

Contributions of Grit and Reward and Punishment Sensitivity in Anorexia Nervosa

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Abstract

Anorexia Nervosa is characterized by distorted body image and persistent food restriction and can lead to adverse health outcomes or death. This project explored the role of grit and reward/punishment sensitivity in dietary restriction and eating disorder severity. Previous research observed increased punishment sensitivity (i.e., excessive desire to avoid negative/punishing situations drives one's behavior) in Anorexia Nervosa. Habit strength and cognitive restraint have also been identified as critical factors in Anorexia Nervosa. In this context, habit strength describes how frequently and unconsciously an individual restricts caloric intake. Cognitive restraint involves the perceived conscious effort to control or limit food intake through various cognitive processes such as calorie counting, diet planning, and establishing eating rules. Grit has been associated with favorable clinical outcomes in depression and anxiety but has not been explored in Anorexia Nervosa. Using an online data collection platform, participants with Anorexia Nervosa completed measures of disordered eating, habit strength, reward/punishment sensitivity, and grit, along with a demographics form. Sixty-three women with a prior Anorexia Nervosa diagnosis participated in the study.

The results revealed grit is not directly associated with dietary restriction or the measures of eating disorder severity. However, all measures of grit were negatively correlated with punishment sensitivity, and grit effort was positively correlated with reward sensitivity.

Regression analyses indicated that punishment sensitivity, cognitive restraint, and habit strength significantly predict dietary restriction and eating disorder severity. Further, grit indirectly influenced habit strength through its effects on punishment sensitivity, indicating potential pathways in developing eating disorder symptoms.

Contributions of Grit and Reward and Punishment Sensitivity to Dietary Restriction in Anorexia Nervosa

According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5-TR; American Psychiatric Association, 2022), Anorexia Nervosa (AN) is an eating disorder characterized by a distorted body image, an intense fear of gaining weight, low weight, and persistent restriction of food intake. The causes of AN are not well understood, but family (Lilenfeld et al., 1998) and twin studies (Bulik et al., 2006) have suggested solid genetic components. It is also believed that learned behavior contributes to the development and maintenance of the disorder (Coniglio et al., 2017; Godier et al., 2016).

Habitual Behavior in Anorexia Nervosa

One of the critical features of eating disorders, including AN, is cognitive restraint and dietary restriction. Cognitive restraint involves the perceived conscious effort to control or limit food intake through various cognitive processes such as calorie counting, diet planning, and establishing eating rules (Polivy & Herman, 1985). Dietary restriction describes behaviors that limit caloric intake (Fairburn, 2008), such as skipping meals. In summary, cognitive restraint is the conscious cognitive effort for the weight loss goal, and dietary restriction reflects the behaviors executed for the weight loss goal.

Habit formation has been identified as an essential factor in the extent of dietary restriction in AN (Kilb & Labudek, 2022). Habit formation describes the process of behaviors that were once reinforced with a reward becoming automated over time and no longer requiring immediate reinforcement (Wise, 2004). In 2013, Walsh proposed a theory suggesting that developing a well-ingrained, maladaptive habit can explain the persistent nature of food restriction in AN. Instead of viewing restriction as goal-directed restraint, Walsh suggested that

restriction becomes a habit after being reinforced by salient rewards. Initially, rewards such as perceived control and accomplishment, external praise, and successful weight loss maintain food restriction. Over time, food restriction is automatically associated with reward, making it habitual and requiring minimal conscious effort. According to Walsh (2013), once established as a habit, food restriction becomes resistant to change, independent of its success in weight loss. Individuals with AN might not consciously choose to continue restricting but still engage in dietary restriction due to the ingrained habit. This theory considers the transition from a cognitive-focused, effortful process to a sensory-driven, automatic process.

Building on this perspective, Coniglio et al. (2017) investigated Walsh's (2013) theory by examining whether habit strength predicts food restriction beyond illness duration, diagnosis (AN versus atypical AN), and cognitive restraint. According to the DSM-5-TR (American Psychological Association, 2022), all the AN criteria are met in atypical AN, but the individual's weight is not below the normal/ expected for their developmental trajectory. Further, Coniglio et al. (2017) investigated whether the strength of habitual food restriction predicts clinical severity beyond diagnosis and cognitive restraint. Clinical severity in this context was measured by the Clinical Impairment Assessment (Bohn & Fairburn, 2008), which assesses functional impairment in the past four weeks in patients with eating disorders (e.g., difficulties in concentration, shame/guilt, impaired social function). The study found that habitual restraint differs from cognitive restraint in its effects on clinical severity. Habitual food restriction explained more variance in clinical severity than cognitive restraint (Coniglio et al., 2017), suggesting that habits may be more important than thoughts' impact on AN. Prior research has supported that habits are often formed through reward and punishment and that one's sensitivity to reward or punishment may determine the strength of those habits (Kilb & Labudek, 2022; Wise, 2004).

Reward and Punishment Sensitivity in Anorexia Nervosa

Reward and punishment sensitivity are factors related to engagement in motivated behavior and are strongly associated with the brain's dopaminergic systems responsible for habit formation and learned behavior (Wise, 2004). Reward sensitivity is the motivation to seek rewards and positive outcomes, while punishment sensitivity is the motivation to avoid punishment and adverse outcomes (Torrubia et al., 2001). High reward sensitivity is characterized by greater motivation and responsiveness to positive outcomes, and very high levels are often associated with impulsivity and risk-seeking (Hawes et al., 2017; Richardson et al., 2014; Xu et al., 2019; Zuckerman, 2014). High punishment sensitivity may contribute to anxiety and fear of negative consequences (Jappe et al., 2011). Typical patterns in reward and punishment sensitivity result in individuals who do not exhibit difficulty in decision-making (Singh & Khan, 2012) or anhedonia (Veldhoven et al., 2020) and are unlikely to display patterns of risk-seeking behavior (Peeters et al., 2017). Harrison et al. (2010) showed that individuals with AN exhibit less sensitivity to rewards than healthy controls, indicating that reduced responsiveness to reward plays a role in AN behavior. Participants also showed heightened punishment sensitivity compared to healthy controls, associated with increased fear of weight gain or negative evaluations. Further, Harrison et al. suggested that this fear can drive restrictive eating patterns as a way to avoid perceived punishment.

Similarly, Kullmann et al. (2013) found that individuals with AN exhibited diminished reward responses to food and social stimuli compared to healthy controls. It has also been suggested that individuals with AN tend to place higher importance on weight loss and maintaining AN behaviors than on food's more immediate rewards because food has a

diminished reward value and may be associated with punishment in individuals with AN (Kaye et al., 2013).

Punishment Sensitivity and Habit Strength

Currently, in the research linking punishment sensitivity to AN, punishment plays a crucial role in habit formation by influencing brain regions like the dorsolateral striatum (DLS), known as the "ground-zero for habits"(Amaya & Smith, 2018). Disruption of the DLS leads to decreased sensitivity to punishment, favoring habitual behaviors over flexible, goal-directed actions (Amaya & Smith, 2018). Additionally, individuals with high punishment sensitivity show decreased adaptability in cognitive control tasks following punishments compared to low punishment-sensitive individuals, potentially indicating a reinforcement of habitual behaviors in response to negative consequences.

Brown et al. (2024) showed that adolescents with restricting AN (AN-R) demonstrated heightened reliance on habitual behaviors in rewarding contexts (model-free learning for reward) and difficulty adjusting their behavior in response to negative consequences (attenuated model-free and model-based learning for punishment), connecting punishment sensitivity to habit strength in AN-R by highlighting an increased tendency towards habitual behaviors in rewarding situations and a reduced ability to adapt behaviors in response to punishment cues.

Grit

Grit is a personality trait that reflects perseverance of effort and the consistency of interest toward achieving long-term goals driven by passion (Duckworth et al., 2007).

Duckworth et al. (2007) describe perseverance of effort as consistent effort over an extended period, reflecting a dedicated and unwavering focus on achieving long-term goals. Passion for long-term goals is marked by sustained interest and enthusiasm for goals, even in the face of

challenges. Individuals with higher levels of grit are less likely to drop out or disengage from their respective life commitments, whether these commitments are military training, employment, education, or marriage (Eskreis-Winkler et al., 2014). Grit is also positively associated with healthy eating behaviors, such as how frequently an individual chooses healthier options like eating vegetables (Martin et al., 2022).

Grit has been suggested as a protective factor against other psychopathologies with altered reward sensitivity, such as depression. Individuals with depression exhibited altered reward sensitivity in their responses during decision-making tasks (Berry et al., 2013; Must et al., 2013). Additionally, prior research has shown that grit is negatively correlated with anxiety and depression (Musumari et al., 2018). Moreover, Knauff et al. (2019) found that higher grit (consistency of interest subscale) has been associated with lower body dissatisfaction scores and shape and weight concerns scores (as measured by the Eating Disorder Examination Questionnaire) in bulimia.

Other personality traits like perfectionism and neuroticism, associated with AN symptoms, have been shown to correlate negatively with grit. Sunbul (2019) found that neuroticism is negatively correlated with grit in university students, but Forbush and Watson (2006) found that neuroticism is positively correlated with AN and Bulimia Nervosa (Forbush & Watson, 2006). Bardone-Cone et al. (2007) results showed that perfectionism, especially self-oriented and socially prescribed perfectionism (as measured with the Multidimensional Perfectionism Scale), is strongly associated with eating disorder symptoms, including those related to AN. Further, Zhang et al. (2021) found that grit acts as a moderator between perfectionism and depression, indicating that grit could be a buffering mechanism against vulnerability to depression.

Neuroscience research has linked grit with motivation levels (e.g., reward and punishment), as evidenced by Myers et al. (2016). Myers et al. found that grit is associated with activity in ventral striatal networks, including connectivity between regions such as the medial prefrontal cortex and rostral anterior cingulate, which are implicated in reward processing in the brain. Grit was also positively associated with the nucleus accumbens volume (Nemmi et al., 2016), a region of the brain highly associated with reward sensitivity (Martínez-Molina et al., 2019).

Prior behavioral research has linked grit and motivation constructs, such as reward and punishment (e.g., Liu et al., 2022). For example, Liu et al. (2022) showed that grit and reward sensitivity are associated with addictive behaviors in internet usage. Internet addiction was positively correlated with reward and punishment motivation levels while displaying negative correlations with grit. Additionally, Fleck et al. (in preparation) observed that higher grit scores were positively associated with higher reward motivation and inversely associated with punishment motivation in college students. Therefore, grit may be relevant in AN's altered reward and punishment sensitivity.

Present Research

There is a gap in the literature in understanding the motivation for developing behaviors that underlie AN. Though Knauff et al. (2019) found that higher grit (consistency of interest subscale) has been associated with lower body dissatisfaction scores and shape and weight concerns scores (as measured by the Eating Disorder Examination Questionnaire Short), no research to date has explored the relationship between grit and AN. Gaining insights into the relationships between grit and reward and punishment sensitivity in AN could improve our understanding of the factors contributing to AN's development and maintenance. Thus, this study

aimed to (a) investigate the relationship between altered reward and punishment sensitivity and restrictive eating behaviors in AN and (b) investigate the association between grit and reward and punishment sensitivity in individuals with AN.

To do so, individuals with AN were asked to complete the (a) Short Grit Scale (SGS; Duckworth & Quinn, 2009) to measure grit, (b) the Sensitivity to Punishment/ Sensitivity to Reward Questionnaire-R20 (SPSRQ-R20; Conner et al., 2018) to measure reward/punishment sensitivity, (c) the Eating Pathology Symptom Index (EPSI; Forbush et al., 2013) to assess cognitive restraint and dietary restriction, (d) the Self Report Habit Index (SRHI; Verplanken & Orbell, 2003) to evaluate the habit strength of dietary restriction, (e) the Frost Multidimensional Perfectionism Scale – Brief (FMPS; Frost et al., 1990; Burgess et al., 2016) to measure perfectionism, and (f) the Eating Disorder Examination Questionnaire Short (EDE-QS; Gideon et al., 2016) to assess the severity of eating disorders.

The project examined the role of grit, reward/punishment sensitivity, habit strength, and cognitive restraint in predicting dietary restriction. Additionally, it explored grit's role in predicting cognitive restraint and habit strength levels in those with AN and reward and punishment sensitivity's role in predicting cognitive restraint and habit strength in AN.

Hypotheses

The following hypotheses were made for the project.

Hypothesis 1: Higher grit scores will be associated with lower levels of dietary restriction. Grit level has been inversely correlated with body EDE-QS subscales (Knauf et al., 2019). Thus, grit could also be a protective factor in AN.

Hypothesis 2: Higher grit scores will be associated with reward/punishment sensitivity scores. Because grit has been associated with symptom severity in other disorders with altered reward

sensitivity (Berry et al., 2013; Must et al., 2013; Musumari et al., 2018), like depression, and individuals with AN exhibited altered reward sensitivity (Harrison et al., 2010; Kaye et al., 2013), similar patterns were expected here. Moreover, it was anticipated that grit would be positively associated with reward sensitivity and inversely related with punishment sensitivity, aligning with the patterns observed in prior research for grit and approach and avoidance motivation (see Fleck et al., in preparation).

Hypothesis 3: Higher punishment sensitivity will be associated with higher cognitive restraint, habit strength, and increased dietary restriction. Given the association between these three measures and AN (Coniglio et al., 2017; Kilb & Labudek, 2022; Polivy & Herman, 1985) and AN's relationship with punishment sensitivity (Harrison et al., 2010; Kaye et al., 2013), positive correlations would be present between punishment sensitivity and cognitive restraint, habit strength, and dietary restriction.

Hypothesis 4: Grit, punishment sensitivity, cognitive restraint, and habit strength will have a combined effect on dietary restriction. Given the relationships between habit strength and cognitive restraint in Coniglio et al. (2017), it was predicted that both habit and cognitive restraint would predict dietary restriction. Further, the protective effects of grit noted in prior research for mental health disorders such as anxiety and depression (e.g., Musumari et al., 2018) suggested that it may be relevant to dietary restriction.

Hypothesis 5: It was also predicted that grit, punishment sensitivity, habit strength, cognitive restraint, and dietary restriction would have a combined effect on symptom severity as measured with the EDE-QS.

Methods

Participants

Participants were recruited using Prolific (<https://www.prolific.com>), an online data collection platform. Only females 18 - 50 years of age, with a prior diagnosis of Anorexia Nervosa, who could read and write in English were eligible to participate. Participants were compensated \$4 for their participation.

The study sample consisted of 63 participants with a mean age of 32.57 years ($SD = 8.41$). Regarding racial demographics, the majority of participants identified as White (84.10%), followed by Black (6.30%), Hispanic (3.20%), Asian (1.60%), Middle Eastern (1.60%), and Other (6.30%). Participants resided across various countries, with the majority residing in the United Kingdom (58.70%), followed by the United States (15.90%), Italy (4.80%), Poland (4.80%), South Africa (4.80%), and others.

On the Eating Disorder Examination Questionnaire-Short Form (EDE-QS), participants had a mean score of 17.68 ($SD = 7.24$). A score over 15 indicates a likelihood of an eating disorder, and 73.00% scored a 15 or higher. The mean Body Mass Index (BMI) was 25.53 ($SD = 7.40$), with 12.70% falling in the underweight category (<18.50), 46.00% falling within the normal range (18.50-24.90), 20.60% classified as overweight (25.0-29.99), and 20.60% classified as obese (>30).

In addition to reporting a current or prior Anorexia Nervosa diagnosis, 7 participants reported having a current or prior diagnosis of Bulimia Nervosa, 11 reported a current or prior diagnosis of Binge Eating Disorder, 3 reported a current or prior diagnosis of Other Specified Feeding or Eating Disorder (previously known as Eating Disorder Not Otherwise Specified), and 2 reported a diagnosis of Avoidant Restrictive Food Intake Disorder. The sample is described in full in Table 1.

In addition to eating disorder symptoms, participants reported various psychiatric disorders, with depression being the most prevalent (53.97%), followed by anxiety disorders (46.03%), attention deficit hyperactivity disorder (12.70%), and others, including autism, borderline personality disorder, bipolar disorder, post-traumatic stress disorder, and obsessive-compulsive disorder.

Measures

Demographics

Participants self-reported sex, age, race, ethnicity, sexual orientation, education level, relationship status, eating disorder diagnosis, and other psychiatric disorders. The participants were also asked to report their height and weight, which was used to calculate their body mass index (BMI) (see Appendix H for complete demographics form).

Sensitivity to Punishment and Sensitivity to Reward Questionnaire-R20 (SPSRQ-R20; Conner et al., 2018)

The SPSRQ is a self-report questionnaire that measures sensitivity to punishment (SP), "I am afraid of new or unexpected situations," and sensitivity to reward (SR), "I like being the center of attention at a party or a social gathering." It was designed to assess individual variations in the tendency to respond to potential rewards and punishments in the environment (Torrubia et al., 2001).

The SPSRQ has been reconstructed for construct validity and use for English-speaking populations (Conner et al., 2018). Conner et al. (2018) test-retest study showed that the SR subscale had a Cronbach's $\alpha = 0.77$ and a Cronbach's $\alpha = 0.83$ at times 1 and 2, respectively, while the SP subscale had a Cronbach's $\alpha = 0.80$ and $\alpha = 0.86$. There are a total of 20 questions. The participants were asked to rate how true the statement was for them on a Likert scale of 1-5,

with 1 being untrue and 5 being true. The even-numbered questions are summed for the SR score, and the SP score is summed from the odd-numbered questions (see Appendix A for question examples). Higher scores indicate higher sensitivity to either reward or punishment.

Eating Pathology Symptom Inventory (EPSI; Forbush et al., 2013)

The EPSI questionnaire comprises 45 items that inquire about an individual's eating habits and beliefs over the last month (see Appendix B; Forbush et al., 2013). Only the cognitive restraint (EPSI-CR) and dietary restriction (EPSI-R) subscales from the EPSI questionnaire were used for this study. The cognitive restraint (CR) subscale includes items such as "I counted the calories of foods I ate." and "I tried to avoid foods with high-calorie content.". The Restriction (R) subscale includes items such as "People told me that I do not eat very much." and "People would be surprised if they knew how little I ate.". EPSI-CR scores range from 0 to 12, and EPSI-R scores range from 0 to 24. The participants are asked to read each item and determine how well it describes their recent experiences in the past four weeks. Then, the participants are instructed to select the option that best describes how frequently each statement applied to them during the past four weeks, including the present day. Higher scores indicate higher levels of cognitive restraint and dietary restriction. The scores from the original study had good internal consistency with median Cronbach α ranging from .84-.89 (Forbush et al., 2013)

Self-Report Habit Index (SRHI; Verplanken & Orbell (2003)

The SRHI is a self-report measure of habit strength. It consists of 12 generic statements of habit frequency, such as "... I do automatically." "... I do without having to consciously remember.", and "... that makes me feel weird if I do not do it" (see Appendix C).

A specific behavior is indicated that should be used to evaluate each statement: "(dietary restriction) is something that I do automatically." The DSM-5-TR (American Psychiatric

Association, 2022) describes examples of dietary restriction in Anorexia Nervosa as refusal to eat certain foods, elimination of whole food groups such as carbohydrates or fats, avoiding meal times, and development of food rituals.

Eating Disorder Examination - Questionnaire Short (EDE-QS; Gideon et al., 2016)

Eating Disorder Examination Questionnaire Short (EDE-QS) was introduced in 2016 for routine outcome assessments to allow session-by-session monitoring of disordered eating (Gideon et al., 2016). The 12-item measure was derived from the longer Eating Disorder Examination Questionnaire (EDE-Q). It was designed for individuals diagnosed with eating disorders such as Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, and other specified feeding and eating disorders. It covers key areas of eating disorder pathology, including behaviors related to eating, attitudes toward weight and shape, dietary restraint, and concerns about eating and body image. It was designed for use in routine outcome assessment, including session-by-session monitoring.

Short Grit Scale (SGS; Duckworth & Quinn, 2009)

The Short Grit Scale (SGS) has eight items with two subscales: a) consistency of interest and b) perseverance of effort (see Appendix E). In previous research, Cronbach's α was acceptable for each population tested, ranging from .73-.83. The questionnaire can be scored globally for a total score and by its two subscales. Each item contains a statement, and the participant is asked to score how much each statement describes them on a 5-point Likert scale. The consistency of interest subscale contains items such as "New ideas and projects sometimes distract me from previous ones (reverse scored)." The perseverance of effort subscale contains items such as "Setbacks don't discourage me."

Frost Multidimensional Perfectionism Scale – Brief (FMPS; Frost et al., 1990; Burgess et al., 2016).

Frost Multidimensional Perfectionism Scale – Brief measures perfectionism and consists of eight questions in total and two subscales. The subscales are *evaluative concerns* and *strivings*, each subscale containing four items. The items are scored on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), with a total score ranging from 8- 40 and a subscale score of 4–20. Higher scores indicate more perfectionism. The Cronbach's α in prior research shows good internal consistency ($\alpha = 0.83$; Woodfin et al., 2020). The evaluative concerns subscale contains items such as “If I fail at work /school I am a failure as a person.” The strivings subscale contains items such as “I have extremely high goals.” (See Appendix F for the full scale).

Procedure

Participants were selected for participation in the study through Prolific by focusing on if they had received an AN diagnosis during the prescreening. The prescreening was open to participants who were registered as female in the Prolific system, were between 18 and 50 years of age, and had a prior mental health diagnosis. Potential participants were redirected to a Qualtrics survey from Prolific during the prescreening. After providing informed consent, participants answered demographic questions, one of which focused on a prior AN diagnosis. Then, participants completed the Eating Disorder Examination Questionnaire Short (see Appendix D) and the Short Grit Scale (see Appendix E). The questionnaires were presented in random order. Finally, debriefing information was shared with participants at the end of the session. All participants were compensated \$1 for completing the prescreening.

If the participants indicated a previous diagnosis of AN during the prescreening, they were invited to the main study through the Prolific platform. Participants in the main study provided informed consent electronically as the initial step on Qualtrics (see Appendix G). Following consent, participants completed a demographic questionnaire and self-report measures, including the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ), Eating Pathology Symptom Inventory (EPSI; Cognitive Restraint and Restriction subscales only), The Short Grit Scale (SGS), and the Frost Multidimensional Perfectionism Scale – Brief (FMPS). Finally, debriefing information was shared with participants at the end of the session (see Appendix I). Participants were compensated \$3 for completing the main study which was estimated to take 15 minutes to complete. Prior to collecting data both studies were approved by the Stockton University institutional review board.

Results

Analysis Overview

Outliers and violations of assumptions were screened prior to analysis. No outliers were detected on any of the measures. Further, none of the measures violated the assumption of normality. All of the measures had acceptable Cronbach's alpha scores for scale validity ($\alpha > .70$). Refer to Table 2 for descriptives, which includes means, standard deviations, and Cronbach's alphas for each measure.

Pearson correlation coefficients were computed to examine the relationships among variables. Table 3 presents the correlation matrix, displaying the correlations between Grit, Reward/Punishment Sensitivity, Cognitive Restraint, Habit Strength, Dietary Restriction, and symptom severity as measured with the EDE-QS. Correlation coefficients were interpreted to assess the strength and direction of associations between variables (see Table 3). Backward

regressions were conducted to determine the best models to predict Dietary Restriction and EDE-QS scores to find the variables that are significant in predicting each eating disorder related construct. Finally, mediation analyses were conducted to examine the relationship between Grit and Cognitive Restraint and Habit Strength through Reward Sensitivity and Punishment Sensitivity.

Analyses

A Pearson correlation was used to test the first hypothesis that Grit would be associated with Dietary Restriction. However, there was a nonsignificant relationship between Grit Effort and Dietary Restriction ($r(61) = .03, p = .83$), Grit Interest and Dietary Restriction ($r(61) = -.09, p = .88$), or Grit Total and Dietary Restriction ($r(61) = -.12, p = .83$). Additionally, Grit did not significantly correlate with scores on the Eating Disorder Examination Questionnaire ($r(61) = .03, p = .37$).

Pearson correlations were also used to test the second hypothesis and assess if Grit is associated with Punishment and Reward Sensitivity. Punishment Sensitivity was negatively correlated with Grit Total ($r(61) = -.61, p < .001$) as well as Grit Effort ($r(61) = -.54, p < .001$) and Grit Interest ($r(61) = -.47, p < .001$). Reward Sensitivity was positively correlated with Grit Effort ($r(61) = .28, p = .03$), but did not achieve a significant relationship with Grit Interest or Grit Total.

Finally, Pearson correlations were also used to test the third hypothesis that Punishment Sensitivity would be correlated with Habit Strength, Cognitive Restraint, and Dietary Restriction. Punishment Sensitivity had a weak positive correlation with Habit Strength ($r(61) = .33, p = .01$), but was not significantly correlated with Cognitive Restraint ($r(61) = .20, p = .11$) or Dietary Restriction ($r(61) = .06, p = .67$).

A backward regression analysis was conducted to test hypothesis 4 to assess Grit, Punishment Sensitivity, Reward Sensitivity, Cognitive Restraint, and Habit Strength as predictors of Dietary Restriction. The backward regression identified the model retaining Habit Strength, Reward Sensitivity, and Cognitive Restraint as the best model to predict Dietary Restriction, $F(3, 59) = 4.72, p = .005$. However, none of the individual predictors retained in the model reached statistical significance, Reward Sensitivity ($B = .14, \beta = 0.20, t = 1.67, p = .10$), Cognitive Restraint ($B = .48, \beta = .25, t = 1.81, p = .08$), and Habit Strength ($B = .09, \beta = .15, t = 1.16, p = .25$). Reward Sensitivity, Cognitive Restraint, and Habit Strength accounted for 15.20% of the variance in Dietary Restriction (adjusted $R^2 = 0.15$) (see Table 4).

A second backward regression analysis was conducted to test hypothesis 5 and to assess Grit, Punishment Sensitivity, Reward Sensitivity, Cognitive Restraint, Habit Strength, and Dietary Restrictions as predictors of EDE-QS scores. The backward regression identified a model that retained Punishment Sensitivity, Habit Strength, and Cognitive Restraint as the best model of EDE-QS, $F(3, 59) = 11.77, p < .001$. The standard regression coefficients indicated nonsignificant contributions from Punishment Sensitivity ($B = .22, \beta = 0.21, t = 1.94, p = .06$) and Habit Strength ($B = .11, \beta = 0.14, t = 1.16, p = .25$). However, Cognitive Restraint was a significant contributor ($B = 1.08, \beta = .44, t = 3.73, p < .001$). The model accounted for 34.3% of the variance in EDE-QS scores (adjusted $R^2 = 0.34$) (see Table 5).

Although the regression analyses did not retain Grit as a predictor of Dietary Restriction or of AN severity, mediation analyses were conducted to explore the potential indirect effects of Grit on Habit Strength and Cognitive Restraint through Punishment Sensitivity and Reward Sensitivity. Thus, it is possible that Grit may influence Reward and Punishment Sensitivities,

which affect Habit Strength and Cognitive Restraint, variables identified as important predictors in the models of AN symptoms and Dietary Restriction above.

The first mediation model tested Reward and Punishment Sensitivity as possible mediators of the relationship between Grit and Habit Strength in a parallel mediation model. Although this analysis did not reveal a significant direct relationship between Grit and Habit Strength ($c' = 2.62, p = .22$), there was a significant indirect effect between Grit and Habit Strength through Punishment Sensitivity ($ab = -3.92, \text{BootLLCI} = -6.61, \text{BootULCI} = -1.25$). Higher Grit was associated with reduced Punishment Sensitivity, which was then linked with reduced Habit Strength. The indirect effect between Grit and Habit Strength through Reward Sensitivity was not significant ($ab = .26, \text{BootLLCI} = -.62, \text{BootULCI} = 1.12$). See Figure 1.

The second mediation model tested Reward and Punishment Sensitivity as potential mediators of the relationship between Grit and Cognitive Restraint in a parallel mediation model. Although this analysis did not reveal a significant direct relationship between Grit and Cognitive restraint ($c' = .72, p = .26$) there was a significant indirect effect between Grit and Cognitive Restraint through Punishment Sensitivity ($ab = -.93, \text{BootLLCI} = -2.10, \text{BootULCI} = -.05$). The indirect effect between Grit and Cognitive Restraint through Reward Sensitivity was not significant ($ab = .26, \text{BootLLCI} = -.05, \text{BootULCI} = .66$). See Figure 2.

The third parallel mediation model tested Reward and Punishment Sensitivity as potential mediators of the relationship between Grit and the eating disorder symptom severity (measured with the EDE-QS). Although this analysis did not reveal a significant direct relationship between Grit and the EDE-QS ($c' = 1.36, p = .39$), there was a significant indirect effect between Grit and the EDE-QS through Punishment Sensitivity ($ab = -2.90, \text{BootLLCI} = -5.12, \text{BootULCI} = -.86$).

The indirect effect between Grit and EDE-QS through Reward Sensitivity was not significant ($ab = .32$, BootLLCI = $-.40$, BootULCI = 1.09). See Figure 3.

Discussion

The present study aimed to investigate the roles of grit and reward and punishment sensitivity in dietary restriction in individuals with Anorexia Nervosa (AN). In the present research, grit was not directly associated with measures of AN symptomology (cognitive restraint, habit strength, and dietary restriction), nor was it correlated with eating disorder symptom severity (EDE-QS). However, grit was correlated with punishment sensitivity, and higher punishment sensitivity was associated with higher scores in habit strength and the EDE-QS. However, punishment sensitivity was not associated with higher cognitive restraint or dietary restriction levels. Higher reward sensitivity was associated with cognitive restraint and dietary restriction. Contrary to expectations, grit did not significantly correlate with dietary restriction or AN symptom severity in the current sample. This finding differs from findings in previous research associating higher levels of grit with lower symptom severity in other mental health disorders like anxiety and depression (Musumari et al., 2018). This may be due to the high comorbidity of other eating disorders and other psychiatric disorders diagnoses. However, mediation analyses revealed that grit may be relevant in AN symptoms severity through punishment sensitivity, discussed further below.

Although it was predicted that habit strength would be a stronger predictor of dietary restriction and clinical severity than cognitive restraint, cognitive restraint was a stronger predictor of dietary restriction in the present research. This result contradicts Coniglio et al.'s (2017) findings, which observed that habit strength explained additional variance in dietary restriction after controlling for cognitive restraint. The present finding suggests that cognitive

restraint may be more important than habit strength in predicting dietary restriction. It is possible that differences in the AN diagnosis in the present sample and the sample in Coniglio et al. (2017) may explain the difference. In the present research, the self-reported diagnoses of AN were not verified, and sample participants were not restricted to individuals currently suffering from AN. Most participants did not currently meet the criteria for an AN diagnosis. It is possible that habit strength explains more variance in dietary restriction before during the active face of AN, and cognitive restraint explains more variance in remission.

Further, the present research revealed that punishment sensitivity mediated the relationship between grit and habit strength. Though grit and habit strength were not directly related, an indirect relationship between grit and habit strength was observed through punishment sensitivity. Here, higher levels of grit were associated with lower levels of punishment sensitivity and lower levels of punishment sensitivity with reduced habit strength. Therefore, it is possible that grit could play a significant role as a protective factor against AN risk by lowering punishment sensitivity levels.

The positive correlation between punishment sensitivity and habit strength among individuals with AN adds a nuanced layer to the field's comprehension of the disorder's symptomatology and treatment considerations. This finding holds particular significance in the context of AN treatment. Steinglass et al. (2018) found that a treatment targeting habit strength called "Regulating Emotions and Changing Habits" resulted in lower global Eating Disorder Examination Questionnaire scores. Further, Jonker et al. (2022) found that higher punishment sensitivity at the start of treatment related to less improvement in eating disorder symptoms, suggesting that punishment sensitivity may contribute to the persistence of AN. The relationship between habit strength and punishment sensitivity in the present study also suggests that

interventions aimed at breaking maladaptive habits may benefit from addressing the heightened punishment sensitivity characteristic of AN patients.

In conclusion, while grit did not directly correlate with AN symptomology or severity measures, it was associated with punishment sensitivity, which influenced habit strength, and reward sensitivity, which influenced cognitive restraint. Punishment and reward sensitivity, in turn, affected symptom severity. Cognitive restraint emerged as a stronger predictor of dietary restriction than habit strength, suggesting its significance in nonclinical settings.

Limitations and Future Directions

It is important to acknowledge several study limitations. The sample size in the present research was relatively small, potentially limiting the generalizability of the findings and the power to find statistically significant results. Additionally, the study's cross-sectional nature precludes causal inferences, highlighting the need for longitudinal research to elucidate the relationship between psychological factors, such as grit and punishment sensitivity, and AN symptoms. Moreover, the reliance on self-report measures introduces the possibility of response bias.

Future research should replicate the present findings in larger, more diverse samples and utilize longitudinal designs to explore causal relationships. Additionally, incorporating objective measures of dietary restriction and AN symptom severity, such as clinical interviews or behavioral assessments, would enhance the validity of the results. Further, more descriptive information about the eating disorder diagnosis, such as subtypes, should be included in data collection and analysis.

Table 1***Demographics***

	N	%	M	SD
Age	63	100%	32.57	8.41
Race	63	100%		
White	53	84.10%		
Asian	1	1.60%		
Black	4	6.30%		
Hispanic	2	3.20%		
Middle Eastern	1	1.60%		
Hawaiian/Pacific Islander	0	0.00%		
Native	0	0.00%		
Other	2	6.30%		
Country of Residence				
United Kingdom	37	58.70%		
United States	10	15.90%		
Italy	3	4.80%		
Poland	3	4.80%		
South Africa	3	4.80%		
Australia	2	3.20%		
Canada	2	3.20%		

Chile	1	1.60%		
France	1	1.60%		
Mexico	1	1.60%		
Eating Disorder Examination Questionnaire Short	63	100%	17.68	7.24
Body Mass Index	63	100%	25.53	7.40
Underweight(<18.5)	8	12.70%		
Normal(18.5-24.9)	29	46.00%		
Overweight (25.0-29.9)	13	20.60%		
Obese (>30)	13	20.60%		
Other Reported Psychiatric Disorders				
Depression	34	53.97%		
Anxiety	29	46.03%		
Autism	6	9.52%		
Attention Deficit Hyperactivity Disorder	8	12.70%		
Borderline Personality Disorder	5	7.94%		
Bipolar Disorder	5	7.94%		
Post Traumatic Stress Disorder	2	3.17%		
Obsessive Compulsive Disorder	2	3.17%		

Table 2*Scale Means and Validity*

Measures	M	SD	Cronbach's Alpha
Grit - Interest	3.60	.93	.88
Grit - Effort	3.22	.76	.73
Reward Sensitivity	25.62	7.96	.85
Punishment Sensitivity	39.06	7.10	.87
Cognitive Restraint	11.38	2.94	.78
Habit Strength	44.51	9.61	.93
Dietary Restriction	18.75	5.65	.86
Perfectionism - Striving	15.22	3.74	.88
Perfectionism - Evaluative Concerns	14.78	4.02	.84

Table 3

Correlation

	1	2	3	4	5	6	7	8
1. Grit (Full)	—							
2. Grit Effort	.778**	—						
3. Grit Interest	.856**	.341**	—					
4. Punishment Sensitivity	-.610**	-.544**	-.465**	—				
5. Reward Sensitivity	0.208	.275*	0.09	-0.191	—			
6. Cognitive Restraint	.011	-0.02	0.03	0.202	.256*	—		
7. Habit Strength	-.075	-0.03	-0.09	.332**	0.042	.479**	—	
8. Dietary Restriction	.028	0.03	0.02	0.055	.274*	.376**	.283*	—
9. Eating Disorder Questionnaire	-.116	-0.10	-0.09	.348**	0.091	.549**	.422**	.258*

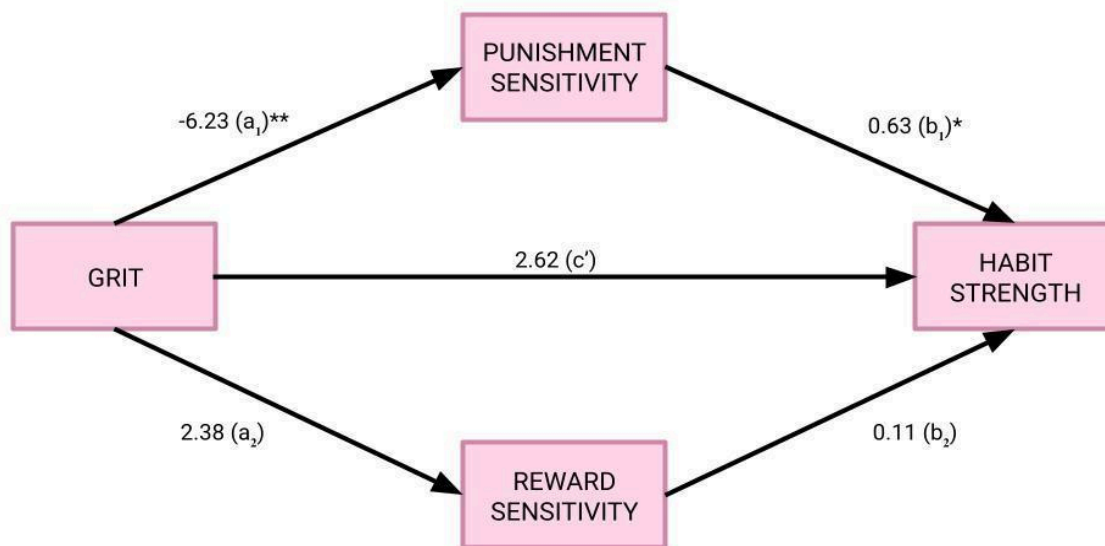
Table 4***Backward Regression for Dietary Restriction***

	Unstandardized Coefficients		Standardized Coefficient	R^2
	<i>B</i>	<i>SE B</i>	β	
Model 3				0.142
Reward Sensitivity	.14	.09	.20	
Habit Strength	.09	.08	.15	
Cognitive Restraint	.73	.28	.38	

Table 5***Backward Regression EDE-QS***

	Unstandardized Coefficients		Standardized Coefficient	<i>R</i> ²
	<i>B</i>	<i>SE B</i>	β	
Model 6				.360
Punishment Sensitivity	.22	.11	.21	
Habit Strength	.11	.09	.14	
Cognitive Restraint	1.08	.29	.44	

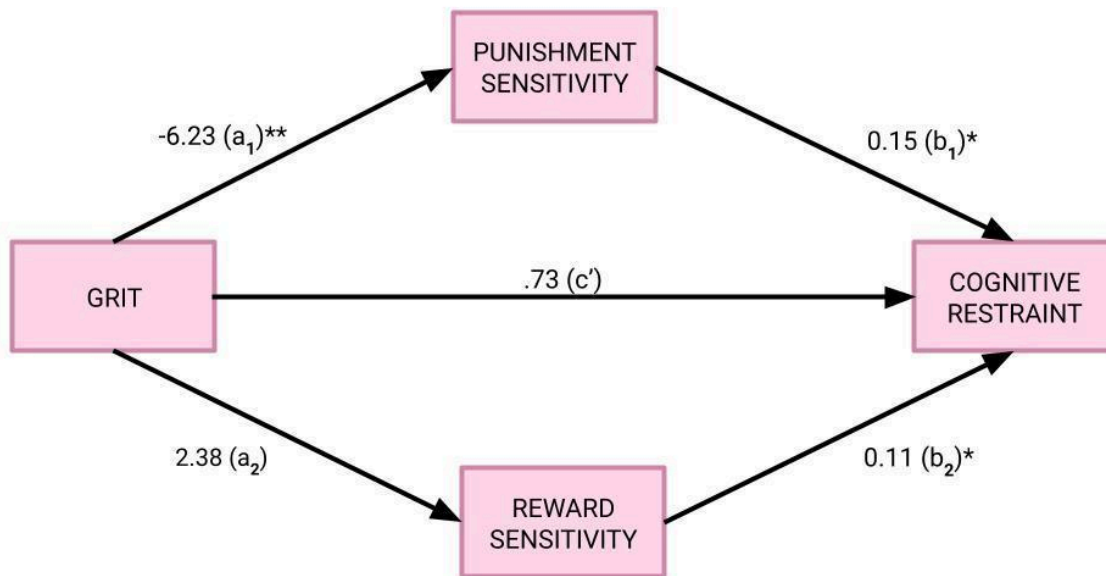
Figure 1



** values significant at the $<.001$ level

* values significant at the $<.05$ level

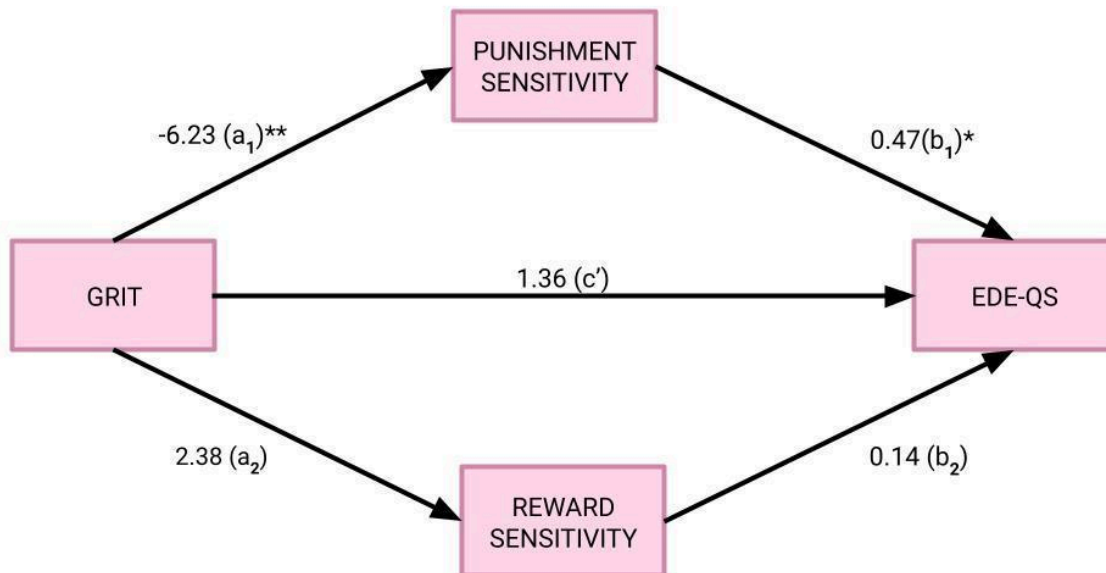
Figure 2



** values significant at the $<.001$ level

* values significant at the $<.05$ level

Figure 3



** values significant at the $< .001$ level

* values significant at the $< .05$ level

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Appendix A - Sensitivity to Punishment Sensitivity to Reward Questionnaire

Directions: Please read the following questions carefully. Then, give an answer to each question by choosing one of the options. there are no wrong answers. choose only one response for each item. Do not leave any items blank.

Likert Scale 1 -5

1 - Very Untrue	2 - Somewhat Untrue	3 - Neutral	4 - Somewhat True	5 - Very True
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1. I am afraid of new or unexpected situations
2. I like being the center of attention at a party or a social gathering
3. I am easily discouraged in difficult situations
4. When I am in a group, I try to make my opinions the most intelligent or the funniest.
5. I am a shy person
6. I take the opportunity to "pick up" people I find attractive
7. I avoid demonstrating my skills for fear of being embarrassed
8. The possibility of social advancement moves me to action, even if this involves not playing fair.
9. I worry about things that I said or did.
10. I prefer activities that lead to immediate gain.
11. I think that I could do more things if it were not for my insecurity or fear.
12. I like to compete and do everything I can to win.
13. Compared to people I know, I am afraid of many things.
14. I do things for quick gains.
15. I find myself worrying about things so much that my ability to perform other mental tasks is impaired.
16. I like to make a competition out of all of my activities.
17. I refrain from doing something I like in order to not be rejected by or disapproved of by others.
18. I would like to be a socially powerful person.
19. I refrain from doing something because I fear embarrassment.
20. I like displaying my physical abilities, even though this may involve danger.

Appendix B - Eating Pathology Symptom Index (CR and DR Only)

Below is a list of experiences and problems that people sometimes have. Read each item to determine how well it describes your recent experiences. Then select the option that best describes how frequently each statement applied to you during the past four weeks, including today. Use this scale when answering:

0	1	2	3	4
Never	Rarely	Sometimes	Often	Very Often

1. I did not like how clothes fit the shape of my body
2. I tried to exclude “unhealthy” foods from my diet
3. I ate when I was not hungry
4. People told me that I do not eat very much
5. I felt that I needed to exercise nearly every day
6. People would be surprised if they knew how little I ate
7. I used muscle-building supplements
8. I pushed myself extremely hard when I exercised
9. I snacked throughout the evening without realizing it
10. I got full more easily than most people
11. I considered taking diuretics to lose weight
12. I tried on different outfits, because I did not like how I looked
13. I thought laxatives are a good way to lose weight
14. I thought that obese people lack self-control
15. I thought about taking steroids as a way to get more muscular
16. I used diet teas or cleansing teas to lose weight
17. I used diet pills
18. I did not like how my body looked
19. I ate until I was uncomfortably full
20. I felt that overweight people are lazy
21. I counted the calories of foods I ate
22. I planned my days around exercising
23. I thought my butt was too big
24. I did not like the size of my thighs
25. I wished the shape of my body was different
26. I was disgusted by the sight of an overweight person wearing tight clothes
27. I made myself vomit in order to lose weight
28. I did not notice how much I ate until after I had finished eating
29. I considered taking a muscle-building supplement
30. I felt that overweight people are unattractive
31. I engaged in strenuous exercise at least five days per week
32. I thought my muscles were too small
33. I got full after eating what most people would consider a small amount of food
34. I was not satisfied with the size of my hips
35. I used protein supplements

36. People encouraged me to eat more
37. If someone offered me food, I felt that I could not resist eating it
38. I was disgusted by the sight of obese people
39. I stuffed myself with food to the point of feeling sick
40. I tried to avoid foods with high-calorie content
41. I exercised to the point of exhaustion
42. I used diuretics in order to lose weight
43. I skipped two meals in a row
44. I ate as if I was on autopilot
45. I ate a very large amount of food in a short period of time (eg, within hours)

Body Dissatisfaction #1, #12, #18, #23, #24, #25, #34

Binge Eating #3, #9, #19, #28, #37, #39, #44, #45

Cognitive Restraint #2, #21, #40

Purging #11, #13, #16, #17, #27, #42

Restricting #4, #6, #10, #33, #36, #43

Excessive Exercise #5, #8, #22, #31, #41

Negative Attitudes toward Obesity #14, #20, #26, #30, #38

Muscle Building #7, #15, #29, #32, #35

Appendix C - Self Report Habit Index

Dietary Restriction is something ...

Examples:

Refuse to eat certain foods

Eliminate whole food groups (carbohydrates, fats, etc.)

Makes excuses to avoid mealtimes or situations involving food

Develop food rituals (e.g., eating foods in certain orders, excessive chewing, rearranging food on a plate, excessive cutting)

<i>1</i> <i>Strongly Agree</i>	<i>2</i> <i>Agree</i>	<i>3</i> <i>Neither</i> <i>Agree or Disagree</i>	<i>4</i> <i>Disagree</i>	<i>5</i> <i>Strongly Disagree</i>
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1. ... I do frequently.
2. ... I do automatically.
3. ... I do without having to consciously remember.
4. ... that makes me feel weird if I do not do it.
5. ... I do without thinking.
6. ... would require effort not to do it.
7. ... that belongs to my (daily, weekly, monthly) routine.
8. ... I start doing before I realize I'm doing it.
9. ... I would find hard not to do.
10. ... I have no need to think about doing.
11. ... that's typically 'me'.
12. ... I have been doing for a long time.

Appendix D - Eating Disorder Examination Questionnaire
EATING DISORDER EXAMINATION QUESTIONNAIRE - SHORT (EDE-QS)
 ON HOW MANY OF THE PAST 7 DAYS...

0	1	2	3
0 DAYS	1-2 DAYS	3-5 DAYS	6-7 DAYS

1. Have you been deliberately trying to limit the amount of food you eat to influence your weight or shape (whether or not you have succeeded)?
2. Have you gone for long periods of time (e.g., 8 or more waking hours) without eating anything at all in order to influence your weight or shape?
3. Has thinking about food, eating, or calories made it very difficult to concentrate on things you are interested in (such as working, following a conversation, or reading)?
4. Has thinking about your weight or shape made it very difficult to concentrate on things you are interested in (such as working, following a conversation, or reading)?
5. Have you had a definite fear that you might gain weight?
6. Have you had a strong desire to lose weight?
7. Have you tried to control your weight or shape by making yourself sick (vomit) or taking laxatives?
8. Have you exercised in a driven or compulsive way as a means of controlling your weight, shape or body fat, or to burn off calories?
9. Have you had a sense of having lost control over your eating (at the time that you were eating)?
10. On how many of these days (*i.e.*, days on which you had a sense of having lost control over your eating) did you eat what other people would regard as an unusually large amount of food in one go?

OVER THE PAST 7 DAYS ...

0	1	2	3
NOT AT ALL	SLIGHTLY	MODERATELY	MARKEDLY

11. Has your weight or shape influenced how you think about (judge) yourself as a person?
12. How dissatisfied have you been with your weight or shape

Appendix E - Short Grit Scale

Directions: Please respond to the following 8 items. Each item provides a statement, choose an answer that best describes you. Be honest – there are no right or wrong answers!

1. New ideas and projects sometimes distract me from previous ones.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
2. Setbacks don't discourage me.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
3. I have been obsessed with a certain idea or project for a short time but later lost interest.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
4. I am a hard worker.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
5. I often set a goal but later choose to pursue a different one.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
7. I finish whatever I begin.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
8. I am diligent.

- a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
-

Scoring:

1. For questions 2, 4, 7 and 8 assign the following points:

5 = Very much like me

4 = Mostly like me

3 = Somewhat like me

2 = Not much like me

1 = Not like me at all

2. For questions 1, 3, 5 and 6, assign the following points:

1 = Very much like me

2 = Mostly like me

3 = Somewhat like me

4 = Not much like me

5 = Not like me at all

Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely Gritty), and the lowest score on this scale is 1 (not at all Gritty).

Appendix F - Frost Multidimensional Perfectionism Scale – Brief (FMPS; Frost et al., 1990; Burgess et al., 2016).

Directions: Please select the number that best corresponds to your agreement with each statement below.

Use this rating system:

Strongly Disagree				Strongly Agree
1	2	3	4	5

1. If I fail at work/school, I am a failure as a person.
2. I set higher goals for myself than most people.
3. If someone does a task at work/school better than me, then I feel like I failed at the whole task.
4. I have extremely high goals.
5. Other people seem to accept lower standards from themselves than I do.
6. If I do not do well all the time, people will not respect me.
7. I expect higher performance in my daily tasks than most people.
8. The fewer mistakes I make, the more people will like me.

Scoring: Sum items for the following subscales. Do not use a total score.

Striving: 2, 4, 5, 7

EC: 1, 3, 6, 8

Appendix G - Consent Form

Informed Consent

The following research study is being conducted by a student and faculty advisor at Stockton University in Galloway, New Jersey. The purpose of this study is to examine the role of Grit on eating behavior in individuals who have been diagnosed with Anorexia Nervosa. By participating, you play a crucial role in advancing research dedicated to eating disorders and contributing to efforts aimed at enhancing the well-being of individuals affected by anorexia nervosa. Your participation in this study is entirely voluntary, and you can choose to withdraw from the study at any time.

If you choose to participate in this study, you will be asked to answer demographic questions such as age and gender and eating disorder history, personality questions on Grit and motivation, and questions about your eating habits. Completing this study should take you no more than 10 minutes.

If you complete the study and correctly answer questions designed to make sure that you are paying attention, you will receive \$4, paid through the Prolific platform. If you do not correctly answer the questions designed to make sure you are paying attention, you will not be compensated any amount for your participation.

A potential risk to you by participating in today's study is that you may feel discomfort or distress while answering questions about your eating habits and body image. If you feel uncomfortable at any point, you are welcome to stop without any penalty to you. Information about mental health resources will also be provided at the end of the study. If you do decide to participate in this study, no identifiable data about you will be collected.

All data collected in conjunction with this project will be stored as password-protected, encrypted files in the Psychology Lab at Stockton University and will be destroyed within 5 years.

If you have questions about your rights as a research participant, contact the Stockton University Institutional Review Board at irb@stockton.edu

If you have questions or concerns about anything during the study, please do not hesitate to contact the primary investigator, Jessica I. Fleck, Ph.D.

Email: jessica.fleck@stockton.edu

Phone: 609-626-3103

Appendix H - Demographic Form

1. What is your Prolific ID? _____
2. What is your age? _____
3. What is your biological sex?
 - a. Male
 - b. Female
 - c. Other (please specify)
4. What is your height? Please report in feet and inches. For example, 5 feet 6 inches. _____
5. What is your weight? Please report in pounds. _____ lb
6. What is your country of origin? _____
7. Which of the following describes your racial and ethnic background? (select all that apply)
 - a. American Indian or Alaska Native
 - b. Asian or Asian American
 - c. Black or African American
 - d. Hispanic or Latino
 - e. Middle Eastern or North African
 - f. Native Hawaiian or Other Pacific Islander
 - g. White
 - h. Other (please specify): _____
8. Which of the following best describes your sexual orientation?
 - a. Heterosexual/straight
 - b. Lesbian
 - c. Bisexual Pansexual
 - d. Queer
 - e. Other (please specify): _____
9. What is your highest level of education?
 - a. Less than high school
 - b. High school or GED
 - c. Some college but no degree
 - d. Associate's degree (2-year degree)
 - e. Bachelor's degree (for example, BA, BS, AB)
 - f. Master's degree (for example, MA, MS, MEng, MEd, MSW, MBA)
 - g. Professional school degree (for example, MD, DDS, DVM, JD)
 - h. Doctoral degree (for example, PhD, EdD)
10. Which of the following best describes your relationship status?
 - a. Single
 - b. Casually dating
 - c. In a committed relationship (not married)
 - d. Married
 - e. Separated or divorced
 - f. Widowed

Eating Disorder History

11. Have you ever been clinically diagnosed with an eating disorder?
 - a. Yes

- b. No
12. What was the diagnosis? Please select all that apply.
- a. Anorexia
 - b. Bulimia
 - c. Binge eating disorder
 - d. Other (please specify)
13. When were you first diagnosed with Anorexia Nervosa? Please provide the month and year of diagnosis, if known. If you do not know the month and year, please provide your age when diagnosed. _____
14. Who diagnosed your eating disorder (ex., general practitioner, psychiatrist, counselor)? Please list all that apply. _____
15. Have you ever been diagnosed by a health professional with any of the following psychological disorders? (select all that apply):
- a. _____ Anxiety disorder (e.g., generalized anxiety disorder, social anxiety, panic disorder, phobia)
 - b. _____ Dementia (e.g., Alzheimer's disease)
 - c. _____ Depression/Mood disorder (e.g., major depression, bipolar disorder, dysthymic disorder)
 - d. _____ Stress disorder (e.g., PTSD)
 - e. _____ Schizophrenia-spectrum disorder (e.g., schizophrenia, schizoaffective disorder)
 - f. _____ Neurodevelopmental disorders(e.g., ADHD)
 - g. _____ Substance use disorder
16. What year were you diagnosed with the above diorder/s? Please list the disorder then a day if there is more then one _____

Appendix I - Feedback Form

Dear Participant,

Thank you for participating in our study on the impact of Grit and Reward/Punishment Sensitivity on Anorexia Nervosa restriction behaviors. Your contribution is valuable to our research, and we would like to provide you with some information about the study and its purpose and answer any questions you may have.

You were asked to complete questionnaires to assess your Reward and Punishment Sensitivity, Grit level, and disordered eating behaviors. Reward and Punishment Sensitivity measures how likely a person is to direct their behavior to obtain something positive or to avoid something negative. Prior research has shown that Punishment Sensitivity, in particular, is related to the thoughts and behaviors that are associated with restrictive eating. Grit is a trait associated with focused effort and the ability to maintain interest in long-term goals. There has been some evidence to show that Grit can work as a protective factor against clinical symptoms of anxiety and depression and may be relevant in psychopathologies that involve abnormal Reward/Punishment Sensitivity patterns. Your participation in this study was entirely voluntary, and you were free to withdraw at any time without penalty.

Your responses are anonymous and cannot be linked back to you.

If you experienced any distress due to this survey, please contact one of the helplines listed below.

ANAD Helpline: 1 (888) 375-7767
Monday-Friday, 9 am-9 pm CT

National Alliance for Eating Disorders Helpline: 1 (866) 662-1235
Monday-Friday, 9 am-7 pm ET

If you are in crisis, please call or text Suicide and Crisis Lifeline: 988
[Spanish speaking services and for Deaf & Hard of Hearing]
or text Crisis Text Line: "HOME" to 741-741. [Spanish speaking services]

Contact Information:

If you have any other questions or concerns about the study, please feel free to contact Dr. Jessica Fleck at jessica.fleck@stockton.edu

Thank you once again for your participation.

Sincerely,

Jessica Fleck

Stockton University

Jessica.Fleck@stockton.edu