.
24. Like my stomach to be empty.
25. Enjoy trying new rich foods.
26. Have the impulse to vomit after meals.

Items assessed on a 1 - 6 (6-point) Likert scale (1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Usually; 6=Always)

Note: Items assessed on a 1 - 6 scale to obtain greater variability (Compeau & Ambwani, 2013).

Some sources recommend scoring items on a 0 - 3 scale (0=Never; 0=Rarely; 0=Sometimes; 1=Often; 2=Usually; 3=Always; Noma, Nakai, Hamagaki, Uehara, Hayashi, & Hayashi, 2006).

Appendix G: Personality Assessment Inventory - Positive Impression Management

PAI-PIM (Morey, 2007)

1. Sometimes I let little things bother me too much.
2. Sometimes I'll avoid someone I really don't like.
3. I sometimes complain too much.
4. Sometimes I'm too impatient.
5. I don't take criticism very well.
6. Sometimes I put things off until the last minute.
7. I sometimes make promises that I can't keep.
8. There have been times when I could have been more thoughtful than I was.
9. I rarely get in a bad mood.

Items assessed on a 0 - 3 (4-point) Likert scale (0=False; 1=Slightly true; 2=Mainly true; 3=Very true)

Appendix H: Shortened Version of Sport Motivation Scale - Revised (SMS-II)

“While still envisioning yourself in that scenario, taking into account all the thoughts and feelings you would have, why do you feel you would participate in your sport?”

1. Because it would give me pleasure to learn more about my sport.
2. Because I would find it enjoyable to discover new performance strategies.
3. Because through sport, I would be living in line with my deepest principles.
4. Because I would chose this sport as a way to develop myself.
5. Because I would feel bad about myself if I did not take the time to do it. *
6. Because I would think others would disapprove of me if I did not. *
7. I would have used to have good reasons for participating in my sport, but I would ask myself if I should continue. *

Items assessed on a 7-point Likert scale (1=Strongly disagree; 2=Fairly disagree; 3=Somewhat disagree; 4=Neutral; 5=Somewhat agree; 6=Fairly agree; 7=Strongly agree)

* Items excluded from data analysis

Appendix I: Dietary Intent Scale

DIS (Stice, Shaw, & Nemeroff, 1998)

“Continue to envision yourself in that scenario, taking into account all the thoughts and feelings you would have. While imagining how you would feel, respond to the following statements ... How often, for the remainder of the season, would you engage in the following behaviors?”

1. I would take small helpings in an effort to control my weight.
2. I would hold back at meals in an attempt to prevent weight gain.
3. I would limit the amount of food I eat in an effort to control my weight.
4. I would sometimes avoid eating in an attempt to control my weight.
5. I would skip meals in an effort to control my weight.
6. I would sometimes eat only one or two meals a day to try to limit my weight.
7. I would eat diet foods in an effort to control my weight.
8. I would count calories to try to prevent weight gain.
9. I would eat low-calorie foods in an effort to avoid weight gain.

Items assessed on a 5-point Likert scale (1=Never, 2=Seldom, 3=Sometimes, 4=Often, 5=Always)

Appendix J: Experimental Vignettes and Manipulation Check Questions

“Imagine that it’s halfway through your sport season and you are experiencing the following scenario. Take your time and picture yourself as vividly as possible in the situation. Take into account all of the thoughts and feelings you would have. Be sure to answer the two questions that follow.”

Note: Responses in **bold** indicate those required for participants to pass the manipulation check. Participants had to answer both questions correctly to pass the manipulation check.

Increased Autonomy

Practice is about to begin, and as you’re warming up with the team, you’re thinking about how well you (played/swam/ran) in the last (game/meet/match). Parents and teammates congratulated you and even named you ‘MVP’ of the (game/meet/match)! You’re excited to begin this practice because you know if you continue to (play/swim/run) they way you have been, you’ll definitely (play/swim/run) in the next (game/meet/match). When your coach arrives, he/she approaches you and asks, “What do you think we should work on at practice today?” You list a couple of things that the team could work on and your coach responds, “Great, I agree. Why don’t you bring the team over and we can get practice started.” As the practice gets underway, your coach provides a helpful balance of positive feedback and constructive critique, saying things like, “That was great, but what do you think you could have done better?” You enjoy that rather than dictating your every move at practice and focusing on only your mistakes, your coach values your opinions and guides you to the correct solutions. After practice, you feel confident in the power you have over your performance ability and are certain you will (play/swim/run) in the next (game/meet/match).

Based on the above scenario, how in control would you feel on this team?

(1) *Not at all in control* (2) *A little in control* (3) ***Somewhat in control*** (4) ***Fairly in control*** (5) ***Very much in control***

In the above scenario, does your coach provide positive feedback, as well as constructive critique at practice?

(1) ***Yes*** (2) *No*

Decreased Autonomy

Practice is about to begin, and as you’re warming up with the team, you’re thinking about how you didn’t (play/swim/run) well in the last (game/meet/match). You try to reassure yourself that it’s okay, but you know that your performance at this practice will strongly determine if you (play/swim/run) in the next (game/meet/match). Your coach arrives, and you take a deep breath, reminding yourself to remain positive and energetic. However, as the practice gets underway,

your coach continues to point out everything you're doing wrong and you become more and more defeated. What's even worse is that your coach is degrading your performance in front of all your teammates, accusing you of being "off" lately and "not pushing yourself." After practice, you approach your coach to talk about what you need to work on in order to (play/swim/run) in the next (game/meet/match), but your coach focuses only on listing your mistakes from the previous (game/meet/match) and comparing you to your teammates who you know are not better than you. You leave this brief meeting not knowing why you're suddenly (playing/swimming/running) poorly or how to improve, and you have a feeling you will not be (playing/swimming/running) in the next (game/meet/match).

Based on the above scenario, how in control would you feel on this team?

(1) Not at all in control (2) A little in control (3) Somewhat in control (4) Fairly in control (5) Very much in control

In the above scenario, does your coach focus on only your mistakes during practice?

(1) Yes (2) No

Increased Competency

Practice is about to begin, and as you're warming up with the team, you're thinking about how well you (played/swam/ran) in the last (game/meet/match). Parents and teammates congratulated you and even named you 'MVP' of the (game/meet/match)! You're excited to begin this practice because you know if you continue to (play/swim/run) they way you have been, you'll definitely (play/swim/run) in the next (game/meet/match). When your coach arrives, practice begins. You feel positive and energetic, and appreciate the constructive and encouraging feedback you're receiving from your coach. Just by yelling things like, "Great work, I knew you could do it!", "Keep it up!", or "Keep trying -- you'll get there!", your coach makes you feel as if you are fully capable of achieving your goals on the team. Throughout practice, your coach compliments you in front of your teammates and points out what qualities you, specifically, bring to the team. At one point, your coach even asks you to demonstrate a skill to the rest of the team. After practice, you feel confident in your ability to perform and genuinely believe that you are a vital member of the team. You are certain you will (play/swim/run) in the next (game/meet/match).

Based on the above scenario, how competent would you feel on this team?

(1) Not at all competent (2) A little competent (3) Somewhat competent (4) Fairly competent (5) Very competent

In the above scenario, do you feel that you are a vital member of this team?

(1) Yes (2) No

Decreased Competency

Practice is about to begin, and as you're warming up with the team, you're thinking about how you didn't (play/swim/run) well in the last (game/meet/match). You try to reassure yourself that it's okay, but you know that your performance at this practice will strongly determine if you (play/swim/run) in the next (game/meet/match). Your coach arrives, and you take a deep breath, reminding yourself to remain positive and energetic. However, as the practice gets underway, your coach continues to point out everything you're doing wrong and you become more and more defeated. What's worse is that rather than providing constructive feedback, your coach yells things like, "No!" or "What are you thinking?!", which makes you feel mentally and physically incapable of performing well. You begin to feel as if you are one of the worst members of the team, and even begin to doubt if you were ever talented at your sport. After practice, you are unsure of your worth on the team and have a feeling you will not be (playing/swimming/running) in the next (game/meet/match).

Based on the above scenario, how competent would you feel on this team?

(1) Not at all competent (2) A little competent (3) Somewhat competent (4) Fairly competent (5) Very competent

In the above scenario, do you feel as if you're one of the worst members of this team?

(1) Yes (2) No

Increased Relatedness

Practice is about to begin, and as you're warming up with the team, you're thinking about how well you (played/swam/ran) in the last (game/meet/match). Parents and teammates congratulated you and even named you 'MVP' of the (game/meet/match)! You're excited to begin this practice because you know if you continue to (play/swim/run) they way you have been, you'll definitely (play/swim/run) in the next (game/meet/match). Before practice begins, however, your coach makes sure to ask you how your day has been going. After admitting that you're pretty busy with schoolwork, your coach reassures you, "Well, you know you're always welcome to talk to me about anything. Your academics are important, so just let me know how you're feeling throughout the practice." You are thankful for the relationship you have with your coach and your comfort in turning to your coach with any problems you are having on the team or in your classes. It is also a relief that you and your coach both believe that "school comes before sport," so you are comfortable admitting to your coach that you're "a little more tired today because of having to stay up late doing homework." Your coach reassures you, "Don't worry, I was once in college, too, so I know we all have good and bad days. But you've been doing really well lately and will surely forget about all that stress once practice begins."

Based on the above scenario, how well would you be able to relate to your coach on this team?

(1) Not at all well (2) A little well (3) Somewhat well (4) Fairly well (5) Very well

In the above scenario, do you feel comfortable to talk to your coach about problems with school?
(1) Yes (2) No

Decreased Relatedness

Practice is about to begin, and as you're warming up with the team, you're thinking about how you didn't (play/swim/run) well in the last (game/meet/match). You try to reassure yourself that it's okay, but you know that your performance at this practice will strongly determine if you (play/swim/run) in the next (game/meet/match). Unfortunately, you're extremely tired today from staying up late doing homework, but you don't feel comfortable telling your coach. You know that no matter what you tell your coach, he/she won't care. Even if your coach did somehow ask you how your day was going, you wouldn't be honest because, overall, you and your coach just don't share the same views on school or the team. While you believe that academics are more important than sport, your coach seems to assume that you have all the time in the world to dedicate to sport. So, if you were to tell your coach that you might be a little "off" at practice today because of how little sleep you got, your coach would most likely respond, "Well, I don't know why you're telling me. That's irresponsible and I don't want to hear about school while at practice." There's no way that you would feel comfortable to approach your coach at the end of practice to talk about (playing/swimming/running) in the next (game/meet/match).

Based on the above scenario, how well would you be able to relate to your coach on this team?
(1) Not at all well (2) A little well (3) Somewhat well (4) Fairly well (5) Very well

In the above scenario, do you feel comfortable to approach your coach about how you're feeling at practice?

(1) Yes (2) No

Appendix K: Participant Demographic Questions

1. What is your age in years?
2. What is your class year? (First-year, Sophomore, Junior, Senior)
3. What is your race/ethnicity? (Asian; American Indian and Alaska Native; Black or African American; Hispanic, Latino, or Spanish origins; Native Hawaiian or Other Pacific Islander; White - including European, Middle East, or North African origins; Other)
4. Which varsity sport do you play at Dickinson College (if you participate in more than one varsity sport, please indicate the sport in which you are currently participating)? *
5. Have you ever been diagnosed with an eating disorder? **
 - a. What was your diagnosis? (Anorexia nervosa, Bulimia nervosa, EDNOS)
6. What is your current height (in feet and inches)? **
7. What is your current weight (in pounds or kilograms)? **

* Question asked right before experimental section so that responses could redirect participants to appropriate vignettes

** Questions asked at the conclusion of the survey