

Contributors to Binge Eating Episodes among Female First Year Psychology Students:

A Moderation Analysis

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PSB3E-BT15: Bachelor Thesis

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July 4, 2025

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Abstract

Binge eating is part of serious eating disorders and has been linked to various negative health outcomes like excessive weight gain. This cross-sectional study looked at whether delay discounting, a measure of impulsive decision making, is positively associated with numbers of binge-eating days. Additionally, this study introduced restrained eating as a moderator of the relationship between delay discounting and days of binge eating in female first-year psychology students ($n = 175$), aged 17 to 30, of the University of Groningen. All data were collected using self-report measures in a controlled laboratory setting. Delay discounting was assessed using the Monetary Choice Questionnaire, a widely used measure of hypothetical monetary choices. Binge-eating days were measured with a numeric response item from the Eating Disorder Examination Questionnaire. Additionally, participants had to fill out the Restraint Scale to assess restrained eating. Results showed that delay discounting was not significantly associated with number of binge-eating days and no significant moderation effect of restrained eating was found. However, in this non-clinical sample, restrained eating was associated with binge-eating independently, rather than through an interaction with delay discounting. These results challenge the idea that delay discounting is an important mechanism in investigating binge-eating in healthy populations. Future research could improve methodological approaches by employing longitudinal designs and placing greater emphasis on cognitive control strategies.

Keywords: delay discounting, restrained eating, binge eating, Monetary Choice Questionnaire, female students

Contributors to Binge Eating Episodes among Female First Year Psychology Students: A Moderation Analysis

Binge eating (BE) is defined as consuming abnormally large quantities of food within a discrete time period (less than two hours) while experiencing a concurrent sense of loss of control (American Psychiatric Association [APA] Dictionary of Psychology, 2018). BE is often paired with several negative health outcomes, emphasizing the need for a better understanding of the possible predictors and underlying mechanisms involved in its development. Recurrent BE is seen as a risk factor for developing eating disorders like Binge Eating Disorder (BED), in which it also represents the core symptom (APA, 2013). BED affects 1–3% of the general population and is considered the most common eating disorder, highlighting its widespread impacts (Kessler et al., 2013). Individuals with BED are at an increased risk of weight gain over time and have a higher likelihood of developing diabetes and other metabolic dysfunctions (McCuen-Wurst et al., 2017). Moreover, a study by Salvia et al. (2022) showed that, in many cases, a diabetes diagnosis preceded the diagnosis of BED. While these findings highlight the serious consequences of clinically diagnosed BED, it is important to note that BE is not limited to clinical populations. It also occurs in non-clinical populations, often triggered by emotional or stressful situations (Catania et al., 2022). Importantly, subclinical BE is even more common, showing that one does not need to meet the diagnostic criteria to experience the negative consequences of BE. Research has identified various negative consequences associated with the behavior of BE itself. These consequences touch on psychological, physiological, and social domains. Among the psychological effects, feelings of shame and guilt are closely associated with BE, as both were found to increase immediately following a binge episode (Davis et al., 2022). Additionally, BE has been shown to directly predict depressive symptoms in adolescents, highlighting its wide-ranging impact even among non-clinical individuals (Sehm & Warschburger, 2016). Moreover, longitudinal

studies have highlighted the occurrence of adverse physiological outcomes. As demonstrated by Sonnevile et al. (2012), individuals who engage in BE are predisposed to weight gain and are even more likely to become obese than individuals who do not engage in BE behaviors. Furthermore, an increase in weight that exceeds healthy levels is a contributing factor to the development of cardiovascular diseases (Sonneville et al., 2012). In addition to these physiological consequences, BE also affects individuals' social lives and relationships. Individuals who binge-eat often withdraw socially, hiding the amount of food that is consumed, and avoiding social activities altogether (Yan et al., 2023). Given these numerous adverse and wide-ranging health consequences associated with BE, it is essential to deepen our understanding of the mechanisms that underlie this behavior. One such mechanism that has gained increasing attention is delay discounting, a measure of impulsive decision-making, which may offer insights into why individuals engage in maladaptive eating patterns despite long-term negative outcomes.

Delay Discounting in the Context of Binge Eating

Delay discounting (DD) describes the tendency to devalue delayed rewards in favor of smaller, immediate ones and is often associated with key characteristics of maladaptive behaviors, such as impulsivity and poor self-regulation (Bickel et al., 2018; Coffino et al., 2016; Rachlin et al., 1991). Individuals with a strong tendency to choose smaller, immediate rewards over larger, delayed ones are considered to have difficulty delaying gratification. This trait has been extensively studied concerning various maladaptive behaviors, including substance use, gambling, and unhealthy eating habits (Bickel et al., 2018). DD plays a crucial role in self-regulatory failures, where individuals struggle to act following long-term goals (Dassen et al., 2018). Research suggests that individuals who frequently make impulsive decisions, as indicated by high DD, tend to exhibit this pattern consistently over time (Göllner et al., 2018). This implies that some individuals may have an innate tendency to prioritize

immediate rewards, even when these choices come at the expense of their long-term well-being. Previous research has suggested a link between DD and weight fluctuations, including both weight gain and loss (Steward et al., 2017). For example, in the context of eating behavior, an individual with high DD may opt for an unhealthy snack to derive immediate pleasure rather than prioritize a long-term weight goal. This tendency is particularly salient among individuals diagnosed with BED, where the desire for short-term gratification from food may outweigh the benefits of maintaining long-term health goals (Steward et al., 2017). Individuals with BED exhibit a stronger preference for immediate rewards, whether related to food or money, rather than delaying gratification. Research by Steward et al. (2017) found that individuals with BED showed significantly steeper DD compared to healthy controls. While the healthy control group in their study showed lower DD than individuals with BED, this does not necessarily mean that DD is not relevant in non-clinical populations. People who tend to favor immediate rewards might already be at higher risk of BE, even if their behavior has not reached a clinical level. Bellitti et al. (2025) researched the relationship between DD and BE, using a cross-commodity DD task. In their study, healthy participants made choices involving either monetary rewards or hyper-palatable food rewards. The authors found a significant association between BE and DD, specifically in the hyper-palatable food now vs. money later condition. That is, individuals with higher BE scores were more likely to prefer immediate food over delayed monetary rewards. This pattern suggests that impulsive decision-making in BE may be particularly pronounced when food-specific choices are involved, rather than in general monetary discounting contexts. However, it is still quite unclear whether this relationship also holds when using a standardized measure of general DD instead of a food-specific one.

The studies mentioned above have focused on clinical populations with binge-type eating disorders, leaving less known about how DD is related to BE as a symptom in non-

clinical groups. In studies that have examined this association in non-clinical samples, DD was often measured using food-related tasks, modified monetary tasks designed for that specific study, or a combination of both. The current study will be one of the few to use the Monetary Choice Questionnaire, a widely validated measurement of general DD, to assess DD in a non-clinical sample. This enables greater comparability and replication within the broader DD literature and contributes to a small but expanding body of research on its relation to BE behavior. This study builds on previous findings regarding DD and BE by focusing on a homogeneous sample in terms of age, gender, and academic background as well as using a comparable, widely validated, and standardized measurement for DD. Since age is identified as a significant factor in DD, examining a sample of only first-year students offers a consistent age range for this study (Steward et al., 2017). In consideration of the evidence presented, DD may be a crucial mechanism underpinning BE behaviors, as it signifies a more extensive inability to resist immediate temptations in favor of long-term benefits, the central focus of the present study.

However, not all individuals who exhibit steep DD tendencies necessarily engage in BE. This suggests that the relationship between DD and BE may depend on additional psychological factors. One such factor that may help explain when BE is more likely to occur among those who prefer immediate rewards is restrained eating. This idea builds on the notion that some individuals high in need for immediate rewards adopt restrained eating as a compensatory strategy to regulate or control their eating behavior (Dong et al., 2016). Paradoxically, however, such restraint can backfire and lead to disinhibited eating or binge episodes (Herman & Mack, 1975). To investigate this possibility, the present study introduces restrained eating as a moderator in the relationship between DD and BE.

The Role of Restrained Eating as Moderator

Restrained eating (RE), as conceptualized by Herman and Polivy (1980), refers to the intentional restriction of food intake to control body weight. In later work, they explained that restrained eaters “set themselves goals that are designed to help them to lose weight or maintain a lowered weight,” often eating deliberately less (Polivy & Herman, 2020, p. 3). This involves constant monitoring and intentional restriction of food consumption. RE is viewed as a persistent effort to lose weight and achieve a leaner physique. However, research suggests that while RE is intended as weight-control strategy, it may unintentionally increase the likelihood of BE, an idea explained by the dietary restraint theory (Herman & Mack, 1975). While relying on cognitive control over eating may seem beneficial, dietary restraint theory suggests that this overcontrol can increase vulnerability to disinhibited eating and binge episodes when self-regulation fails. In essence, the theory suggests that attempts to restrict food intake, such as dieting, can paradoxically lead to excessive food consumption. Given this, restrained eaters are seen at risk for BE behavior. Indeed, there is evidence for the relationship between RE patterns and BE (Linardon, 2018). An assumption of the present study is, that some individuals with better inhibitory control may engage in RE without an increased risk of BE. Notably, research on the relationship between different subtypes of impulsivity and measures of RE shows that RE is associated with better inhibitory control (Leitch et al., 2013). In line with this, individuals with low DD, reflecting greater cognitive control, may be more capable of maintaining RE patterns without engaging in BE. Given this, RE remains a particularly relevant construct to examine as a moderating factor in the relationship between DD and BE.

The present study

This study seeks to investigate whether DD tendencies are associated with BE and whether RE serves as a moderator in the relationship between DD and BE. Specifically, to what extent does RE moderate the relationship between DD and BE in female first-year

psychology students? By addressing this question, the study aims to clarify the role of DD tendencies in maladaptive eating behaviors, specifically BE, within a non-clinical sample. Although previous research has explored DD and BE separately, the specific pathway through RE, as well as the dynamics of this relationship in subclinical populations, remains underexplored. Two specific hypotheses are investigated in this study; H1: DD is positively related to number of BE days in female first year psychology students. H2: The relationship between DD and number of BE days is moderated by RE, such that the association is stronger among individuals with higher levels of restrained eating.

Methods

Participants

Participants were first year psychology students from the University of Groningen. The sample consisted of a group of 175 female participants, of whom 59% ($n = 104$) were Dutch and 41% ($n = 71$) held other nationalities. The ages ranged from 17 to 30 with a mean of 19.31 years ($SD = 1.79$). The average BMI of these participants at the first measurement was 21.90 ($SD = 2.84$).

Materials

Delay Discounting

To assess DD the Monetary Choice Questionnaire (MCQ; Kirby et al., 1999) was used. The MCQ consists of 27 forced-choice items, where participants are presented with two hypothetical monetary options: a smaller reward available immediately or a larger reward available after a delay. An example item would be: “Would you prefer \$69 today, or \$85 in 91 days?”. The choices in the MCQ vary in terms of both delay duration and reward magnitude, allowing for the calculation of an individual’s discounting rate (k-value). The k-value is a free parameter that determines how much future rewards are devalued due to delay. A higher k-value reflects a stronger preference for immediate gratification rather than waiting for a more

significant reward in the future. The calculation of the k-value of the MCQ was performed using an SPSS syntax developed by Gray et al. (2016), which automatically computes individual k-values based on participants' responses. The computed k-values were then log-transformed to ensure a normal distribution of the values and to avoid the violation of the assumption of normality. In the presents study's final sample, the MCQ had an internal consistency of Cronbach's $\alpha = .91$ demonstrating excellent reliability.

Binge Eating

The number of bingeing days were assessed with Item 15 "Over the past 28 days, on how many days have such episodes of overeating occurred (i.e., have you eaten an unusually large amount of food and have had a sense of loss of control at the time)?" of the Eating Disorder Examination Questionnaire (EDE-Q). Participants answer this numeric response item by reporting a number from 0 to 28, depending on how often they recall overeating. The EDE-Q is a self-report questionnaire developed by Fairburn and Beglin (2008) and consists of 28 items in total that assess key aspects of eating pathology, including dietary restraint, concerns about weight and shape, and days of BE.

Restrained Eating

To measure RE, the Restraint Scale (Polivy et al., 1978) was used. The scale is a widely used self-report measure designed to assess one's level of restraint measured by 10 items (Polivy et al., 2020). Higher scores on the Restraint Scale indicate greater RE tendencies, meaning an individual's intentional restriction of food intake to control body weight. The sum score of all 10 items of the first data collection session is used. In the presents study's final sample, the Restraint Scale had an internal consistency of Cronbach's $\alpha = .80$, demonstrating good reliability.

Procedure

The study was conducted at the Faculty of Behavioral and Social Sciences of the University of Groningen and was approved by the Ethics Committee of Psychology of the University of Groningen with the code PSY-2324-S-0363. The data reported in the present cross-sectional study was part of a larger longitudinal study, conducting research about DD, eating, and emotion regulation strategies. First-year psychology students were recruited using the SONA platform, a participant recruitment tool used by academic institutions, where they could enroll themselves in the study “PSY-2324-S-0363 Emotion Regulation and Weight”. The study of this paper only makes use of the data from the first of five data collection points. Prior to participation, all participants provided informed consent. Before the first data collection point, participants were asked to come in standardized clothing (a t-shirt and leggings) to minimize variability in weight measurements. They completed a set of five questionnaires via the Qualtrics platform and were then measured for their height (meters) and weight (kilogram). Participants could decide if they want to complete the questionnaires in Dutch or in English. For the three intermediate data points, participants only completed the EDE-Q Questionnaire and had their weight measured at each session. At the last data collection point, participants completed the same set of five questionnaires and had both height and weight measured. For the first four sessions, students received SONA credits, which are commonly required in first-year psychology courses at the University of Groningen. Participants received €5 for the fifth session and an additional €5 if they completed all five sessions.

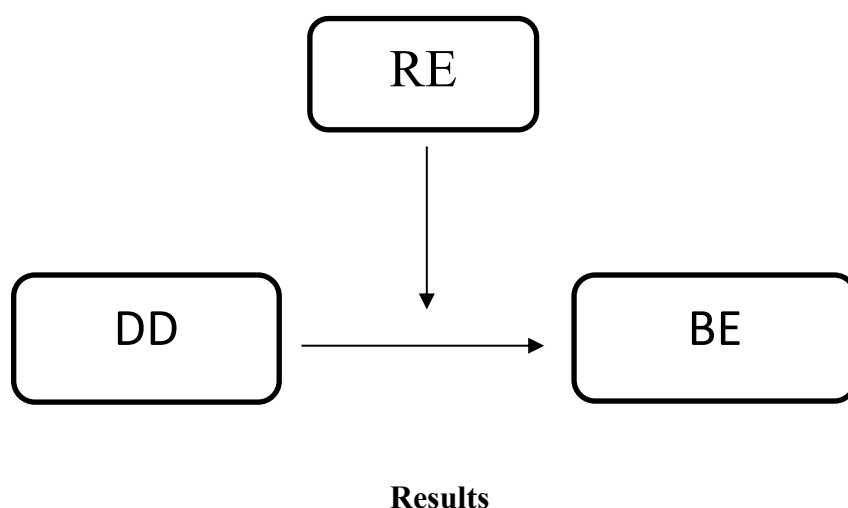
Statistical Analysis

All statistical analyses were carried out in SPSS (IBM Corp, 2024). To test the moderation model, PROCESS macro for SPSS (Hayes, 2022) will be utilized, specifically Model 1, which is designed for testing moderation effects. To evaluate the normality of residuals, a Q-Q plot of the standardized residuals was reviewed (Figure 2). The assumptions

of linearity and homoscedasticity were assessed by inspecting scatterplots between the independent variable (DD), the moderator (RE), and the dependent variable (BE) (Figure 3-6). Multicollinearity between DD and RE was checked by examining the variance inflation factor, verifying that the predictors were not highly correlated with each other. The assumption of independence was considered not violated as each participant completed the questionnaires independently without external influence. To test both hypotheses, a simple moderation analysis was conducted (see Figure 1 for a representation of the moderation model). Statistical significance for all analyses was determined using an alpha level of .05. To achieve adequate statistical power (.80) for detecting medium effects sizes ($f^2 = .15$), an a priori power analysis using G power determined that a minimum of 55 participants would be required to find a main effect (Hypothesis 1) and 68 to find an interaction effect (Hypothesis 2).

Figure 1

Conceptual Diagram of the Moderating Role of Restrained Eating between Delay Discounting and Binge Eating



Descriptives

Table 1 depicts the descriptive statistics and correlations among the three relevant variables DD, RE, and BE. The reported days of BE ranged from a minimum of zero days to a maximum of 23 days. The results indicate insignificant relationships between DD and BE as well as between DD and RE. However, there is a significant positive relationship between RE and BE, showing that a higher score on the Restraint Scale is related to a higher number of BE days.

Table 1

Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3
1. DD	2.41	0.59	-	-	-
2. RE	13.28	5.5	.091	-	-
3. BE	2.67	4.62	-.003	.452*	-

Note. $n = 175$. Correlations are highlighted if significant at $*p < .05$.

Main Analyses

Assumption checks

Although the Q–Q plot showed mild deviations from normality, the analysis proceeded with caution, acknowledging that linear regression is generally robust to such minor violations (Figure 2). Assumptions of linearity and homoscedasticity were checked via scatterplots (Figure 3-6). The residuals do exhibit a random pattern and therefore, linearity and homoscedasticity are considered not violated. The variance inflation factor was below 4, meaning that there is no sign of multicollinearity between the variables.

Hypothesis testing

All statistical analyses were carried out using PROCESS macro for SPSS. The overall model was significant ($F(3, 171) = 15.46, p < .001$), explaining approximately 21.3% of the variance in BE ($R^2 = .213$). Hypothesis 1 predicted a positive relationship between DD and

number of BE days. The analysis revealed that the main effect between DD and BE was not statistically significant ($b = -0.39$, $SE = 0.53$, $t = -0.73$, $p = .465$), indicating that there is no direct association between DD and BE in this sample. To test hypothesis 2 (restrained eating moderates the relationship DD and BE) the interaction effect of DD and RE was examined, which also yielded a non-significant effect ($b = -1.45$, $SE = 1.15$, $t = -1.26$, $p = .209$). The change in explained variance from the interaction term was minimal and not significant ($\Delta R^2 = .007$, $p = .209$). However, restrained eating emerged as a significant predictor on its own ($b = 3.78$, $SE = 0.58$, $t = 6.57$, $p < .001$), indicating that RE is associated with more BE days.

Discussion

The study investigated the relationship between DD and BE and whether this relationship is moderated by RE. The results did not reveal a significant relationship between DD and BE. Similarly, the interaction between DD and RE was non-significant, indicating that RE does not have a moderating effect on the relationship between DD and the number of BE days. However, RE independently emerged as a significant predictor of BE behavior, with higher levels of RE being associated with more days of bingeing.

Different from what was hypothesized, the results revealed no significant relationship between DD and BE. This finding stands in contrast to prior research, which has frequently observed a positive association between DD and maladaptive eating behaviors such as BE (Steward et al., 2017). However, the absence of a significant effect does not necessarily invalidate the assumption that DD contributes to dysregulated eating. It may rather suggest that this relationship is more complex and context-dependent than initially assumed. The discrepancy between the findings of the present study and prior studies may be attributable to the composition of the samples. Unlike many of the prior studies discussed in the introduction, which included both clinical and non-clinical groups, the present study focused exclusively on a non-clinical sample. Clinical groups often include individuals with more

pronounced DD tendencies and more severe eating pathology, making associations easier to detect (Bickel et al., 2018; Dassen et al., 2018; Steward et al., 2017). It may be possible that participants in our study exhibit generally lower DD rates, which could have masked associations with BE. The significant group differences observed by Steward et al. (2017) between individuals with BED and healthy controls suggest that DD may be more strongly associated with BE in clinical populations. However, the absence of such variation in the present non-clinical sample may explain why no significant association was found. This implies that DD might only become a meaningful predictor of BE when the behavior is more severe or persistent. Another possible explanation may lie in the sample characteristics. All participants were young, female students, which means there was not much variety in age or socioeconomic background. The study by Leitch et al. (2013) used a similar sample as our study, healthy-weight female students, and was also unable to find a significant main effect. However, it is important to mention that Leitch et al. (2013) investigated the effect of DD on uncontrolled eating instead of BE. Although the two constructs are related in that both involve a loss of control, they should not be considered equivalent. Notably, studies including broader age ranges have reported significant relationships between DD and BE (Manasse et al., 2015). This may suggest that DD is less relevant for predicting BE in younger adults, but becomes a more relevant factor in older populations. Thus, while our findings do not support the initial hypothesis, they highlight the importance of considering sample characteristics when examining the role of DD in eating behavior. Another reason for not finding what was expected could be the questionnaire used to measure DD. While the present study used the same measure of DD as some prior research, there are still some notable differences that may help explain the divergent findings. Unlike Bellitti et al. (2025), who used a cross-commodity DD task and found significant associations with eating-related traits, this study employed the Monetary Choice Questionnaire (MCQ) to measure DD in a general reward context. Other

studies using the MCQ, such as Steward et al. (2017), did find associations between DD and BE, but their sample included individuals with diagnosed eating disorders, who typically show much steeper discounting tendencies. These comparisons imply that while DD may be elevated in clinical or at-risk groups, it might not reliably predict maladaptive eating behaviors in non-clinical samples. The present findings contribute to this perspective by showing that general DD is not associated with BE in a sample of healthy, young women.

In contrast to the second hypothesis and our expectations, restrained eating did not moderate the relationship between DD and BE. Although previous research has suggested a connection between DD and RE, with some studies proposing that more impulsive individuals may adopt restrictive eating strategies to manage their impulses (Dong et al., 2016), the current study found no such relationship. This lack of relation challenges the assumption that individuals with a higher tendency to prefer immediate rewards are more likely to engage in restrained eating as a form of self-regulation. Specifically, this finding contradicts prior research suggesting that the interaction between DD and RE may be a particularly influential factor in predicting BE (Coffino et al., 2016; Leitch et al., 2013). Leitch et al. (2013) found that RE was associated with greater inhibitory control, suggesting that restrained eaters may, on average, be less impulsive than non-restrained eaters. However, this also points to individual variability within restrained eaters, while some exhibit strong inhibitory control, others may still be vulnerable to impulsive eating. They assessed RE using the Three-Factor Eating Questionnaire, which specifically measures cognitive efforts to restrict intake. However, the present study used the Restraint Scale (Polivy et al., 1978), which captures a more emotionally driven and potentially rigid form of restraint that has been more directly linked to disinhibited eating. Therefore, while their findings offer valuable insight into the role of inhibitory control in restrained eating, differences in measurement tools highlight the need to distinguish between cognitive and emotionally driven restraint. By using the restraint

scale, the present study extends this line of research by focusing on a form of restraint that may be more closely tied to BE tendencies, especially in individuals with lower cognitive control. Although the full model accounted for a meaningful proportion of variance in BE (21.3%), the effect was primarily driven by restrained eating. DD and its interaction with RE did not contribute significantly, suggesting that restrained eating alone is the key factor underlying the observed effect size. Given all this, both hypotheses are rejected.

Despite the non-significant results of the relationships of interest, RE was significantly and positively related to number of BE days. This result aligns with the dietary restraint theory, which explains that chronic attempts to restrict food intake can paradoxically lead to disinhibited eating and loss of control (Herman & Polivy, 1980). The current findings support the notion that control over eating may backfire, which results in more days of BE among individuals who engage in restrained eating. Specifically, these findings are consistent with previous research showing that restrained eaters are particularly vulnerable to overeating (Polivy & Herman, 2020).

Limitations

This study has several strengths, including the use of a homogeneous sample, reliable and validated measurement tools, and a controlled laboratory setting. However, there are also important limitations that must be acknowledged to properly interpret the findings. First, one might see the usage of the MCQ as a limitation. While the MCQ is a widely validated measurement tool, it raises the question of whether it truly captures a general form of DD or whether it reflects a domain-specific form of decision making. The MCQ is based on hypothetical monetary choices; however, people value money differently based on factors such as socioeconomic status, personal experiences, or financial habits. These influences may limit the extent to which monetary tasks reflect broader decision-making tendencies. Therefore, it may be worth exploring alternative approaches, such as real-life behavioral

tasks, rather than hypothetical questions, or tasks that incorporate non-monetary rewards to assess DD in a more ecologically valid manner. Second, BE was assessed using a single item from the EDE-Q, which asked participants to report the number of binge days over the past 28 days. While this count data offers a straightforward number of days on which one or more BE episodes occurred, it limits the depth of information available and may fail to capture the severity of BE behavior. Moreover, the item gives only a short-term snapshot of behavior and therefore might miss people who binge less regularly but still experience problematic eating behavior. This approach also does not account for the stability or fluctuation of BE over time, which is important because persistent patterns may indicate a chronic BE, whereas fluctuating patterns could reflect situational binge episodes. These distinct patterns stem from different underlying motivations and could require attention to different factors when further conducting research. Third, the cross-sectional design of the study prevents any conclusions about causality. Fourth and last, all variables were assessed through self-report questionnaires. Self-report data are subject to recall bias, social desirability, and underreporting, especially for sensitive topics like eating behaviors. This may have affected the accuracy and validity of the results. Beyond these limitations, certain methodological choices further affect the interpretability of the results. Although the homogeneity of the sample offers information for one specific group, it might have also resulted in range restriction and limitation of the generalizability of the findings. Taken together, these limitations highlight the need for cautious interpretation of the findings and point to several directions for improving future research in this area.

Implications and Future Directions

The findings of this study contribute to a growing understanding of DD as one of the psychological mechanisms underlying BE behavior in non-clinical populations. Although DD has been associated with binge-type eating disorders in clinical samples, the lack of a

significant effect in this non-clinical sample suggests that its influence may be more pronounced in severe or chronic forms of BE, rather than in subclinical or episodic occurrences. While no moderating effect was found, the significant association between RE and BE supports the notion that a rigid diet may, in itself, be a risk factor for maladaptive eating. This suggests that cognitive control efforts, such as RE, may be a more immediate predictor of BE in non-clinical samples than general impulsivity as assessed by DD.

Moreover, the current results challenge the assumption that BE primarily results from a failure of self-regulation in individuals with steep DD tendencies. While DD may still play a role in clinical populations, the findings of this study indicate that in non-clinical samples, RE on its own may already increase vulnerability to BE, regardless of one's DD tendencies.

Several paths for future research arise from the limitations and outcomes of this study. First, the measurement of BE could be improved. The use of the single item from the EDE-Q, which assessed BE over the past 28 days, provides only limited information. Future work could employ an interview-based assessment that captures both the frequency and severity of BE episodes, allowing for a deeper understanding of this behavior. Second, the cross-sectional nature of the study prevents any further conclusions. Using a longitudinal design would allow to explore how these relationships develop over time and better understand what precedes BE in the first place. With longitudinal studies, it could be observed how the variables change, and it would give a clearer picture of the dynamics between DD, RE, and BE. Third, future research could aim to develop or validate DD measures that are not limited to monetary rewards but instead assess impulsivity using more generalizable or personally relevant rewards. This would help address the limitation that individuals differ in how they subjectively value money, potentially increasing ecological validity and the applicability of findings across diverse populations. Lastly, future research could examine a different age group to explore whether DD has a different impact on BE behavior in older women. This

would expand the existing knowledge on DD and contribute to the literature by identifying age-specific patterns in decision-making tendencies related to reward valuation, which could help inform more targeted prevention and intervention strategies.

Conclusion

This study set out to investigate whether DD contributes to BE, and if this relationship is moderated by restrained RE. Contrary to expectations, DD was not significantly related to BE, nor did RE moderate this relationship. However, RE on its own was positively associated with BE, suggesting that the rigid control of eating may, in some cases, contribute to disinhibited eating episodes. While these findings do not support the initially proposed interaction, they offer important insight into the mechanisms that may underlie BE in non-clinical populations by identifying DD as a less relevant construct in predicting BE. Specifically, they highlight that impulsivity, at least as measured through monetary-based DD tasks, may not be the most relevant predictor in younger, homogeneous samples. Instead, cognitive strategies like restraint appear to play a more central role. These results contribute to the broader discussion on how BE develops and is maintained, by putting emphasis on cognitive control strategies and underscore the importance of examining multiple pathways and psychological factors. Future research could explore different and potentially more accurate methods for assessing DD, as well as adopt longitudinal studies to better capture frequency and regularity of BE.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Publishing.
- APA Dictionary of Psychology. (2018). <https://dictionary.apa.org/binge-eating>
- Bellitti, J. S., L'Insalata, A. M., & Fazzino, T. L. (2025). Discounting of Hyper-Palatable Foods Is Associated with Eating Motives and Binge Eating Behavior. *Nutrients*, 17(8), 1356. <https://doi.org/10.3390/nu17081356>
- Bickel, W. K., Moody, L. N., Koffarnus, M., Thomas, J. G., & Wing, R. (2018). Self-control as measured by delay discounting is greater among successful weight losers than controls. *Journal of Behavioral Medicine*, 41(6), 891–896. <https://doi.org/10.1007/s10865-018-9936-5>
- Catania, J., Spirou, D., Gascoigne, M., & Raman, J. (2022). Loss of control as a transdiagnostic feature in obesity-related eating behaviours: A systematic review. *European Eating Disorders Review*, 31(1), 24–45. <https://doi.org/10.1002/erv.2936>
- Coffino, J. A., Orloff, N. C., & Hormes, J. M. (2016). Dietary Restraint Partially Mediates the Relationship between Impulsivity and Binge Eating Only in Lean Individuals: The Importance of Accounting for Body Mass in Studies of Restraint. *Frontiers in Psychology*, 7. <https://doi.org/10.3389/fpsyg.2016.01499>
- Dassen, F. C. M., Houben, K., Allom, V., & Jansen, A. (2018). Self-regulation and obesity: the role of executive function and delay discounting in the prediction of weight loss. *Journal of Behavioral Medicine*, 41(6), 806–818. <https://doi.org/10.1007/s10865-018-9940-9>
- Davis, H. A., Keel, P. K., Tangney, J. P., & Smith, G. T. (2022). Increases in shame following binge eating among women: Laboratory and longitudinal findings. *Appetite*, 178, 106276. <https://doi.org/10.1016/j.appet.2022.106276>

- Dong, D., Wang, Y., Jackson, T., Chen, S., Wang, Y., Zhou, F., & Chen, H. (2016). Impulse control and restrained eating among young women: Evidence for compensatory cortical activation during a chocolate-specific delayed discounting task. *Appetite*, 105, 477–486. <https://doi.org/10.1016/j.appet.2016.05.017>
- Göllner, L. M., Ballhausen, N., Kliegel, M., & Forstmeier, S. (2018). Delay of Gratification, Delay Discounting and their Associations with Age, Episodic Future Thinking, and Future Time Perspective. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.02304>
- Herman, C. P., & Mack, D. (1975b). Restrained and unrestrained eating1. *Journal of Personality*, 43(4), 647–660. <https://doi.org/10.1111/j.1467-6494.1975.tb00727.x>
- Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. J. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia: Saunders.
- Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (3rd ed.). The Guilford Press.
- IBM Corp. (2024). *IBM SPSS Statistics for Windows* (Version 30.0) [Computer software]. IBM Corp.
- Kessler, R. C., Berglund, P. A., Chiu, W. T., Deitz, A. C., Hudson, J. I., Shahly, V., Aguilar-Gaxiola, S., Alonso, J., Angermeyer, M. C., Benjet, C., Bruffaerts, R., De Girolamo, G., De Graaf, R., Haro, J. M., Kovess-Masfety, V., O'Neill, S., Posada-Villa, J., Sasu, C., Scott, K., . . . Xavier, M. (2013). The prevalence and correlates of binge eating disorder in the World Health Organization World Mental Health Surveys. *Biological Psychiatry*, 73(9), 904–914. <https://doi.org/10.1016/j.biopsych.2012.11.020>
- Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Monetary Choice Questionnaire [Dataset]. In *PsycTESTS Dataset*. <https://doi.org/10.1037/t10044-000>

- Leitch, M. A., Morgan, M. J., & Yeomans, M. R. (2013). Different subtypes of impulsivity differentiate uncontrolled eating and dietary restraint. *Appetite*, 69, 54–63.
<https://doi.org/10.1016/j.appet.2013.05.007>
- Linardon, J. (2018). The relationship between dietary restraint and binge eating: Examining eating-related self-efficacy as a moderator. *Appetite*, 127, 126–129.
<https://doi.org/10.1016/j.appet.2018.04.026>
- Manasse, S. M., Espel, H. M., Forman, E. M., Ruocco, A. C., Juarascio, A. S., Butryn, M. L., Zhang, F., & Lowe, M. R. (2015). The independent and interacting effects of hedonic hunger and executive function on binge eating. *Appetite*, 89, 16–21. <https://doi.org/10.1016/j.appet.2015.01.013>
- McCuen-Wurst, C., Ruggieri, M., & Allison, K. C. (2017). Disordered eating and obesity: associations between binge-eating disorder, night-eating syndrome, and weight-related comorbidities. *Annals of the New York Academy of Sciences*, 1411(1), 96–105. <https://doi.org/10.1111/nyas.13467>
- Polivy, J., Herman, C. P., & Warsh, S. (1978). Internal and external components of emotionality in restrained and unrestrained eaters. *Journal of Abnormal Psychology*, 87, 100–114.
- Polivy, J., Herman, C. P., & Mills, J. S. (2020). What is restrained eating and how do we identify it? *Appetite*, 155. <https://doi-org.proxy-ub.rug.nl/10.1016/j.appet.2020.104820>
- Rachlin, H., Raineri, A., & Cross, D. (1991). SUBJECTIVE PROBABILITY AND DELAY. *Journal of the Experimental Analysis of Behavior*, 55(2), 233–244.
<https://doi.org/10.1901/jeab.1991.55-233>
- Salvia, M. G., Ritholz, M. D., Craigen, K. L., & Quatromoni, P. A. (2022). Managing type 2 diabetes or prediabetes and binge eating disorder: a qualitative study of patients’

perceptions and lived experiences. *Journal of Eating Disorders*, 10(1).

<https://doi.org/10.1186/s40337-022-00666-y>

Sehm, M., & Warschburger, P. (2016). Prospective associations between binge eating and psychological risk factors in adolescence. *Journal of Clinical Child & Adolescent Psychology*, 47(5), 770–784. <https://doi.org/10.1080/15374416.2016.1178124>

Sonneville, K. R., Horton, N. J., Micali, N., Crosby, R. D., Swanson, S. A., Solmi, F., & Field, A. E. (2012). Longitudinal associations between binge eating and overeating and adverse outcomes among adolescents and young adults. *JAMA Pediatrics*, 167(2), 149. <https://doi.org/10.1001/2013.jamapediatrics.12>

Steward, T., Mestre-Bach, G., Vintró-Alcaraz, C., Agüera, Z., Jiménez-Murcia, S., Granero, R., & Fernández-Aranda, F. (2017). Delay discounting of reward and impulsivity in eating disorders: from anorexia nervosa to binge eating disorder. *European Eating Disorders Review*, 25(6), 601–606. <https://doi.org/10.1002/erv.2543>

Yan, H., Liu, C., Tseng, M. M., Lee, T., Mu, P., & Lin, H. (2023). Severity of Binge Eating Behavior among Overweight College Students in Taiwan and Associated Factors. *Healthcare*, 11(3), 338. <https://doi.org/10.3390/healthcare11030338>

Appendix

Figure 2

Q-Q Plot of the Standardized Residuals

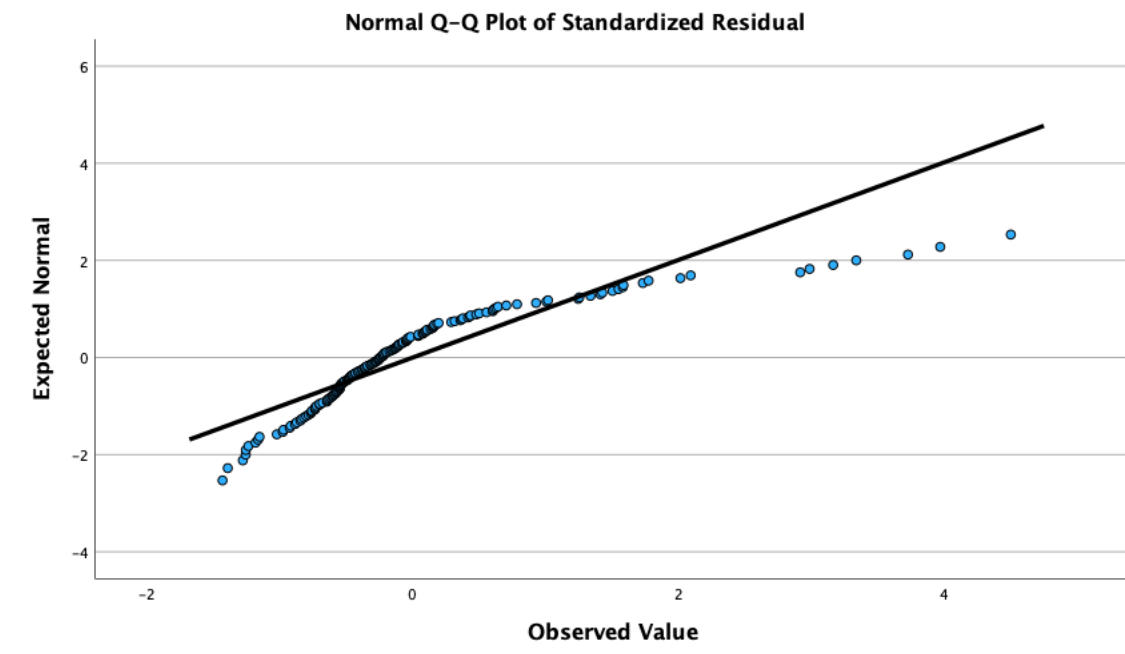


Figure 3

Scatterplot for BE and DD

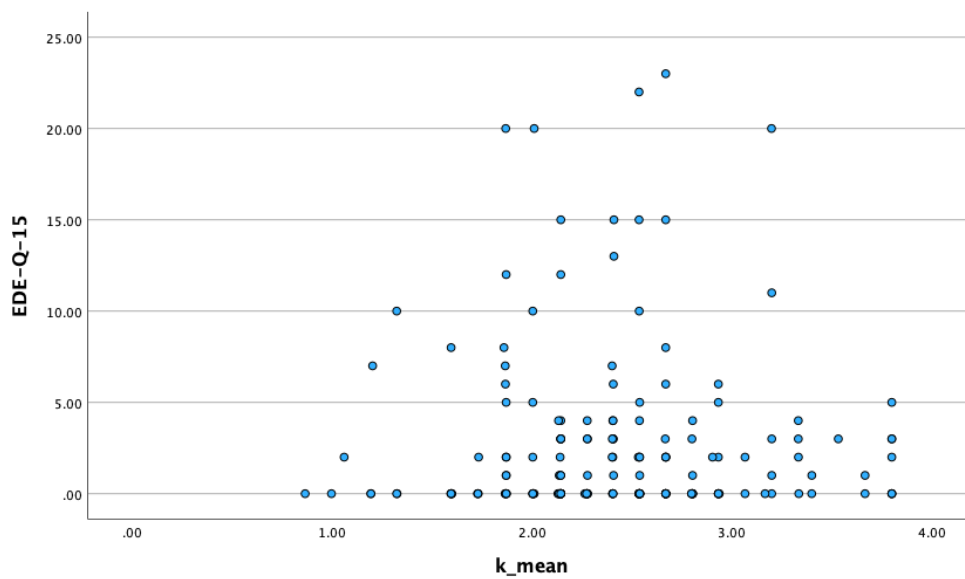


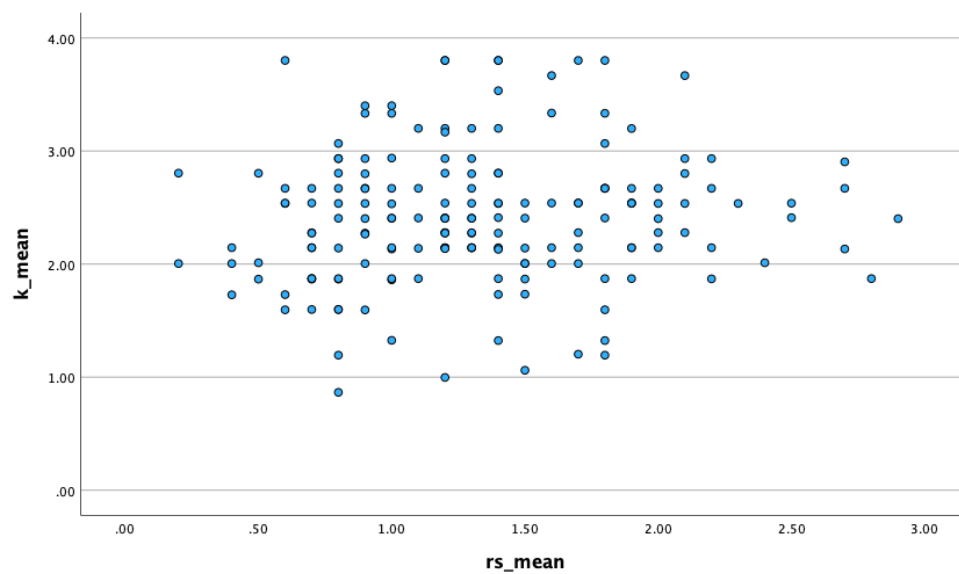
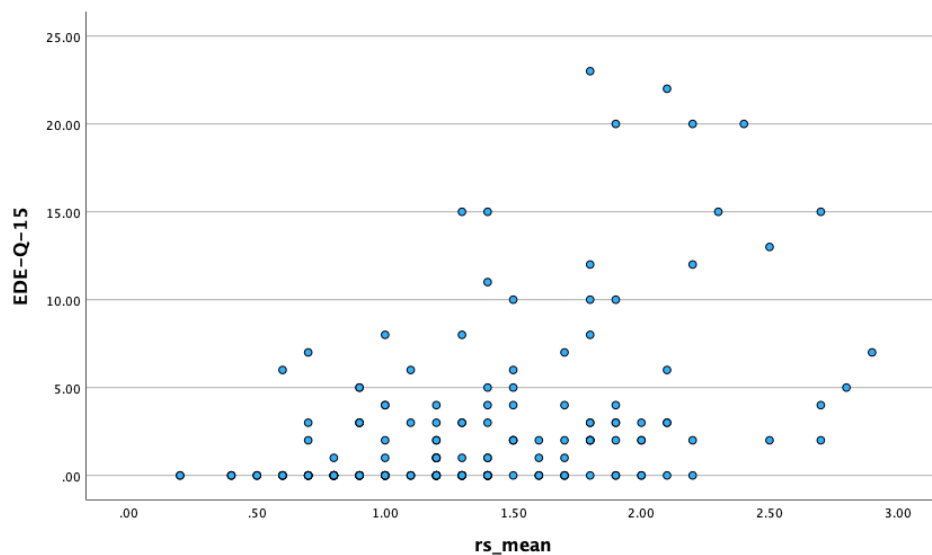
Figure 4*Scatterplot for DD and RE***Figure 5***Scatterplot for BE and RE*

Figure 6

Scatterplot of the Standardized Residuals for DD and RE on BE

