Restrictive Eating and Risk for Suicidal Behavior: An Application of the Interpersonal-Psychological Theory of Suicide

by

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Abstract

Though the relationship between methods of dieting and suicidal behavior has been established (e.g., Crow et al., 2008), existing studies have not examined mechanisms underlying this relationship. This study sought to enhance understanding of this relationship using the interpersonal-psychological theory of suicide (IPTS; Joiner, 2005). We compared a sample of selected undergraduates who endorsed recently engaging in one dieting method (i.e., restrictive eating; $n = 99$) to control undergraduates endorsing no lifetime use of dietary methods ($n = 94$). We hypothesized that, statistically controlling for presence of other non-restrictive dietary methods, the restrictive eating group would have great acquired capability for suicide (ACS) and higher likelihood of suicide attempt history, and that no group differences would emerge on other IPTS constructs or suicidal ideation (SI). Contrary to hypotheses, no differences emerged between groups on ACS, and frequency of restrictive eating within the dietary restrictor group was not significantly associated with ACS. Consistent with hypotheses, dietary restrictors were more likely to have suicide attempt history, and groups had comparable levels of other IPTS constructs and SI. Though results were not entirely consistent with hypotheses, the current study represents the first attempt at isolating and examining a specific dietary method using the IPTS. Results suggest that, in isolation, restrictive eating may not be directly contributing to risk for suicide.

Table of Contents

List of Tables

Dieting, which refers to intentional and sustained restriction of food intake for the purposes of weight loss or maintenance (Stice, Fisher, & Lowe, 2004; Wadden, Brownell, & Foster, 2002) is endorsed by as many as 70% of men and women in the United States (French, Jeffery, & Murray, 1999; Jeffery, Adlis, & Forster, 1991). Dieting is especially common among college-aged women, often accompanying weight gain that occurs during the transition from high school to college (Anderson, Shapiro, & Lundgren, 2003; Lowe et al., 2006). Although less common than among women, some research suggests that college-aged men also engage in dietary practices to control weight (Lavender, De Young, & Anderson, 2010; O'Dea & Abraham, 2002).

Though dieting is usually thought to mean restriction of food intake for the purposes of weight loss or maintenance (Stice et al., 2004), the distinction between normal dietary practices and eating pathology are unclear, as the term dieting is also commonly used to refer to more extreme weight control methods such as purging and excessive exercise (Ackard, Croll, & Kearney-Cooke, 2002; Brownell & Rodin, 1994; Mintz & Betz, 1988; Whitehouse & Button, 1988). Although these practices may be characteristic of eating disorders such as bulimia nervosa (BN) and anorexia nervosa (AN), some college students without clinical eating disorder diagnoses also report using methods such as purging, taking diet pills, or using laxatives to influence weight (Brownell & Rodin, 1994; Bunnell, Shenker, Nussbaum, Jacobson, & Cooper, 1990; Chamay-Weber, Narring, & Michaud, 2005). However, most frequently used by college students are practices that restrict food intake to influence weight (i.e., restrictive eating), such as eating fewer calories, eliminating certain types of food, skipping meals, and in extreme cases,

fasting (Lavender, De Young, & Anderson, 2010; Mintz & Betz, 1988; O'Dea & Abraham, 2002; Striegel-Moore et al., 2009; Tylka & Subich, 2002).

Changes in diet and reduction of caloric intake are often associated with health benefits for overweight or obese individuals, including decreased risk of cardiovascular problems (Goodpaster et al., 2010) and decreased risk of diabetes (Van Dam, Willet, Rimm, Stampfer, & Hu, 2002). Additionally, dieting may be related to promotion of healthy behavior such as increased physical exercise and increased fruit and vegetable intake (French, Perry, Leon, & Fulkerson, 1995; Rafiroui, Sargent, Parra-Medina, Drane, & Valois, 2003). However, presence of more extreme, unhealthy weight loss behavior has received attention in the research literature because of its potential effects on long-term health outcomes such as osteoporosis and its association with a wide range of unhealthy behavior, such as problematic use of alcohol, marijuana, and cigarettes (Brownell & Rodin, 1994; Chamay-Weber et al., 2005; Heidelberg & Correia, 2009; Krahn, Kurth, Gomberg, & Drewnowski, 2005; Rafiroui et al., 2003). Though many negative health outcomes have been identified and studied in relation to dieting, one area that warrants further research is its relationship with suicidal behavior. Existing literature suggests a disconcerting correlation between dieting and suicidal ideation and attempts (Crow, Eisenberg, Story, & Neumark-Sztainer, 2008; French, Story, Downes, Resnick, & Blum, 1995; Neumark-Sztainer, Story, Dixon, & Murray, 1998; Rafiroui et al., 2003). Additionally, dieting is correlated with depressive symptoms, low self-esteem, and problems in interpersonal relationships, all factors that may also be related to the presence of suicidal behavior (Ackard et al., 2002; Bunnell et al., 1990; Crow, Eisenberg, Story, & Neumark-Sztainer, 2006; Crow et al., 2008; French et al., 1996).

Relatively few studies have investigated the relationship between suicidal behavior and dieting, and those that have are hampered by limitations. Researchers have often assessed for suicidal ideation and attempts in a dichotomous manner (e.g., Crow et al., 2008; Neumark-Sztainer et al., 1998; Rafiroui et al., 2003), which limits ability to explore the relationship between dieting and the intensity and frequency of suicidal behavior. Furthermore, past studies reporting information on dieting and suicidal behavior have often not utilized a specific operational definition of dieting, which makes it difficult to discern to which behavior the term dieting refers (Rafiroui et al., 2003; Timko, Perone, & Crossfield, 2006). For example, dieting may be assessed with the question: *How often have you gone on a diet during the last year? By diet, we mean changing the way you eat so you can lose weight* (French et al., 1995b). This question is vague and could be interpreted by respondents to include a variety of disparate types of behavior (e.g., fasting for long stretches of time, eliminating sugary foods from one's diet). Even when researchers collect information about specific dietary practices, practices are often grouped together for statistical analyses (e.g., Crow et al., 2008; Neumark-Sztainer et al., 1998; Rafiroui et al., 2003).

Moreover, an overarching limitation is the atheoretical nature of the existing literature connecting dieting and suicidal behavior, which focuses only on the correlation between dieting and suicidal behavior, rather than on attempting to identify explanatory mechanisms. The interpersonal-psychological theory of suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) proposes a comprehensive set of causal processes for suicide that may elucidate the heretofore-unexplained link between dieting and suicidal behavior. Although risk factors such as previous suicide attempts (Christiansen & Jensen, 2007), mental disorders (Nock, Hwang, Sampson, & Kessler, 2010), social isolation (Duberstein et al., 2004), family conflict (Joiner et al., 2002), and

unemployment (Brown, Beck, Steer, & Grisham, 2000) have been associated with suicidal behavior, each factor in isolation is limited as a predictor. The IPTS seeks to illuminate how these distal risk factors, and others, are related proximally to suicidal behavior through a precise and empirically-based causal pathway (Van Orden et al., 2010). The current study seeks to integrate the literature on dieting and suicidal behavior with the theoretical propositions of the IPTS in order to isolate and examine the relationship between specific restrictive dieting methods and suicidal behavior.

The Interpersonal-Psychological Theory of Suicide

The IPTS suggests that three separate constructs must be in place before a lethal suicide attempt can occur: thwarted belongingness, perceived burdensomeness, and an acquired capability for suicide (Joiner, 2005; Van Orden et al., 2010). Thwarted belongingness refers to a feeling of social disconnectedness, wherein an individual lacks support and does not provide support to others. Perceived burdensomeness refers to an individual's sense that he or she is a liability to others, accompanied by feelings of self-hate. The presence of either thwarted belongingness or perceived burdensomeness in isolation is proposed to create passive suicidal ideation (e.g., *I wish I were dead*). The joint presence of these constructs in combination with hopelessness about these conditions ever improving will produce active suicidal desire (e.g., *I want to kill myself*). However, according to the theory, suicidal desire alone is not sufficient to lead to lethal (or near-lethal) suicidal behavior. In addition, an individual must also possess a lowered fear of death, as well as elevated physical pain tolerance in order to engage in the fearsome and painful act of lethal self-injury. Lowered fear of death and elevated physical pain tolerance together comprise the third construct of the theory, known as the acquired capability for suicide (ACS; Van Orden et al., 2010).

The ACS is proposed to develop over time through repeated exposure to a variety of life experiences that are painful and provocative (i.e., fear-inducing). In this sense, the capability to inflict lethal self-harm is *acquired* over time, suggesting that it is not an innate characteristic. Instead, Joiner (2005) has adapted principles from opponent process theory (OPT; Solomon & Corbit, 1974) to explain the process by which the capability to withstand the fear and pain involved in self-injury can be acquired. OPT suggests that observable responses are the result of two underlying processes: the primary process and the opponent process. The primary process is the initial response to a stimulus (e.g., fear), and the opponent process is the opposite response (e.g., relief). Over time, repeated exposure to a stimulus results in an increase in the magnitude of the opponent process, whereas the magnitude of the primary process response is reduced. Once the magnitude of the opponent process surpasses that of the primary process, the observable result is habituation. In the context of ACS, instances of repeated self-harm are proposed to result in reduced fear of death and pain response (i.e., the primary processes) and an increase in the opponent processes of fearlessness about death and analgesia (Joiner, 2005; Van Orden et al., 2010). Subsequently, according to the IPTS, individuals with a history of nonfatal self-harm should have greater acquired capability for lethal self-injury than those without such a history.

The relationship between both pain tolerance and fearlessness about death and suicidal behavior has been demonstrated and supported in past research. Regarding pain tolerance, individuals with a history of suicide attempts and non-suicidal self-injury exhibit greater pain tolerance than control participants (Kemperman, Russ, & Shearin, 1997; Orbach, Mikulincer, King, Cohen, & Stein, 1997; Orbach et al., 1996). Similarly, other research indicates that there is a positive association between frequency of prior self-harm behavior and positive emotional

experiences following a recent episode of self-injury (Gordon et al., 2010) and following imagined self-injury (Brain, Haines, & Williams, 1998). Research also suggests that individuals with more previous suicide attempts self-report greater fearlessness about death, compared with non-attempters (Van Orden, Witte, Gordon, Bender, & Joiner, 2008). This increased fearlessness about death among suicide attempters can even distinguish attempters from suicide ideators (Smith, Cukrowicz, Poindexter, Hobson, & Cohen, 2010).

Although much research on acquired capability has been gathered from studies of suicide attempters, the majority of individuals who attempt suicide will not eventually die by suicide, and many individuals who die by suicide do so on their first attempt (Rudd, Joiner, & Rajab, 1996). These data suggest that other factors besides previous suicide attempts must also contribute to acquiring a capability for suicide (Van Orden et al., 2010). Indeed, a growing empirical literature suggests that combat exposure (Kang & Bullman, 2008), childhood maltreatment (Beautrais, 2001), exposure to suicidality in others (Insel & Gould, 2008), and impulsive behavior (McGirr et al., 2008) are all linked to suicidal behavior, and Joiner (2005) and Van Orden et al. (2010) suggest that these experiences function as painful and/or provocative events that, after repeated exposure over a period of time, could habituate an individual to physical pain and/or fear of death. However, there are likely other painful and provocative life events that increase ACS. Identification of additional painful and provocative events would serve to clarify the complex pathway from suicidal ideation to fatal attempt in the context of the IPTS.

Dieting, Perceived Burdensomeness, and Thwarted Belongingness

Although past research has established a link between dieting and suicidal behavior (Crow et al., 2008; French et al., 1995b; Neumark-Sztainer et al., 1998; Rafiroui et al., 2003), no

studies have specifically examined the constructs of the IPTS in relation to dieting. However, several psychological correlates and predictors of dieting seem relevant to the first two constructs of the theory (i.e., perceived burdensomeness and thwarted belongingness), and therefore, may partially explain the link between dieting and suicidal behavior. For example, past research has supported the relationship between dieting practices and depression, low self-esteem, and problems in interpersonal relationships, all of which could be related to feeling alone and/or like a burden (Ackard, Croll et al., 2002; Crow et al., 2006; Crow et al., 2008; French & Jeffery, 1994; Van Orden et al., 2010).

Another notable correlate of eating pathology that may be associated with both perceived burdensomeness and thwarted belongingness is perfectionism. Much research has established the link between perfectionism and eating pathology (e.g., Downey & Chang, 2007; Fairburn, Cooper, Doll, & Welch, 1999; Stice, 2002). Especially pertinent to the thwarted belongingness construct are findings that self-reported dieting is highest among individuals with high levels of perfectionism who are also experiencing interpersonal distress (Cain, Bardone-Cone, Abramson, Vohs, & Joiner, 2008). Among those with high levels of perfectionism, maladaptive perfectionists (i.e., those who perceive a high discrepancy between their high standards and ability to achieve those standards) may experience more interpersonal problems than adaptive perfectionists (i.e., those who strive for high standards but who are not self-critical about achieving these standards; Slaney, Pincus, Uliaszek, & Wang, 2006). Therefore, maladaptive perfectionism in particular may be associated with thwarted belongingness. Moreover, due to a discrepancy between their impossibly high standards and their ability to actually meet those standards (Slaney, Rice, Mobley, Trippi, & Ashby, 2001), maladaptive perfectionists may experience more intense feelings of perceived burdensomeness, compared to adaptive

perfectionists, insofar as they feel that they are a liability on those around them and/or feel self-hatred because of these failings. Indeed, research by Rasmussen and colleagues (2012) suggests that perceived burdensomeness mediates the relationship between maladaptive perfectionism and suicidal ideation in a sample of unselected undergraduates, proposing that the perception of burdensomeness experienced by some maladaptive perfectionists may cause such psychological distress that it leads to suicidal ideation.

Although dieting may be related to both perceived burdensomeness and thwarted belongingness, the nature of the relationship between dieting and these constructs is unclear. Some longitudinal research has suggested that depressive symptoms, perfectionism, problems in parent-child relationships, and low self-esteem precede the development of dieting in adolescents (Hill & Pallin, 1998; Stice, 2002; Von Soest & Wichstrom, 2009). That these psychosocial risk factors, which are presumably associated with thwarted belongingness and perceived burdensomeness, precede the development of dieting suggests that dieting, thwarted belongingness, and perceived burdensomeness may be better conceptualized as multifinal outcomes of these psychosocial risk factors. For example, maladaptive perfectionism may lead to both perceived burdensomeness and dieting. However, it is perceived burdensomeness, not dieting, that accounts for the relationship between maladaptive perfectionism and suicidal ideation, as found by Rasmussen et al. (2012). Thus, the relationship between dieting and suicidal ideation may be spurious and accounted for by psychosocial variables that are related to dieting and thwarted belongingness and/or perceived burdensomeness. Nevertheless, existing research has not examined the relationship between thwarted belongingness or perceived burdensomeness in relation to dieting practices and suicidal ideation, so the relationship among the variables remains unknown. The current study will address this limitation.

Dieting and the Acquired Capability for Suicide

The range of behavior often associated with dieting (e.g., fasting, skipping meals, purging) may be considered painful experiences that could facilitate the habituation to physical pain, and possibly, fear of death. Indeed, previous research has found that methods of weight control damage tissues, exert pain, and have adverse health consequences (Baker & Sandle, 1996; Hellstrom, 2007; Sidiropoulos, 2007). Therefore, the repetition of these practices necessary to lose weight, accompanied by enduring the pain associated with the behavior, may contribute to an increased tolerance of physical pain. This increased pain tolerance may make it possible for an individual who desires suicide to enact a medically lethal suicide attempt.

In support of this notion that there is a relationship between methods of weight control and ACS, individuals diagnosed with anorexia nervosa (AN) – a disorder characterized by restrictive eating – have high rates of suicide (e.g., Preti et al., 2011). The suggestion that restrictive eating increases ACS, and therefore can partially explain the link between AN and suicide, was first posited by Joiner (2005). However, the existing literature on this topic is limited and relies on imperfect measures of restrictive eating, ACS, or both. For example, there is evidence that individuals with AN have higher pain tolerance compared to control subjects (de Zwaan, Biener, Bach, Wiesnagrotzki, & Stacher, 1996; Lautenbacher, Pauls, Strian, Pirke, & Krieg, 1991; Raymond et al., 1999); furthermore, among those with AN, there is a positive association between self-injury and pain tolerance (Claes, Vandereycken & Vertommen, 2006). However, no study has demonstrated this relationship between people who only engage in restrictive eating (as opposed to having a diagnosis of AN) and increased physical pain tolerance, which leaves open the possibility that other associated features of AN (e.g., genetic risk factors) explain the association between this disorder and pain tolerance. Moreover, no study has

explored the possible relationship between restrictive eating and the other component of acquired capability – fearlessness about death.

Three recent studies provide additional, albeit, indirect support for the relationship between restrictive eating and ACS. Holm-Denoma et al. (2008) demonstrated that individuals with AN use highly lethal suicide methods that would likely result in death even in individuals of normal weight status. On the basis of these results, the authors posited that people with AN are capable of using lethal suicide methods because they have habituated to pain after repeated engagement in self-starvation. Selby et al. (2010) found an association between the restrictive subtype of AN and the frequency and lethality of suicidal behavior, even after controlling for endorsement of other types of painful and/or provocative behavior (e.g., self-induced vomiting, non-suicidal self-injury). On the basis of these results, Selby et al. (2010) reasoned that the habitual starvation experienced by individuals with the restrictive subtype of AN results in habituation to fear of death and physical pain. In addition, Witte et al. (2012) investigated the relationship between various painful and provocative experiences and suicidal behavior in a sample of patients diagnosed with body dysmorphic disorder (BDD). One finding of this study was that BDD-related restrictive eating (i.e., dieting or restricting eating to improve appearance of body areas of concern) was associated with suicide attempts, but not with suicidal ideation. The authors argued that this finding provides evidence of a specific relationship between restrictive food intake and ACS, as opposed to desire for suicide. Although these studies provide preliminary support for the relationship between restrictive eating and ACS, no direct measures of ACS were utilized. Additionally, measures of restrictive eating were limited—no measure was utilized by Holm-Denoma et al. (2008), whereas Selby et al. (2010) only specified AN, restrictive subtype, rather than using a direct measure of dietary restriction, and Witte et al.

(2012) used a dichotomous measure of restrictive eating. Thus, studies of the relationship between restrictive eating and ACS in clinical samples are limited; furthermore, to our knowledge, there have been no investigations of the link between acquired capability and restrictive eating in non-clinical populations.

Current Study

We aimed to integrate and improve upon two existing lines of research: the first, examining the relationship between dieting and suicidal behavior, and the second, investigating the relationship between restrictive eating and ACS. Existing literature on dieting and suicidal behavior is limited by its atheoretical nature, inconsistent operational definitions of dieting, and use of dichotomous measures of suicidal behavior. The current study addressed these limitations by using the IPTS as a framework and focusing specifically on one form of restrictive eating (i.e., fasting for prolonged periods of time) within the broader category of dieting. The existing literature on restrictive eating and ACS is primarily limited by imprecise measurement of key constructs; furthermore, because all existing studies have been conducted with samples of individuals diagnosed with either AN or BDD, it was not possible to demonstrate a relationship between restrictive eating specifically, as opposed to other associated features of these disorders (e.g., genetics, clinical distress), and ACS. The current study aimed to address these limitations by using psychometrically sound instruments and by focusing on presence of restrictive eating in a non-clinical sample. Moreover, the relationship between restrictive eating and the other constructs of the theory (i.e., perceived burdensomeness and thwarted belongingness) was examined for the first time.

Because existing research has demonstrated high rates of dieting among college students (Anderson et al., 2003; Lowe et al., 2006, Mintz & Betz, 1988; O'Dea & Abraham, 2002;

Striegel-Moore et al., 2009), we recruited college students who endorsed engaging in restrictive eating (i.e., fasting for eight hours or more while awake in order to influence shape or weight). In order to study the unique relationship between restrictive eating and the theory constructs, we also collected information on use of non-restrictive dieting methods (e.g., purging, excessive exercise), so that we could use these as control variables. Additionally, we collected data on a range of psychosocial variables that have a known association with dieting (e.g., depression, self-esteem, perfectionism, and problems in interpersonal relationships; Ackard et al., 2002; Crow et al., 2006; Crow et al., 2008; French & Jeffery, 1994) in order to characterize the psychosocial correlates of dietary restrictors, and to control for these variables.

Based on previous research on psychosocial correlates and suicidal behavior associated with dieting, and on preliminary evidence using the IPTS to study restrictive eating, we hypothesized that:

1. Consistent with prior studies on psychosocial correlates of individual who diet, college students who endorsed restrictive eating over the past month (i.e., dietary restrictors) would have lower self-esteem, fewer social supports and less satisfaction with this social support, more depressive symptoms, higher maladaptive perfectionism, higher levels of concern for weight, body shape, and eating, higher dietary restraint, and lower body mass index (BMI) than control participants not engaging in any form of dieting.
2. Dietary restrictors would have increased levels of perceived burdensomeness and thwarted belongingness compared to controls. However, we predicted that upon controlling for other psychosocial correlates, the levels of perceived burdensomeness and thwarted belongingness would not differ between the groups.

3. Dietary restrictors would have higher scores on a measure of suicidal ideation than controls. However, after controlling for other psychosocial variables (including thwarted belongingness and perceived burdensomeness), we predicted that the difference between the two groups on suicidal ideation would no longer be significant. Additionally, dietary restrictors would have higher likelihood of past suicide attempts compared to controls.
4. Dietary restrictors would have higher acquired capability for suicide (i.e., pain tolerance and fearlessness about death) than controls. However, we expected a stronger relationship between dietary restriction and pain tolerance than between dietary restriction and fearlessness about death, given that restrictive eating is more likely to expose (and therefore, habituate) an individual to physical pain than to the concept of death. We predicted that these differences would persist after controlling for psychosocial correlates.
5. Within the group of dietary restrictors, the frequency and number of lifetime restrictive methods used would have a positive correlation with both physical pain tolerance and fearlessness about death.

Method

Participants and Procedure

Participants were Auburn University undergraduates recruited through the SONA Human Subject Pool Software. Undergraduates were allowed to participate if over 18 years of age, and participants under age 19 had to provide parental consent to participate. Participants were able to sign up for the study online through SONA if they met inclusion criterion in a brief online screener by endorsing the item *within the past month, have you gone for long periods of time (8 hours or more) while awake without eating anything in order to influence your shape or weight?* Along with this dietary restrictors group, we recruited a second group of control participants with similar demographics (i.e., age, gender, race, and ethnicity). In an alternate SONA study signup, control individuals were allowed to participate if they did not endorse engaging in any eating pathology (i.e., fasting, self-induced vomiting, excessive exercise, laxative/diuretic use, binge eating) over their lifetime. Additionally, all participants (both dietary restrictors and controls) were subject to certain exclusion criteria, in order to ensure accurate and consistent measures of pain tolerance as well as to protect participants from possible negative outcomes from the pain tolerance assessment. We excluded participants currently taking any over-the-counter or prescription medications that increase the chance of bleeding (e.g., blood thinners such as aspirin, Coumadin, or Plavix; National Institutes of Health, 2012) as well as individuals with bleeding disorders (e.g., hemophilia). Additionally, to reduce errors due to pain insensitivity, participants were excluded if they had consumed alcohol within one hour of participation or taken any type of analgesic within eight hours of participation. Similarly, because of the

relationship between smoking and reduced pain sensitivity (Pomerleau, Turk, & Fertig, 1984), non-smoking participants were selected. Following several incidents that occurred when using the algometer in the current study and in another study being conducted in our research laboratory, we also began to exclude participants who had a history of seizures and fainting midway through data collection, in order to reduce risk of potential harm to participants who may have these preexisting conditions.

Prior to collecting data, we utilized G*Power version 3.1.2 (Erdfelder, Faul, & Buchner, 1996) to conduct a power analysis to determine the number of participants to recruit based on a priori hypotheses. For Hypothesis 5, which only includes the dietary restrictors, in order to have .80 power to detect a correlation of $r = .30$, we determined that a minimum of 84 dietary restrictors were needed. This analysis brought the total number of participants, combining both the dietary restrictor and control groups, needed to 168, which would give us .89 power to detect a medium effect size ($f^2 = .25$) for a MANCOVA with up to 10 covariates. Based on this analysis, the final sample used in the current study included 193 ($n = 99$ dietary restrictors; $n = 94$ controls) mostly female (83.90%) participants, whose mean age was 19.69 ($SD = 1.97$; range from 17 to 35). Most participants were non-Latino, White/European origin (90.20%); 7.80% were Black/African American; 2.10% were Latino/Hispanic; 1.00% were Asian American/Pacific Islander; 1.00% identified as multi-racial or other. Demographics for both groups (i.e., dietary restrictors and controls) were highly similar (see Table 1 for demographic information on both groups).

Upon determining eligibility, all participants (dietary restrictors and controls) were invited to participate in the study in our research laboratory. In the laboratory, they completed two sets of tasks. The first task was a battery of measures on a laboratory computer including

use, frequency, and history of dietary behavior, current and lifetime suicidal behavior, and other psychosocial variables. The second task included measurement of physical pain tolerance, height, and weight, which were conducted by a trained undergraduate research assistant. Participants were counterbalanced for the order of these sets of tasks. All participants were compensated for their participation through extra credit points for their respective psychology courses through the SONA Human Subject Pool Software.

Measures

Dietary behavior and attitudes. The Eating Disorder Examination—Questionnaire Version 6 (EDE-Q; Fairburn & Beglin 1994; Fairburn & Beglin, 2008) is a 28-item, self-report version of the EDE-Interview (Fairburn & Cooper, 1993). This questionnaire measures core attitudes about and symptoms of disordered eating over the past 28 days on four subscales: Restraint, Weight Concern, Shape Concern, and Eating Concern. The questionnaire also assesses for the occurrence and frequency of specific behavior such as binge eating, purging, using laxatives, using diuretics, and engaging in hard exercise with open-ended response questions (e.g., *Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?*). A systematic review of past research found acceptable internal consistency, test-retest reliability, and construct validity for the EDE-Q (Berg, Peterson, Frazier, & Crow, 2011). In the current study, all subscales scores of the EDE-Q were used to compare the attitudes and concerns of dietary restrictors compared to controls. In addition, endorsement of item 2 (i.e., *During the past 28 days, have you gone for long periods of time [8 waking hours or more] without eating to influence your shape or weight?)* was used to include participants in the dietary restrictor group. Because the Restraint subscale also includes the item assessing for fasting, which was used to group participants, the Restraint subscale total scores

were calculated without this item in analyses. Internal consistencies for the four subscales were all in the acceptable range for both groups in the current sample (α values ranged from .80-.88 for dietary restrictor group; α values ranged from .68-.89 for control group), with the exception of the Eating Concern subscale, which had lower internal consistency (α = .34) within the control group. Upon inspection of item responses for this subscale, it became clear that a majority of participants (67% of control sample) endorsed the lowest score possible for all items of this subscale. Because restriction of range attenuates measures of association (e.g., Pearson's correlation; Cronbach's alpha; Sackett & Yang, 2000), it is likely that the lower alpha value reflects the relatively low degree of eating pathology within the control group, which was the goal of recruitment.

Current restrictive dietary methods. In addition to the item from the EDE-Q assessing for current (i.e., past 28 days) fasting, additional items generated for this study were used to assess current use of other restrictive methods. Descriptive statistics on the endorsement of these current restrictive method items within the dietary restrictor group can be found in Table 2. Participants were asked to indicate the number of times over the past 28 days that they have skipped meals, or used other dieting methods found by Mintz and Betz (1988) to be restrictive dieting practices. These items clarified the extent to which participants in the dietary restrictor group have recently utilized other forms of restrictive eating, in addition to fasting for eight hours or more. These additional restrictive methods included: eat low calorie food, eat on a special diet, count calories, and stop eating certain foods (see Table 3). For current endorsement, participants were provided open-ended responses to items 2-7 in Table 3 to indicate the number of days over the past 28 days the restrictive method was used.

Current non-restrictive dietary methods. Other items from the EDE-Q assessing for current (i.e., past 28 days) endorsement of other non-restrictive dietary methods (i.e., self-induced vomiting, laxative use, excessive exercise, and binge eating) were also included for descriptive purposes. Descriptive statistics on the endorsement of current non-restrictive methods within the dietary restrictor group can be found in Table 2.

Lifetime restrictive dietary methods. Lifetime use of restrictive methods was assessed using items generated for this study. Participants were asked to indicate the number of times over their lifetime that they have fasted, skipped meals, eaten low calorie food, eaten on a special diet, reduced calorie intake, counted calories, and stopped eating certain foods (see Table 3). These items were rated on a 10-point scale, with higher scores indicating higher frequency of behavior. The total number of restrictive methods a participant has ever used was calculated using data from the items in Table 3. If the participant endorsed using one of these methods (e.g., skipping meals, counting calories, etc.) over his/her lifetime, the item was coded *1*; if he/she did not use a certain method over the lifetime, the item was coded *0*. Then, these coded scores were summed to create a total score for number of lifetime restrictive eating practices. Total score of lifetime restrictive dietary methods and specific frequency of each method (based on 10-point scale) over the lifetime were used to test Hypothesis 5. Furthermore, the item assessing for lifetime fasting was used as one of the exclusion criteria for the control group. Descriptive statistics on the endorsement of these lifetime restrictive method items within the dietary restrictor group can be found in Table 2.

Lifetime non-restrictive dietary methods. Additionally, items created for this study were used to determine lifetime occurrence and frequency of non-restrictive dietary methods (see Table 4). Using items from this table (excluding item 5, which assesses for binge eating), a total

score for use of non-restrictive dietary methods over the lifetime was derived from items on this questionnaire using the same procedure described earlier in calculating number of restrictive eating methods used, in order to control for lifetime use of non-restrictive dietary methods in analyses. These items were also rated on a 10-point scale, with higher scores indicating higher frequency of behavior. The item assessing for frequency of binge eating episodes was used for descriptive purposes. Descriptive statistics on the endorsement of these additional non-restrictive dietary methods within the dietary restrictor group can be found in Table 2. As described earlier (see *Participants and Procedure*), in order to be included in the control group, participants must not have endorsed lifetime engagement in self-induced vomiting, excessive exercise, laxative/diuretic use, or binge eating; thus, these created items were used as exclusion criteria for the control group.

Suicidal behavior. The Beck Suicide Scale (BSS; Beck & Steer, 1991) is a frequently used, 21-item self-report measure of suicide ideation and desire. Items are rated on a 0-2 scale, and higher scores on the first 19 items indicate increased suicidal ideation and possible intent. Total score from the first 19 items were used as a measure of suicidal ideation in the current study. Items 20 and 21 assess for the frequency and lethality of an individual's past suicide attempts (9.10% of dietary restrictor group reported a past suicide attempt; 0.00% of control group). Item 20 was used to test group differences in suicide attempt history for Hypothesis 3. Numerous studies have demonstrated the sound psychometric properties of the BSS, including its internal consistency and concurrent validity (e.g., Beck & Steer, 1991; Beck, Steer, & Ranieri, 1988). Internal consistencies for items 1-19 were in the acceptable range for both groups in the current sample (α = .88 dietary restrictor group; α = .79 control group).

Fearlessness about death. The Acquired Capability for Suicide Scale (ACSS; Van Orden et al., 2008) was originally developed as a 20-item self-report measure to assess an individual's fearlessness about death (e.g., *I am not at all afraid to die*) and pain insensitivity (e.g., *I can tolerate a lot more pain than most people*). Items are rated on a five-point Likert scale, and higher scores indicate a greater acquired capability for suicide. For the purposes of this study, a shorter seven-item version of the ACSS was utilized that specifically assesses fearlessness about death. Support for this shorter version of the ACSS was generated from a recent factor analytic study, which found that these seven items demonstrate acceptable convergent and discriminant validity (Ribeiro et al., 2014). Internal consistency for this subscale was in the acceptable range for both groups in the current sample (α = .88 dietary restrictor group; α = .77 control group).

Physical pain tolerance. Physical pain tolerance was measured using a Medoc Algomed pressure algometer. A trained undergraduate research assistant applied the algometer to the participant's hand between the second and third finger. The experimenter gradually increased the amount of pressure applied at a rate of five kilopascals per second, and participants were instructed to depress an indicator button at the point at which the pain became too uncomfortable to continue. If participants reached the maximum pressure safety cutoff (i.e., 2000 kilopascals) before indicating that the pain was too uncomfortable to continue, then the experimenter manually discontinued the trial. The amount of pressure that was applied at the point when the participant stopped the trial, or when the maximum pressure cutoff was reached, was recorded as an indicator of pain tolerance. Participants completed five separate trials, and the values from each trial were averaged to calculate pain tolerance. In order to prevent habituation, there was a 60 second interval between each pain tolerance measurement (Orbach et al., 1997). Internal

consistency of the pain tolerance trials was adequate (α = .98 dietary restrictor group; α = .98 control group). Additionally, because of past research demonstrating asymmetry in pain tolerance due to handedness (Gobel & Westphal, 1987; Murray & Hagan, 1973; Pauli, Wiedemann, & Nicola, 1999), we collected information on participants' handedness to control for this variable, and pain tolerance measurements were conducted on all participants' right hands. This technique has been used as a reliable measure of physical pain tolerance in studies of the IPTS (Bender et al., 2011; Witte, Gordon, Smith, & Van Orden, 2012).

Perceived burdensomeness and thwarted belongingness. The Interpersonal Needs Questionnaire (INQ-R; Van Orden et al., 2008; Van Orden, Cukrowicz, Witte, & Joiner, 2012) is a 15-item, self-report scale that is used to measure a respondent's current beliefs about feeling connected to others (i.e., thwarted belongingness) and feeling like a burden (i.e., perceived burdensomeness). Thwarted belongingness is measured with a nine-item subscale, and perceived burdensomeness is measured with a six-item subscale. Items are rated on a seven-point Likert scale, with higher ratings indicating higher levels of the constructs. Previous studies have found acceptable psychometric properties for both subscales (Bryan, Cukrowicz, West, & Morrow, 2010; Bryan, Clemans, & Hernandez, 2012; Van Orden et al., 2012). In the current study, internal consistency for the belongingness subscale (α = .90 dietary restrictor group; α = .90 control group) and burdensomeness subscales (α = .88 dietary restrictor group; α = .92 control group) were found to be in the acceptable range for both groups.

Perfectionism. The Almost-Perfect Scale Revised (APS-R; Slaney et al., 2001) consists of 23 items, which are rated on a seven-point Likert scale measuring perfectionism on three subscales: Standards, Order, and Discrepancy. Consistent with recent studies (e.g., Rice, Choi, Zhang, Morero, & Anderson, 2012; Rice, Richardson, & Clark, 2012), we used only the

Discrepancy subscale. The Discrepancy subscale measures the self-critical, maladaptive aspect of perfectionism and is comprised of 12 items (e.g., *Doing my best never seems to be good enough*). Slaney et al. (2001) found acceptable levels of internal consistency, reliability, and construct validity for all APS-R subscales. Internal consistency for this subscale was in the acceptable range for both groups in the current sample (α = .94 dietary restrictor group; α = .95 control group).

Depressive symptoms. The Center for Epidemiological Studies—Depression Scale (CES-D; Radloff, 1977) is a 20-item scale measuring depressive symptoms experienced within the past week (e.g., *I felt sad*). Items are rated on a three-point Likert scale; higher ratings indicate increased depressive symptomatology. The CES-D has good internal consistency, test-retest reliability, and has been shown to correlate with clinical ratings of depression severity, attesting to its construct validity (Radloff, 1977). In the current study, internal consistency was found to be in the acceptable range for both groups (α = .90 dietary restrictor group; α = .89 control group).

Self-esteem. The State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991) is a 20-item, self-report scale that asks respondents to rate themselves based on how they have felt within the past week. Items are rated on a five-point Likert scale and include items such as *I feel confident about my abilities*. Research has shown that the SSES divides into three subscales: Appearance, Social, and Performance (Heatherton & Polivy, 1991). The SSES has demonstrated acceptable internal consistency and adequate test-retest reliability for each subscale and the total score of the SSES (Heatherton & Polivy, 1991). For the purposes of this study, only the total score for self-esteem was utilized, with higher total scores indicating higher self-esteem. Internal

consistency was found to be in the acceptable range for both groups (α = .91 dietary restrictor group; α = .91 control group).

Social support. The Social Support Questionnaire (SSQ-6; Sarason, Sarason, Shearin, & Pierce, 1987) is a self-report measure with six items asking about respondents' perceived number of social supports, and their satisfaction with their current level of social support. Respondents are asked to list people in their lives who fit certain descriptions (e.g., *Who can you really count on to be dependable when you need help?*) and to rate their overall level of social support on a six-point Likert scale for each description. The SSQ-6 yields two separate scores: a Number of Availability score, based on the number of people listed per item, and a Satisfaction score, based on ratings of overall social support for each item, both of which were used in our analyses. The SSQ-6 has demonstrated good reliability and validity (Sarason, Shearin, Pierce, & Sarason, 1987). In the current sample, internal consistency was adequate for both the Number of Availability scale (α = .92 dietary restrictor group; α = .93 control group) and Satisfaction scale (α = .98 dietary restrictor group; α = .96 control group).

Height and weight. Height and weight were assessed in the laboratory using a digital scale and stadiometer (i.e., height measuring rod). This information was used to calculate the body mass index (BMI) of all participants using the formula provided by the Center for Disease Control and Prevention (2011).

Demographics. Additional information such as gender, ethnicity, race, and age was collected for the purposes of collecting demographically similar dietary restrictor and control groups.

Results

All analyses were performed using IBM SPSS version 21. Missing data were minimal, and missing value pattern analysis in SPSS Version 21 revealed that almost all variables had less than 5% missing data. Missing data were handled using multiple imputation in SPSS. Based on the amount of missing data, we followed recommendations by Bodner (2008) and imputed six datasets, running the analyses in each imputed dataset. Whereas pooled results are available for some analytic techniques (e.g., regression) when using multiple imputation, no pooled results are produced by SPSS for analysis of covariance (ANCOVA) or multivariate analysis of covariance (MANCOVA) models, which were the main focus of our analyses. Thus, we instead inspected the output from the six imputed datasets to determine consistency in results for our MANCOVA analyses and reported only the results from the original (i.e., non-imputed) dataset. Output from the imputed datasets indicated that after accounting for minimal missing data, results were highly similar to results from the original dataset for all analyses.

Preliminary Analyses

Intercorrelations between all study variables can be found in Tables 5 and 6. As indicated previously (see *Measures* section), descriptive statistics on current and lifetime endorsement of restrictive and non-restrictive methods within the dietary restrictor group can be found in Table 2. Within the dietary restrictor group, use of a variety of restrictive methods currently and over the lifetime was typical (i.e., over lifetime, the least frequently used method of eating on a special diet was still endorsed by 85% of the sample), and on average, dietary restrictors

endorsed fasting relatively frequently over the past month (M = 1.80; based off Likert scale 1 = 1-5 days; 2 = 6-12; 3 = 13-15; 4 = 16-22; 5 = 23-27; 6 = every day).

Additionally, endorsement of non-restrictive methods was relatively common over the past month and over the lifetime within the dietary restrictor group. Over the past month, the most common method endorsed was excessive exercise (69% of sample), whereas fewer participants endorsed other non-restrictive methods (i.e., self-induced vomiting, laxative use; 7-8%), and 60% of the sample endorsed binge eating. Over the lifetime, the most common method endorsed also was engaging in excessive exercise (86% of sample). Fewer participants endorsed other non-restrictive methods like self-induced vomiting, diuretic, and laxative use (22-30% of sample), and a majority of the sample (69%) endorsed engaging in binge eating over the lifetime.

Hypothesis 1: Group Differences in Psychosocial Variables

To test Hypothesis 1, a MANCOVA was performed to compare group means for the dietary restrictor and control groups on a collection of psychosocial measures. The total scores for self-esteem, number of social supports, satisfaction with social supports, depressive symptoms, maladaptive perfectionism, weight, shape, and eating concern, dietary restraint, and BMI were entered into a MANCOVA, with total score for lifetime use of non-restrictive dietary practices as a covariate. Results of this analysis revealed a significant effect of dietary group on psychosocial variables, Wilk's $\Lambda = 0.62$, $F(8, 179) = 13.72$, $p < .01$, partial $\eta^2 = .60$. As noted previously, due to the low internal reliability ($\alpha = .34$ control group) of the Eating Concern subscale, results on this scale should be viewed with caution.

We followed up this MANCOVA by examining the univariate results for each dependent variable (see Table 7). In order to reduce the risk of Type I error, we used Benjamini and Hochberg's (1995) method for multiple comparison correction. The univariate results revealed

significant differences between the dietary restrictor and control groups on most psychosocial variables, with dietary restrictors having higher depressive symptoms, higher maladaptive perfectionism, higher weight/shape/eating concerns, higher dietary restraint, higher BMI, and lower self-esteem compared to controls. Effect sizes on scores of weight, shape, and eating concern, and dietary restraint were large (partial η^2 = .37-.56), whereas medium effect sizes were observed for self-esteem and maladaptive perfectionism (partial η^2 = .22 and .13, respectively), and small effect sizes were observed for group differences on depression and BMI (partial η^2 = .08). The groups did not differ on number of social supports or satisfaction with these supports (total supports and satisfaction; partial η^2 = .01-.02).

Hypothesis 2: Group Differences in Thwarted Belongingness and Perceived Burdensomeness

To test Hypothesis 2, a MANCOVA framework was utilized to compare dietary restrictors with controls on measures of perceived burdensomeness and thwarted belongingness with total score for lifetime use of non-restrictive dietary practices as a covariate. Results of this analysis (see Table 7) indicated no significant effect of dietary group on thwarted belongingness or perceived burdensomeness, Wilk's Λ = 0.99, $F(2, 188)$ = .84, p = .44, partial η^2 = .01. Because no group differences emerged in this MANCOVA, we did not pursue follow-up analyses that were intended to test changes in group differences after controlling for psychosocial variables.

Hypothesis 3: Group Differences in Suicidal Ideation and Attempts

In order to investigate the relationship between dietary restriction and suicidal ideation, we conducted an ANCOVA, with the total score for suicidal ideation as the dependent variable and lifetime non-restrictive dieting practices as a covariate. Results of this analysis (see Table 7) revealed non-significant effects of dietary group on levels of suicidal ideation, $F(1, 190)$ = 2.46,

p = .12, partial η^2 = .01. Because no group differences emerged in this ANCOVA, we did not pursue follow-up analyses that were intended to test changes in group differences after controlling for psychosocial variables.

To test group differences in suicide attempt history, we conducted a chi-square analysis, using a dichotomous variable for presence or absence of suicide attempt history. Results of this analysis indicated that there is a significant relationship between suicide attempt history and dietary group, X^2 (1, N = 193) = 7.92, p = .00. Dietary restrictors were more likely to have a suicide attempt history than controls (i.e., 9.10% versus 0.00%).

Hypothesis 4: Group Differences in ACS

For Hypothesis 4, total scores for fearlessness about death and pain tolerance were entered into a MANCOVA, with total score for lifetime use of non-restrictive dietary practices as a covariate. Results of this analysis (see Table 7) indicated no significant effect of dietary group on either facet of ACS, Wilk's Λ = 0.99, F(2, 175) = .56, p = .57, partial η^2 = .01. Because no group differences emerged in this MANCOVA, we did not pursue follow-up analyses that were intended to test changes in group differences after controlling for psychosocial variables. In order to examine any effect of participant handedness in the relationship between dietary restriction and pain tolerance, we conducted a separate ANCOVA, including handedness and lifetime use of non-restrictive dietary practices as covariates. Results of this analysis indicated that even after controlling for handedness, no significant effect of dietary group emerged on levels of pain tolerance, F(1, 175) = .10, p = .75.

Hypothesis 5: ACS and Use of Restrictive Dietary Methods

To investigate Hypothesis 5, we used data from the dietary restrictors group only (n = 99) to examine whether the total score for restrictive methods (i.e., summed total of number of

restrictive methods used over the lifetime) and/or reported frequencies of each of these methods over the lifetime (i.e., responses to lifetime items from Table 3) were correlated with physical pain tolerance and fearlessness about death scores. Pooled correlations, using the imputed datasets, can be found in Table 5, and demonstrate that neither total number of restrictive methods, nor frequency of those methods, were significantly correlated with either facet of ACS. Additionally, we examined the correlation between current restrictive methods (i.e., past 28 days) and both facets of ACS, which did not reveal any significant correlations (see Table 5).

We also conducted exploratory analyses to investigate correlations between current and lifetime non-restrictive dietary methods (e.g., purging, laxative use, etc.), total non-restrictive methods, and ACS, which are also found in Table 5. Results of these correlations indicate that most current or lifetime non-restrictive methods, and total score for use of lifetime non-restrictive methods were not significantly correlated with either facet of ACS. However, current endorsement of excessive exercise and binge eating were significantly correlated with pain tolerance (*r's* = .22 and .24, respectively).

Post-hoc Analyses

Due to high endorsement of other non-restrictive dietary methods within the dietary restrictor group, we were concerned that controlling for the lifetime non-restrictive methods variable may have removed important variance from our MANCOVA analyses. Thus, we conducted post-hoc analyses to examine group differences without including total score for lifetime non-restrictive methods as a covariate. Results of these post-hoc analyses revealed that for all study hypotheses, the pattern of results was the same. That is, no new group differences emerged after removing this covariate, and existing group differences were consistent after removing this covariate.

Discussion

The current study integrated and expanded upon two existing lines of research: findings establishing the relationship between dieting and suicidal behavior, and research on the link between restrictive eating and ACS. We sought to address limitations in previous research by focusing on one restrictive eating method (i.e., fasting) within a non-clinical sample, in order to isolate and examine this behavior within the framework of the IPTS. Secondarily, we sought to characterize psychosocial differences between dietary restrictors and individuals endorsing no eating pathology over the lifetime.

In line with hypotheses and consistent with previous research (e.g., Ackard et al., 2002; Crow et al., 2006; Crow et al., 2008; French & Jeffery, 1994), significant group differences emerged between dietary restrictors and controls on multiple psychosocial variables, including depressive symptoms, self-esteem, maladaptive perfectionism, and concern for shape/weight/eating, and dietary restraint. In terms of characterizing the dietary restrictor group in the current study, these findings demonstrate the increased pathology within this group compared to individuals with similar demographics who endorse neither restrictive nor non-restrictive dietary methods over the lifetime. Moreover, these findings lend additional support to research indicating that even within a non-clinical sample, symptoms of disordered eating are associated with adverse social and emotional consequences, such as elevated depressive symptoms and lower self-esteem (e.g., Ackard, Fulkerson, & Neumark-Sztainer, 2011; Swanson, Crow, LeGrange, Swendsen, & Merikangas, 2011). Although not in the predicted direction, the groups also differed on body mass index (BMI), with dietary restrictors having higher BMI, on

average, compared to controls in the current sample. This finding is in line with past research suggesting that dieting may actually be related to weight gain, especially among college students (Lowe et al., 2006).

Results testing group differences on thwarted belongingness and perceived burdensomeness provided mixed support for hypotheses. That is, although we predicted that there would be no significant differences between the dietary restrictor and control groups on these constructs after accounting for other psychosocial variables (i.e., depressive symptoms; self-esteem; perfectionism; social support), we anticipated that differences would emerge prior to controlling for these variables. Contrary to this prediction, no differences between groups emerged, even without controlling for other psychosocial variables. Although many psychosocial variables measured in the current study were elevated within the dietary restrictor group, it may be that psychosocial differences observed reflect distinct pathology not necessarily contributing to perceived burdensomeness and thwarted belongingness. Notably, no differences were evident in levels of social support (i.e., number of social supports or satisfaction with this support) between the two groups. Because level of stability in interpersonal relationships contributes both to thwarted belongingness (i.e., level of social connectedness) and perceived burdensomeness (i.e., presence of reciprocal care in relationships), it may be that the similar levels of social support, despite other differences in psychosocial functioning, contributed to similarities on these IPTS constructs. Indeed, within both groups, we found small to moderate negative bivariate correlations between social support variables (i.e., number of social support and satisfaction with this support) and IPTS constructs. Thus, if groups had comparable levels of social support, which seems to most clearly tap both IPTS constructs compared to other psychosocial variables, this finding may help to explain the observed similarities on levels of thwarted belongingness and

perceived burdensomeness. Moreover, because social isolation is also one of the strongest predictors of suicidal ideation (Joiner & Van Orden, 2008; Van Orden et al., 2010), similarities between the groups on the measure of social support may also be related to similarities on suicidal ideation. In fact, review of past research has indicated that a greater number of reported family and friends is associated with decreased risk for lethal suicidal behavior (Van Orden et al., 2010).

In support of this notion, results were also inconsistent with predictions on group differences in suicidal ideation, as the groups did not differ on this variable. Although past research has established increased risk for suicidal behavior among individuals who endorse disordered eating or, more broadly, dieting practices, this research has been limited by imprecise measurements of dieting, which may account for differences in the results of the current study. That is, past studies have been limited by lack of operational definitions of what constitutes dieting (e.g., Rafiroui et al., 2003; Timko et al., 2006), and have not sought to investigate specific dietary behavior (e.g., restrictive eating) and suicidal behavior, as was the goal of the current study. However, as indicated by post-hoc analyses, even after removing the covariate that controlled for lifetime use of non-restrictive methods, no group differences emerged on suicidal ideation. Moreover, differences in the samples utilized in previous studies may have contributed to discrepant findings. For example, most prior research on suicidal ideation and dieting has focused on adolescent populations (e.g., Crow et al., 2008; Neumark-Sztainer et al., 1998; Rafiroui et al., 2003), whereas our sample was recruited from a college student population. Compared to college students, adolescents who engage in dieting may represent a more pathological group. Additionally, the prevalence of suicidal ideation endorsed by samples in previous studies was higher than in the current study. For example, among participants endorsing

more severe disordered eating (e.g., self-induced vomiting, laxative/diuretic use), Crow and colleagues (2008) found that between 38-55% of these participants endorsed suicidal ideation. Similarly, in a group of individuals endorsing self-induced vomiting and diet pill usage, Neumark-Sztainer and colleagues (1998) found that 34-62% of participants endorsed suicidal ideation. In our sample of dietary restrictors, only 18.18% endorsed suicidal ideation. Thus, differences in the current study results may also reflect a restriction of range in our measure of suicidal ideation. Additionally, it is likely that with the larger samples utilized in past studies (e.g., $N = 16{,}296$; Neumark-Sztainer et al., 1998) significant differences on suicidal ideation between dieting individuals versus non-dieting would be more easily detected, though they actually represent small effect sizes similar to those of the current study.

Consistent with hypotheses, dietary restrictors were more likely to have a suicide attempt history than controls. This finding is in line with past research indicating the higher risk for suicide attempt among individuals engaging in dietary methods (Crow et al., 2008; Neumark-Sztainer et al., 1998). This finding is also consistent with prior research establishing the unique relationship between restrictive eating and suicide attempts, but not suicidal ideation (Witte et al., 2012). Based on past research (e.g., Holm-Denoma et al., 2008; Selby et al., 2010; Witte et al., 2012), we sought to investigate the postulation that engaging in certain types of disordered eating (i.e., restrictive eating) may be influencing an individual's capability to enact lethal self-harm, which was the first test of the relationship between restrictive eating and measures of ACS. However, when considering group differences on facets of ACS (i.e., fearlessness about death and physical pain tolerance), which is proposed to be the mechanism by which lethal suicide attempts occur (Van Orden et al., 2010), no group differences emerged. As such, the findings that no differences exist between dietary restrictors and controls and that frequency of

current or lifetime restrictive eating within the dietary restrictor group was not related to either facet of ACS, suggest that engaging in repeated fasting is likely not functioning as a painful and/or fear-inducing event contributing to heightened ACS.

By collecting information on and controlling for the presence of other non-restrictive dietary methods, the current study represents the first attempt at isolating and examining the relationship between one specific behavior (i.e., restrictive eating) and ACS. However, although it was our goal to isolate the behavior of restrictive eating in order to investigate its relationship with ACS, there was a high frequency of other types of non-restrictive dietary methods within the restrictor group. That is, although the target sample of the study was to recruit participants who only engage in restrictive eating, it does not appear that this behavior occurs in isolation, and, based on the frequencies of other non-restrictive dietary methods in our sample, it seems that other methods of disordered eating are prominent over the lifetime and currently as well. For this reason, it is difficult to completely parse out the relationship between restrictive eating on risk for suicide. As such, group differences on likelihood of suicide attempt do not necessarily reflect differences in restrictive eating between the two groups.

Notably, even with the unanticipated presence of non-restrictive methods in our dietary restrictor sample, many of which have also been proposed as painful and provocative experiences that could contribute to ACS, we still did not find differences between this group and controls on ACS. Moreover, the dietary restrictor group had fairly extensive histories using these other methods, and in considering the bivariate correlations between current and lifetime non-restrictive methods and ACS, no significant associations emerged for lifetime methods, despite sufficient power in the study to detect medium-sized correlations. However, in considering current non-restrictive methods, significant associations emerged between excessive

exercise and binge eating and the pain tolerance facet of ACS. This finding is consistent with other recent research within the framework of the IPTS which found that engaging in over-exercise over the past month was associated with higher levels of ACS (Smith et al., 2012). Because there was no association between lifetime binge eating and excessive exercise and pain tolerance, it may be that recency of this behavior contributes differentially to ACS. That is, because presence of painful and/or fear-inducing events need to be particularly salient and severe in order to contribute to increases in ACS, it may that time since occurrence of these events would affect the degree to which they influence ACS. Although the IPTS proposes that ACS is a relatively stable construct once it has developed (Van Orden et al., 2010), there may differential contributions to ACS based on time since event, which represents an important avenue for future research. However, related to the hypotheses of the study, it appears that for fasting, both current and lifetime endorsement of this behavior were not significantly related to ACS, even when this behavior was occurring recently and frequently.

Based on non-significant relationships between both current and lifetime restrictive eating and ACS, one possibility is that engaging in restrictive eating may not pose the same level of potency and/or threat as other events proposed to contribute to ACS (e.g., combat exposure; childhood abuse; Van Orden et al., 2010), and that engaging in more frequent, but less severe, behavior affects ACS differently. Indeed, the differences in body mass index between the groups in our study (i.e., control group having lower BMI than the dietary restrictors) suggest that the restrictive eating endorsed by dietary restrictors in our sample was not severe enough as to result in the significant weight loss and/or unhealthy low weight that is characteristic of restrictive eating in AN, which may have affected the influence of this behavior on ACS. It seems that the severe restrictive eating and associated low weight seen in clinical AN samples may confer

specific risk for suicide, beyond the effects of restrictive eating in a non-clinical, mostly healthy weight sample of individuals who endorse restrictive eating. To better parse out the effects of types of dietary methods on ACS, future studies should also investigate non-clinical individuals engaging in only non-restrictive dietary methods (e.g., purging, excessive exercise) to compare their levels of ACS to individuals who engage in restrictive dietary methods. Investigation of this behavior within a non-clinical sample would help to control for associated factors of clinical disorders that may confound understanding of how specific behavior can contribute to risk for suicide.

Additionally, in considering the facet of physical pain tolerance, dietary restrictors may not have demonstrated higher pain responses based on the measurement of physical pain tolerance used in the current study (i.e., pressure algometer). Although some past research examining pain sensitivity among individuals with diagnoses of AN (i.e., those who engage in severe restrictive eating) has used measures of pressure pain similar to the one utilized in the current study (e.g., Raymond et al., 1999) and has found differences between AN and control subjects, other research has found these differences utilizing a thermal pain measure (e.g., de Zwaan et al., 1996; Lautenbacher et al., 1991). The use of different devices to measure pain may be especially important to consider given that pain tolerance is proposed by the IPTS to likely be method-specific (Van Orden et al., 2010). Thus, as described by Van Orden and colleagues (2010), an individual may acquire the necessary pain tolerance to engage in one type of behavior (e.g., cutting), but may not have necessarily display the same tolerance for other types of behavior (e.g., taking a lethal number of pills). Although the behavior of interest in the current study, restrictive eating, has been demonstrated to inflict bodily harm, especially in severe forms seen in the disorder anorexia nervosa (e.g., Crisp, Callender, Halek, & Hsu, 1992), it may be that

the type of pain tolerance to which this behavior contributes is not fully tapped by a measure of pressure pain tolerance. It seems that the pain induced by engaging in restrictive eating (e.g., hunger pains) may reflect higher ability to sustain internally-based pain, rather than pain involved in surface-level injury, which seems to be the type of pain that pressure and thermal pain measurements inflict. As such, use of a method that might measure this type of internal pain may be better suited for examining pain tolerance within disordered eating samples. For example, ischemic pain measurements, which involve using a blood-pressure cuff or similar tourniquet on participants' arms and instructing participants to perform tasks with this arm (e.g., clenching fist; holding onto a handgrip) while sustaining this pain, have also been used in other studies patients with bulimia nervosa (e.g., Stein et al., 2003). Because this ischemic pain procedure involves application of more internally-based pain (similar to the type of pain sustained by engaging in restrictive eating), rather than skin/surface pain, this method may be better able to measure the type of pain tolerance developed by those who engage in restrictive eating. Future studies should conduct a more nuanced exploration of these method-specific types of pain tolerance by incorporating other measurements of pain tolerance, which may help to further elucidate the relationship between restrictive eating and pain tolerance.

Despite improvements and expansions upon past literature, this study had a number of limitations. First, the data are cross-sectional, which limits our ability to speak to causality and fully understand the specific effects of restrictive eating on IPTS constructs. Additionally, the study sample was low in diversity (i.e., predominantly young, Non-Hispanic/Latino, White, female undergraduates). Therefore, results may not generalize to more diverse samples. As mentioned previously, although our measure of physical pain tolerance contributed to a multi-modal investigation of IPTS constructs, it also may be that this particular measure of pain

tolerance taps a type of pain tolerance that is not particularly relevant in examining restrictive eating. It may also be that measures of physical pain tolerance measure a different pain construct than do self-report measures of pain tolerance, which may reflect more of the cognitive appraisal aspect of pain. Although the IPTS proposes that pain tolerance is a key component of ACS, there is a dearth of literature examining which type of pain tolerance is a more potent predictor of lethal suicidal behavior, which warrants attention in future research, and may have influenced the observed similarities between groups in our study.

Despite noted limitations, the application of the IPTS in the current study helped to integrate and improve upon two bodies of literature (i.e., dieting and suicidal behavior, and the IPTS and restrictive eating). Our design, including recruitment of two demographically similar samples of undergraduates, allowed for a detailed comparison between the groups and provides a characterization of the psychosocial functioning of non-clinical individuals who engage in restrictive eating. Additionally, our focus on the specific behavior of restrictive eating, as opposed to clinical diagnostic status or a combined measure of disordered eating, addressed limitations in existing research, and allowed for a stringent test of some fundamental hypotheses of the IPTS. As such, our findings contribute to an enhanced understanding of the theoretical mechanisms by which disordered eating may confer increased risk for suicidal behavior.

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Appendix 1: Tables

Table 1.

Demographics for Dietary Restrictor and Control Groups.

Demographic Variable	*M (SD)*	n (% of sample)
Dietary Restrictors (n = 99)		
Age	19.80 (1.74)	
Gender		
Female		85 (85.90)
Male		14 (14.10)
Race		
White/European Origin		90 (90.90)
Black/African American		7 (7.10)
Asian American		1 (1.00)
Native American/Pacific Islander		1 (1.00)
Ethnicity		
Non-Hispanic/Latino		96 (97.00)
Hispanic/Latino		3 (3.00)
Controls (n = 94)		
Age	19.60 (2.20)	
Gender		
Female		77 (81.90)
Male		17 (18.1)
Race		
White/European Origin		84 (89.40)
Black/African American		8 (8.50)
Asian American		1 (1.10)
Native American/Pacific Islander		1 (1.10)
Ethnicity		
Non-Hispanic/Latino		93 (98.90)
Hispanic/Latino		1 (1.10)

Table 2.
Descriptive Statistics for Use of Lifetime Restrictive and Non-Restrictive Methods Within Dietary Restrictor Group. Statistics based on participant endorsement to items in Tables 2, 3, and select items from the Eating Disorder Examination Questionnaire (EDE-Q).

Lifetime Restrictive Methods[a]	*M* times used *(SD)*	n (%) of sample endorsing item
Fasting	5.10 (2.44)	98 (98.90)[b]
Skipping meals	5.25 (2.57)	94 (94.94)
Low calorie food	6.85 (2.50)	96 (96.97)
Special diet	5.09 (3.19)	85 (85.86)
Reduce calories	6.64 (2.64)	93 (93.94)
Counted calories	5.94 (2.91)	90 (90.90)
Eliminate foods	6.20 (2.93)	91 (91.92)
Lifetime Non-Restrictive Methods[a]		
Self-induced vomiting	1.21 (2.43)	30 (30.30)
Diuretic use	0.79 (1.78)	22 (22.22)
Excessive exercise	4.71 (3.10)	86 (86.87)
Laxative use	0.67 (1.57)	25 (25.25)
Binge eating	3.34 (2.93)	69 (69.70)
Past 28 Days Restrictive Methods		
Fasting[c]	1.80 (1.18)	99 (100.00)
Skipping meals[d]	6.73 (6.55)	87 (87.88)
Low calorie food[d]	13.53 (8.95)	89 (90.81)
Special diet[d]	9.63 (9.67)	66 (67.35)
Reduce calories[d]	14.20 (8.97)	90 (91.84)
Counted calories[d]	10.74 (10.41)	71 (72.45)
Eliminate foods[d]	13.28 (10.53)	77 (78.57)
Past 28 Days Non-Restrictive Methods		
Self-induced vomiting[e]	0.53 (2.54)	7 (7.07)
Excessive exercise[e]	6.00 (6.93)	69 (69.70)
Laxative use[e]	0.19 (0.79)	8 (8.08)
Binge eating[f]	2.64 (4.00)	60 (60.60)

Note: [a]Means for lifetime restrictive and non-restrictive methods reported are according to Likert scale used for items in Tables 3 and 4 (i.e., 0 = 0 times using method during lifetime; 1 = 2-3; 3 = 4-10; 4 = 11-20; 5 = 21-40; 6 = 41-60; 7 = 61-80; 8 = 81-100; 9 = 100+). [b]Though one participant did not endorse fasting over lifetime, this participant was still included in analyses based on endorsing the inclusion item assessing for fasting within 28 days. [c]Means for past 28 days fasting based on responses to item from the Eating Disorder Examination—Questionnaire (EDE-Q) using the Likert scale (0 = 0 days; 1 = 1-5; 2 = 6-12; 3 = 13-15; 4 = 16-22; 5 = 23-27; 6 = every day). [d]Means for past 28 days restrictive methods and binge eating based on number of days (with open-ended response) over past 28 days endorsed item. [e]Means for past 28 days self-induced vomiting, excessive exercise, and laxative use are based on number of times (with open-ended response) over past 28 days endorsed item from the EDE-Q. [f]Past 28 days binge eating means based on number of days (with open-ended response) over past 28 days endorsed EDE-Q item.

Table 3.

Items Assessing Frequency of Restrictive Dietary Methods Over Lifetime and Currently. Participants were instructed to indicate number of times each method has been used over the course of their lives. For current endorsement of methods, item 1 was not administered, and responses were open-ended for number of days over past 28 days used method.

During your life, how many times…	0	1	2-3	4-10	11-20	21-40	41-60	61-80	81-100	100+
1. …Have you gone for long periods of time (8 hours or more) while awake without eating anything in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
2. …Have you skipped one than one meal (besides breakfast) in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
3. …Have you eaten food low in calories food in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
4. …Have you eaten on a special diet in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
5. …Have you reduced the number of calories you consume in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
6. …Have you counted calories in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9
7. …Have you eliminated specific foods from your diet in order to influence your shape or weight?	0	1	2	3	4	5	6	7	8	9

Table 4.

Items Assessing Frequency of Non-Restrictive Methods Over Lifetime. Participants were instructed to endorse one answer to indicate number of times each method has been used over the course of their lives.

During your life, how many times…	0	1	2-3	4-10	11-20	21-40	41-60	61-80	81-100	100+
1. ...Have you made yourself sick (vomit) as a means of influencing your shape or weight?	0	1	2	3	4	5	6	7	8	9
2. ...Have you taken diuretics (water tablets) as a means of influencing your shape or weight?	0	1	2	3	4	5	6	7	8	9
3. ...Have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories?	0	1	2	3	4	5	6	7	8	9
4. ...Have you taken laxatives as a means of influencing your shape or weight?	0	1	2	3	4	5	6	7	8	9
5. ...Have you had an episode of overeating (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)?	0	1	2	3	4	5	6	7	8	9

Table 5. *Intercorrelations Between all Study Variables for Dietary Restrictor Group (N = 99)*

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Gender	1.00																
2	Self-esteem	-.24*	1.00															
3	Num social	-.09	.21*	1.00														
4	Satis social	.07	.16	.18	1.00													
5	Depressive	.07	-.63*	-.34*	-.21*	1.00												
6	Perfection	.16	-.69*	-.18	-.19	.57*	1.00											
7	Shape	.29*	-.66*	-.13	-.07	.40*	.38*	1.00										
8	Weight	.28*	-.59*	-.08	-.12	.39*	.37*	.88*	1.00									
9	Eating	.24*	-.48*	-.12	-.06	.38*	.33*	.70*	.74*	1.00								
10	Restraint	.13	-.23*	.09	.12	.33*	.16	.50*	.55*	.61*	1.00							
11	BMI	-.29*	-.02	-.09	.18	.02	-.11	.15	.16	.12	.08	1.00						
12	Belong	-.08	-.51*	-.32*	-.31*	.69*	.45*	.27*	.31*	.22*	.03	.10	1.00					
13	Burden	.01	-.34*	-.34*	-.11	.46*	.27*	.24*	.19	.09	.00	.17	.50*	1.00				
14	SI	.00	-.17	-.16	-.04	.17	.15	.12	.09	.12	-.07	.15	.26*	.34*	1.00			
15	FAD	-.08	.08	.01	-.05	.13	.15	-.21	-.19	-.06	-.04	.01	.17	.12	.22*	1.00		
16	Pain tolerance	-.48	.12	.04	-.12	.07	.04	-.03	-.02	-.02	.14	.21*	.12	.04	.19	.26*	1.00	
17	Total restrict	.18	-.18	.06	.06	.22*	.10	.32*	.37*	.29*	.45*	.10	.10	.02	.00	.04	-.05	1.00
18	Life Fasting	.08	-.19	-.01	-.04	.30*	.34*	.31*	.32*	.33*	.37*	.20*	.16	.07	.06	.06	.15	.37*
19	Life Skipping meals	.10	-.14	.01	-.02	.19	.24*	.25*	.28*	.26*	.29*	.16	.08	.03	-.14	.04	-.05	.38*
20	Life Low calorie food	.29*	-.14	.03	.06	.17	.05	.32*	.34*	.32*	.45*	.03	.11	-.15	-.03	.03	-.01	.68*
21	Life Special diet	.15	-.07	.20	.11	.10	.07	.39*	.38*	.35*	.58*	.18	-.05	-.17	-.03	-.01	.09	.57*
22	Life Reduce calories	.20	-.10	.06	.10	.19	.04	.35*	.36*	.32*	.50*	.10	.07	-.10	-.08	.04	.05	.73*
23	Life Counted calories	.21*	-.15	-.04	.02	.15	.08	.37*	.36*	.35*	.45*	.14	.05	-.07	-.03	.01	.04	.59*
24	Life Eliminate foods	.10	-.12	.04	.05	.19	.12	.42*	.47*	.49*	.63*	.17	.02	-.12	.07	-.02	.07	.67*
25	Total non-restrict	.13	-.03	-.10	.07	.04	.03	.08	.14	.20	.22*	-.12	.02	.07	-.03	.07	-.03	.32*
26	Life Vomiting	.17	-.26*	-.21*	-.13	.27*	.36*	.20	.25*	.39*	.27*	-.19	.17	.16	.09	.10	.01	.14
27	Life Diuretic use	.07	-.05	-.04	.14	.07	.11	.09	.19	.22*	.19	.04	.10	.04	.01	-.03	-.05	.17
28	Life Excessive exercise	-.15	.01	.14	.10	.08	.06	.12	.12	.21*	.33*	-.03	-.09	-.05	-.02	.02	.11	.28*
29	Life Laxative use	.12	.02	-.19	.07	.00	.06	.08	.08	.14	.18	-.06	-.02	-.02	-.05	.00	.01	.17
30	Life Binge eating	-.06	-.28*	-.06	-.12	.29*	.19	.27*	.26*	.49*	.27*	.18	.20	.09	.20*	.11	.14	.20
31	Current Fasting	-.17	-.08	-.06	-.05	.26*	.05	.16	.16	.24*	.40*	.27*	.07	.13	-.10	.04	.15	.12
32	Current Skip meals	.02	-.17	.04	-.14	.24*	.24*	.14	.16	.16	.29*	.08	.11	.02	-.12	.01	-.03	.25*
33	Current Low calorie food	.14	-.09	.13	.03	.16	.10	.27*	.36*	.34*	.53*	.09	.12	-.15	-.13	-.03	.03	.50*
34	Current Special diet	.01	-.11	.22*	.04	.11	.02	.27*	.31*	.24*	.53*	.06	.02	-.08	-.05	-.02	.16	.33*
35	Current Reduce calories	.00	-.05	.08	.09	.15	.04	.21*	.25*	.34*	.50*	.19	.05	-.04	-.14	.05	.14	.43*
36	Current Counted calories	.16	-.06	.03	.05	.11	.02	.29*	.32*	.40*	.53*	.11	.03	-.06	-.05	-.08	.07	.36*
37	Current Eliminate foods	.13	-.05	.10	.12	.15	.03	.34*	.41*	.35*	.61*	.07	.00	-.06	.06	-.03	.16	.39*
38	Current Vomiting	.07	-.20*	-.04	-.15	.19	.11	.25*	.29*	.33*	.32*	-.10	.06	.04	-.07	-.09	-.11	.07
39	Current Exercise	.03	-.02	.10	-.04	.15	.07	.18	.32*	.21*	.42*	-.10	.08	.04	-.05	-.16	.21*	.18
40	Current Laxatives	.10	.07	.08	.07	-.13	.00	.07	.04	.14	.19	-.06	-.01	.06	-.08	-.10	-.09	.10
41	Current Binge eating	-.22*	-.16	-.11	-.19	.17	.08	.20	.20*	.36*	.07	.27*	.17	.17	.12	.03	.24*	-.06

Table 5 (continued).

		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
18	Life Fasting	1.00																
19	Life Skipping meals	.84*	1.00															
20	Life Low calorie food	.45*	.41*	1.00														
21	Life Special diet	.45*	.38*	.59*	1.00													
22	Life Reduce calories	.50*	.46*	.87*	.66*	1.00												
23	Life Counted calories	.42*	.37*	.74*	.57*	.80*	1.00											
24	Life Eliminate foods	.56*	.51*	.70*	.74*	.73*	.66*	1.00										
25	Total non-restrict	.17	.16	.21*	.21*	.18	.24*	.23*	1.00									
26	Life Vomiting	.33*	.25*	.20*	.05	.15	.25*	.23*	.48*	1.00								
27	Life Diuretic use	.17	.16	.17	.17	.18	.20	.17	.62*	.34*	1.00							
28	Life Excessive exercise	.26*	.25*	.23*	.34*	.24*	.17	.34*	.29*	.29*	.15	1.00						
29	Life Laxative use	.08	.00	.15	.15	.12	.21*	.15	.57*	.37*	.40*	.20	1.00					
30	Life Binge eating	.23*	.17	.18	.25*	.20	.22*	.28*	.20*	.27*	.15	.42*	.19	1.00				
31	Current Fasting	.53*	.48*	.06	.25*	.08	.11	.29*	.02	.11	-.01	.26*	.08	.25*	1.00			
32	Current Skip meals	.67*	.75*	.26*	.33*	.29*	.19	.38*	-.01	.14	.05	.12	-.07	.15	.62*	1.00		
33	Current Low calorie food	.36*	.26*	.58*	.48*	.58*	.51*	.54*	.14	.09	.23*	.09	.19	.14	.12	.28*	1.00	
34	Current Special diet	.24*	.18	.34*	.59*	.33*	.22*	.46*	.19	.07	.13	.22*	.06	.12	.23*	.18	.59*	1.00
35	Current Reduce calories	.35*	.30*	.49*	.37*	.57*	.44*	.40*	.10	.10	.19	.12	.13	.22*	.17	.32*	.74*	.43*
36	Current Counted calories	.30*	.21*	.44*	.39*	.44*	.63*	.43*	.21*	.22*	.19	.13	.20	.16	.20	.16	.64*	.41*
37	Current Eliminate foods	.22*	.11	.34*	.42*	.36*	.23*	.51*	.14	.09	.14	.23*	.06	.12	.19	.14	.57*	.64*
38	Current Vomiting	.11	.08	-.02	.02	-.03	.10	.09	.13	.58*	.07	.16	.08	.17	.11	.08	.09	.15
39	Current Exercise	.18	.11	.18	.36*	.17	.13	.29*	.21*	.18	.05	.53*	.18	.14	.18	.15	.23*	.42*
40	Current Laxatives	.08	.14	.04	.11	.05	.11	.11	.29*	.10	.34*	.12	.34*	.17	.02	.11	.06	-.01
41	Current Binge eating	-.02	-.01	-.11	.01	-.07	-.05	.01	.06	.13	.05	.00	.03	.62*	.08	.00	.00	.05

		35	36	37	38	39	40	41
35	Current Reduce calories	1.00						
36	Current Counted calories	.68*	1.00					
37	Current Eliminate foods	.47*	.50*	1.00				
38	Current Vomiting	.08	.24*	.18	1.00			
39	Current Exercise	.21*	.26*	.37*	.18	1.00		
40	Current Laxatives	.08	.13	.00	.01	.13	1.00	
41	Current Binge eating	.14	-.01	.03	.11	-.01	.05	1.00

Note: Correlations are for total scores for variables 2-16. Gender: male = 0; female = 1. Num social = number of social supports; Satis social = satisfaction with social support; Depressive = depressive symptoms; Perfection = maladaptive perfectionism; Shape = shape concern subscale; Weight = weight concern subscale; Eating = eating concern subscale; Restraint = restraint subscale; BMI = body mass index; Belong = belongingness; Burden = burdensomeness; SI = suicidal ideation; FAD = fearlessness about death; Pain tolerance = average across five trials. Total restriction = total score for number of restrictive methods used over lifetime; Total non-restrict = total score for number of non-restrictive methods used over lifetime; Variables 18-24 and 32-37 refer to endorsement of items from Table 3, which indicate frequency of restrictive methods over the lifetime and currently; Variables 26-30 refer to endorsement of items from Table 4, which indicate frequency of non-restrictive methods over lifetime; Variables 31, 38-41 refer to endorsement of current (past 28 days) restrictive and non-restrictive methods from Eating Disorder Examination Questionnaire (EDE-Q).
* $p \leq .05$

Table 6.

Intercorrelations Between all Study Variables for Control Group (N = 94).

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Gender	1.00															
2	Self-esteem	-.05	1.00														
3	Num social	.08	.27*	1.00													
4	Satis social	-.05	.38*	.183	1.00												
5	Depressive	.03	-.70*	-.46*	-.43*	1.00											
6	Perfection	-.20	-.63*	-.32*	-.22*	.61*	1.00										
7	Shape	.30*	-.40*	-.03	-.33*	.29*	.02	1.00									
8	Weight	.29*	-.30*	-.02	-.15	.24*	-.04	.78*	1.00								
9	Eating	.16	-.24*	-.01	-.18	.21*	.05	.52*	.55*	1.00							
10	Restraint	.13	.02	-.07	-.26*	-.08	-.13	.36*	.23*	.21*	1.00						
11	BMI	-.17	.01	.03	-.04	-.03	-.12	.14	.39*	.23*	-.06	1.00					
12	Belong	-.11	-.57*	-.54*	-.45*	.76*	.47*	.28*	.20	.20	-.03	.06	1.00				
13	Burden	.09	-.63*	-.35*	-.53*	.74*	.41*	.35*	.32*	.21*	-.05	.02	.69*	1.00			
14	SI	.09	-.38*	-.29*	-.33*	.45*	.26*	.20	.15	.06	-.02	-.11	.40*	.61*	1.00		
15	FAD	-.29*	.19	.01	.07	-.13	-.12	-.14	-.17	-.23*	-.05	.13	-.00	-.00	.01	1.00	
16	Pain tolerance	-.50*	-.00	-.07	.03	-.03	.18	-.20	-.11	-.14	-.06	.26*	.01	.11	.13	.25*	1.00

Note: Correlations are for total scores for variables 2-16. Gender: male = 0; female = 1. Num social = number of social supports; Satis social = satisfaction with social support; Depressive = depressive symptoms; Perfection = maladaptive perfectionism; Shape = shape concern subscale; Weight = weight concern subscale; Eating = eating concern subscale; Restraint = restraint subscale; BMI = body mass index; Belong = belongingness; Burden = burdensomeness; SI = suicidal ideation; FAD = fearlessness about death; Pain tolerance = average across five trials.
* $p \leq .05$

Table 7.

Results of Hypotheses 1-4. Between-subjects effects and group mean differences for all study hypotheses.

Psychosocial Variable Total Score	Dietary Restrictors *M (SD)*	Controls *M (SD)*	*F*(df)	*p*	Partial η^2
Hypothesis 1					
Self-esteem	64.27 (13.73)	77.70 (11.30)	22.93 (1, 186)	.00	.11
Number of social supports	5.09 (2.11)	5.59 (2.23)	0.10 (1, 186)	.82	.00
Satisfaction with social support	5.29 (1.15)	5.58 (.81)	2.22 (1, 186)	.15	.01
Depressive symptoms	16.29 (9.96)	10.71 (8.68)	5.97 (1, 186)	.02	.03
Maladaptive perfectionism	50.70 (15.83)	38.55 (15.34)	11.62 (1, 186)	.00	.06
Shape concern	3.56 (1.42)	0.89 (0.84)	98.70 (1, 186)	.00	.35
Weight concern	3.01 (1.45)	0.62 (0.69)	72.01 (1, 186)	.00	.28
Eating concern	1.40 (1.12)	0.11 (0.19)	29.27 (1, 186)	.00	.14
Restraint	2.82 (1.60)	0.74 (1.05)	30.66 (1, 186)	.00	.14
Body mass index	24.74 (3.91)	22.63 (3.30)	13.28 (1, 186)	.00	.07
Hypothesis 2					
Belongingness	10.57 (9.84)	8.38 (9.95)	0.84 (1, 189)	.36	.00
Burdensomeness	1.48 (2.86)	1.30 (3.17)	0.04 (1, 189)	.85	.00
Hypothesis 3					
Suicidal ideation	0.79 (2.48)	0.26 (1.17)	2.46 (1, 190)	.12	.01
Hypothesis 4					
FAD	13.72 (6.70)	14.64 (5.44)	1.11 (1, 176)	.29	.00
Pain tolerance	236.74 (132.92)	254.57 (130.90)	0.15 (1, 176)	.70	.00

Note: All results control for total score lifetime non-restrictive methods. The Restraint subscale reflects total scores not including the item assessing for fasting. Group means differ at $p < .05$ using Benjamini and Hochberg's (1995) procedure to control for the false discovery rate in post hoc pairwise comparisons.