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***The Relationships Between Childhood
Maltreatment and Binge Eating: Examining the
Mediating Role of Functional Gastrointestinal
Symptoms***

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Abstract

Objective: Current study aimed to examine the mediating role of functional gastrointestinal symptoms in the relationship between childhood maltreatment and binge eating.

Method: Using an online survey, self-reports of childhood maltreatment, binge eating, and gastrointestinal symptoms were collected in 331 participants.

Results: The simple regression analysis revealed childhood maltreatment to be significantly associated with binge eating. However, a separate multiple regression model suggested only emotional and sexual abuse to have a significant relationship with binge eating. The mediation analysis found functional gastrointestinal symptoms to be a significant mediator for the association between childhood maltreatment and binge eating.

Conclusion: The experience of childhood maltreatment increases the probability of binge eating. Additionally, the occurrence of functional gastrointestinal symptoms significantly mediated the relationship between childhood maltreatment and binge eating.

Keywords: child maltreatment, child abuse, child neglect, binge eating, disordered eating, gastrointestinal symptoms, gastrointestinal disorder

Introduction

Binge Eating is a pattern of disordered eating that involves the “loss of control” over one’s eating, and consumption of an objectively large amount of food within a short period of time (DSM-5; American Psychiatric Association, 2013). Additionally, binge eating episodes are often accompanied and/or followed by the feelings of shame, guilt, disgust, and/or depression, differentiating it from overeating (Burton & Abbott, 2019). Binge eating is a defining feature of two DSM-5 eating disorders: Binge Eating Disorder and Bulimia Nervosa (American Psychiatric Association, 2013). Bulimia Nervosa, unlike Binge Eating Disorder, involves engagement in compensatory behaviors such as purging, fasting and/or excessive exercise (Agüera et al., 2020). However, while it is not a defining symptom, individuals diagnosed with Anorexia Nervosa also often engage in binge eating (Wick et al., 2020). Similarly, approximately 7 - 13% of the general population also engage in frequent binge eating episodes, with the numbers of individuals increasing over the years (Mitchison et al., 2017; Burton & Abbott, 2019).

As binge eating episodes involve overconsumption of food, the caloric surplus often leads to rapid weight gain. Consequently, binge eating has continuously been associated with higher body mass index (BMI) and obesity, with approximately 30% of individuals diagnosed with binge eating disorder having higher weight than recommended, and 32% having obesity (Kessler et al., 2021). However, obesity is not the only health concern associated with binge eating. According to Javaras et al. (2008), binge eating is associated with insulin resistance, type 2 diabetes, metabolic syndrome, chronic headaches, and spinal pains. Moreover, 75% of individuals engaging in repeated binge eating meet the criteria for a mental disorder outside the realm of eating disorders (Hudson et al., 2007). Most common mental disorders found among individuals who binge eat are mood disorders, anxiety disorders, post-traumatic stress disorder, and substance dependence or abuse (Mitchison et al., 2017; Hudson et al., 2007). Considering the serious, and highly prevalent comorbid physical as well as psychological conditions associated with binge eating, it is crucial to understand mechanisms and factors involved in the development and maintenance of this form of disordered eating.

Childhood Maltreatment

Childhood maltreatment involves all actions that put a child into a position of possible or actual harm in regard to their physical and mental health, as well as overall development and safety (World Health Organization, 2020; WHO). More specifically, childhood maltreatment includes emotional, physical, and sexual abuse, as well as emotional and physical neglect (Bernstein et al., 2003). According to the WHO (2020), it is estimated that nearly 3 out of 4 children, between the ages of two and four, experience physical and/or psychological abuse from their parent or caregiver. Moreover, approximately 1 in 5 women, and, 1 in 13 men have experienced some form of sexual abuse between the ages of 0 to 17 (World Health Organization, 2020).

The experience of childhood maltreatment has been linked to a large number of harmful effects on the functioning of the human body such as changes in the hypothalamic-pituitary-adrenal (HPA) axis, structural and functional brain changes, as well as adverse effects on the immune, metabolic, neuroendocrine, and autonomic systems (Chandan et al., 2020; Lippard & Nemeroff, 2020). Additionally, individuals with a history of childhood maltreatment, compared to those without, exhibit higher impulsivity, delays and deficits in understanding and regulating emotions, and deficits in utilization of strategies to manage negative emotion (Dvir et al., 2012). It is presumed that such negative alterations put individuals at a higher risk for a number of psychiatric and physiological disorders including posttraumatic stress disorder (PTSD), mood and anxiety disorders, personality disorders, as well as eating disorders (Amianto et al., 2018). Among individuals diagnosed with eating disorders, elevated rates of experienced childhood maltreatment have been well documented, with highest rates found amongst those presenting with binge eating psychopathology (Molendijk et al., 2017). For example, Latzer et al. (2020) found significantly higher rates of childhood trauma and maltreatment among individuals diagnosed with binge eating psychopathologies (Bulimia Nervosa, Binge Eating Disorder, and night eating syndrome with binge eating) compared to healthy controls. Moreover, Hazzard et al. (2019) found that individuals who have experienced sexual abuse in childhood were twice as likely to report binge eating concerns compared to individuals who have not experienced any form of childhood abuse. Additionally, Afifi et al. (2017) found an association between all forms of childhood maltreatment and binge eating among women, however when controlling for all subtypes of childhood maltreatment only sexual and emotional abuse remained significantly associated with binge eating.

Furthermore, history of childhood maltreatment has also been associated with earlier onset of eating disorders, including binge eating (Molendijk et al., 2017). Taken together, these findings suggest that the experience of childhood maltreatment is a potential risk factor for the future occurrence of binge eating.

Functional Gastrointestinal Symptoms

As mentioned above, while an abundance of evidence continuously illustrates the damaging consequences of childhood maltreatment, pathways between childhood maltreatment and binge eating remain unclear and insufficiently investigated. Thus, it is of imperative importance to identify factors influencing this relationship. Chandan and colleagues (2020) have found individuals exposed to childhood maltreatment to be at double the risk of developing certain functional somatic disorders including functional gastrointestinal disorders such as IBS. Thus, a plausible explanation for the association between childhood maltreatment and binge eating may be the presence of functional gastrointestinal symptoms. Functional gastrointestinal symptoms relate to persistent and recurring gastrointestinal symptoms such as acid regurgitation, abdominal pain, bloating, constipation and/or diarrhea, which cannot be explained by any serologic, mucosal, radiographic, or structural abnormalities (Hashemi et al., 2020; Peat et al., 2013). Some of the most common functional gastrointestinal disorders include irritable bowel syndrome (IBS), non-ulcer dyspepsia, functional dyspepsia, and chronic abdominal pain (Leserman & Drossman, 2007). Generally, gastrointestinal problems are managed by life-long dietary modifications such as dietary restraint and elimination of ingredients causing the occurrence of gastrointestinal symptoms (Satherley et al., 2015). Occasionally, due to the greater attention given to dietary intake, disordered eating may develop (Melchior. et al., 2020). Thus, gastrointestinal symptoms are a frequent occurrence among individuals with dysfunctional eating habits such as binge eating, often contributing to the development and maintenance of the eating disorders (Hetterich et al., 2019). For example, among the general population Cremonini et al. (2009) found a significant association between binge eating and both upper, and lower gastrointestinal symptoms, independently of BMI. Furthermore, Quick, McWilliams, and Byrd-Bredbenner (2012) also found individuals following controlled diets, due to health conditions such as functional gastrointestinal disorders, to be twice as likely to be diagnosed with an eating disorder compared to controls.

Similarly, functional gastrointestinal disorders were found to be a common occurrence among individuals who have reported a history of maltreatment in childhood (Tilburg et al., 2010). For example, Koloski et al. (2005) found over half of individuals experiencing symptoms of IBS, and two-thirds of individuals diagnosed with functional dyspepsia, to have reported experiencing abuse as children. Additionally, Tilburg et al. (2010) also found all subtypes of self-reported experience of childhood maltreatment were associated with abdominal pain, nausea, and/or vomiting. Godwin and Stein (2004) suggest that maltreatment, which leads to increased health risk behaviors, impacts the development of poorer health including the health of the gastrointestinal tract. However, while the association between the experience of childhood maltreatment and functional gastrointestinal symptoms has been well documented, the exact mechanisms behind the association have not been revealed.

Thus, based on all the evidence, the presence of functional gastrointestinal problems among individuals engaging in binge eating as well as those who have previously experienced childhood abuse and/or neglect, could potentially explain the relationship between childhood maltreatment and binge eating.

Aims of the Study

The aim of this study is to investigate the relationship between the experience of childhood maltreatment and binge eating. More specifically, the study intends to determine whether the experience of childhood maltreatment significantly predicts the onset of binge eating. Additionally, the study also investigates whether functional gastrointestinal symptoms, a very common occurrence among the population engaging in binge eating, presents as a significant mediator between the potential association of childhood maltreatment and binge eating (Figure 1).

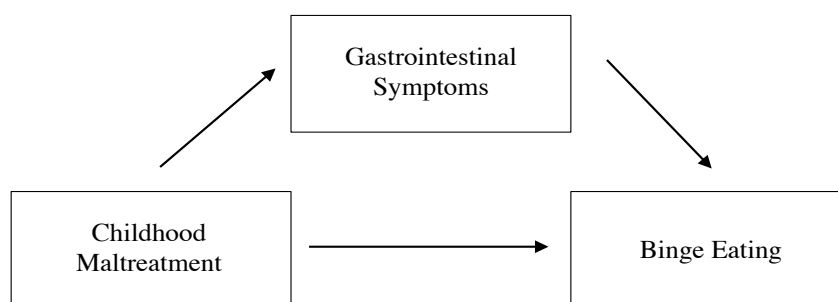
The importance of this study is driven by the fact that the relationship between childhood trauma and most eating psychopathologies including binge eating is not well understood. Additionally, previous research in this area has often led to inconclusive and contrasting results. Furthermore, at this time, Cognitive Behavioral Therapy (CBT) has been the main therapeutic choice for binge eating, although approximately 50% individuals experience relapse and remain symptomatic following CBT (Södersten et al., 2017).

Identifying potential causes and factors influencing the development and maintenance of binge eating gives future research a possibility to widen the knowledge about risk factors, and possibly provide a platform, and the direction for the development of more effective therapeutic choices, which are crucial at this point of time.

Thus, current study aims to test following hypothesis: H_1 : The experience of childhood maltreatment significantly predicts binge eating in adulthood, and H_2 : The relationship between childhood maltreatment and binge eating is mediated by functional gastrointestinal symptoms.

Figure 1

The hypothesized mediational model for the relationship between childhood maltreatment, gastrointestinal symptoms, and binge eating



Methods

Participants

The inclusion criteria for the study were: 1) age 18 or above; and 2) sufficient understanding of English. The aim of the study was to include both the clinical and the non-clinical sample to achieve diverse and non-biased results, representative of the population.

Participants were recruited using various social media platforms such as Facebook and Reddit. To achieve the inclusion of the clinical sample, advertisement was posted on support groups for people diagnosed with eating disorders such as Binge Eating Disorder and Bulimia Nervosa, as well as people with a history of maltreatment.

Prior to posting on such groups, moderators and admins were contacted to ask for the permission to post recruitment advertisement.

Based on the inclusion criteria, the study featured 331 participants between the ages of 18 – 74 ($M = 27.74$, $SD = 9.12$). The sample consisted of 240 female participants, 72 male participants and 19 participants who identified with other gender identities. Majority of participants lived in the USA (54.4%) and have obtained a high-school degree (36.6) or a bachelor's degree (35.6%). Half of participants (50.8%) have indicated experiencing gastrointestinal problems, of which 82.7% do not suffer from a structural gastrointestinal disorder that would cause the experienced gastrointestinal problems.

Materials

Demographics

All the participants were asked to indicate their age, gender, country of residence and highest level of achieved education.

Additionally, participants were asked whether they experience any gastrointestinal problems (e.g., “Do you experience any gastrointestinal problems? (e.g., vomiting, acid reflux, abdominal pain?”). If participants stated they experienced gastrointestinal problems, they were asked whether the gastrointestinal problems could be explained by a diagnosed structural gastrointestinal disorder (e.g., “Do you have a structural gastrointestinal disorder explaining the experienced gastrointestinal problems?”). Structural gastrointestinal disorders involve a physical abnormality in the gastrointestinal tract such as Celiac Disease, Crohn's Disease, Ulcerative Colitis.

Binge Eating

Binge Eating Scale (BES; Gormally et al., 1982) is a 16-item questionnaire that assess the presence of behavioral and cognitive/affective symptoms associated with binge eating. Each item contains 3 to 4 statements as response options, with each statement reflecting a different level of the severity of the symptom. Participants were asked to indicate which statement best described them. Higher scores indicated a more severe pathology of binge eating. BES exhibited excellent internal consistency ($\alpha = .94$).

Childhood Maltreatment

To assess the experience and severity of childhood abuse and neglect, the Childhood Trauma Questionnaire (CTQ) was used (Bernstein & Fink, 1998). This self-report instrument contains 28 items, examining the experience and severity of childhood emotional, physical, and sexual abuse, as well as emotional and physical neglect. Each item is rated on a 5-point scale from (1) being *never true* to (5) being *very often true*. Internal consistency of the total CTQ was excellent ($\alpha = .89$), as well as very good to excellent for all the five subscales: emotional abuse ($\alpha = .89$), physical abuse ($\alpha = .83$), sexual abuse ($\alpha = .95$), emotional neglect ($\alpha = .87$), and physical neglect ($\alpha = .80$).

Gastrointestinal Symptoms

The presence of gastrointestinal symptoms was assessed using the Gastrointestinal Symptom Rating Scale (GSRS; Svedlund et al., 1995). The scale contains 15 items representing 5 symptom groups: Reflux, Abdominal pain, Indigestion, Diarrhea and Constipation. Each item is rated on a 7-point Likert scale from (1) *no discomfort at all* to (7) *very severe discomfort*. The overall internal consistency of GSRS was excellent ($\alpha = .86$).

Procedure

Participants were sampled between March 2022 and April 2022 (approximately 4 weeks) through an online survey, using the software Qualtrics© (2022, Qualtrics, Provo, UT). To access the survey, participants were provided with a link, by using various social media platforms. Standard informed consent was provided before to the beginning of the survey, explaining the aims and the background of the study, potential risks such as emotional distress due to the sensitivity of the study, and voluntary participation, and the right to terminate the survey at any point (see Appendix A). The responses in the survey were not “forced” due to the voluntary nature of the survey. Anonymity was guaranteed at all times, as none of the questions included any information that could lead to the identification of respondents. Participants were not offered monetary compensation for their participation in the survey.

Additionally, respondents had to indicate a sufficient level of English, and be 18 years or above. In case one of these criteria was not met, respondents were not able to continue with the questionnaire. Once all the criteria were met, participants were able to begin with the study.

The completion of the entire survey took approximately 15 to 20 minutes. Once the survey had been fully completed, respondents were thanked for their participation, provided with the aims of the study, and contact information from the researcher and the supervisor of the study.

Statistical Analysis

The entire analysis was performed using RStudio (2020). Firstly, Pearson correlation coefficients were calculated for all the variables used in the regression and mediation analysis. Gender differences in the variables of childhood maltreatment, binge eating, and gastrointestinal symptoms were preliminarily investigated through analyses of variance (ANOVA).

The first hypothesis was tested using a simple linear regression model that included the total score on the CTQ as the predictor and total score of BES as the outcome variable. Additionally, a multiple regression model was created to test the association between all the five subtypes of childhood maltreatment (emotional, physical, and sexual abuse, and emotional and physical neglect) and binge eating. Based on previous studies (Burns and colleagues, 2012; Emery et al., 2021; Waller et al., 2007) each subtype of childhood maltreatment had a different effect on disordered eating, making it crucial to explore the effects individually. However, most individuals who have reported history of childhood maltreatment, experienced multiple subtypes of childhood maltreatment in their lifetime, requiring the analysis to include a regression model containing all the subtypes of childhood maltreatment (Kim et al., 2016). Once the models were created, the following assumptions of linear regression were tested for possible violations: normality of residuals and outliers (Cook's distance, Leverage values), linearity, homoscedasticity, and multicollinearity. The second hypothesis examining the mediation role of gastrointestinal symptoms in the association between childhood maltreatment and binge eating was tested using the Hayes' PROCESS macro for RStudio (Hayes, 2022). The bootstrapping approach allowed for the estimation of the direct and indirect effects in our single mediator model. Thus, Process Macro also provided estimates for (1) the effect of childhood maltreatment on gastrointestinal symptoms; and (2) the effect of gastrointestinal symptoms on binge eating. 5000 bootstrap samples, most commonly used and recommended, were set when testing the mediation model (Hayes, 2022)

Ethics

All recruited participants provided a written informed consent to this study. All the procedures were conducted according to the Ethics of Research Involving Humans (<https://etikprovningsmyndigheten.se/>). Additionally, as mentioned above, the data collection was completely anonymous and none of the collected information in this study could lead to the identification of a specific individual. Thus, based on the criteria of the Ethics of Research Involving Humans, the study was not deemed to require additional approval from the local Ethics Committee.

Results

Preliminary Analysis

Pearson correlation (Table 1) was conducted to assess the association between the total scores of variables used in the regression analysis, and mediation analysis. As presented in Table 1, childhood maltreatment was positively and significantly correlated with binge eating ($r = .348, p = p < .001$). Additionally, all the subtypes of childhood maltreatment were also positively and significantly correlated with binge eating. Gastrointestinal symptoms, the potential mediator, was positively and significantly correlated with both the independent variable childhood maltreatment and the dependent variable binge eating.

Table 1.
Pearson correlation coefficients across the study variables

	Childhood Maltreatment	Emotional Abuse	Physical Abuse	Sexual Abuse	Emotional Neglect	Physical Neglect	Binge Eating	GI Symptoms
Childhood Maltreatment	-	.869***	.731***	.643***	.835***	.793***	0.348***	.334***
Emotional Abuse	.869***	-	.545***	.369***	.790***	.668***	.347***	.318***
Physical Abuse	.731***	.545***	-	.416***	.575***	.491***	.182*	.254***
Sexual Abuse	.643***	.369***	.416***	-	.305***	.371***	.220**	.240***
Emotional Neglect	.835***	.790***	.575***	.305***	-	.613***	.314***	.270***
Physical Neglect	.793***	.668***	.491***	.371***	.613***	-	.252***	.272***
Binge Eating	.348***	.347***	.182*	.220**	.314***	.252***	-	.539***
GI Symptoms	.334***	.318***	.254***	.240***	.270***	.272***	.539***	-

*Note: $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$*

To assess mean differences between the genders the total scores on CTQ, BES and GSRS, analyses of variance (ANOVA) was conducted. Results revealed there was no significant difference between genders on any of the three variables: child maltreatment ($F(1, 298) = .006, p = 0.94$), binge eating ($F(1, 298) = .38, p = .537$), and gastrointestinal symptoms ($F(1, 298) = .005, p = .946$). Complete results, including means and standard deviation of the ANOVA are reported in Table 2.

Table 2.

Means, Standard Deviations and F-values of research variables for men, women, others, and individuals who did not wish to disclose their gender

	Male		Female		Other		Do not wish to disclose		F (1, 298)
	M	SD	M	SD	M	SD	M	SD	
Childhood Maltreatment	54	14.4	57.4	16.3	42.7	3.79	52.5	11.3	.006
Binge Eating	36	10.6	36.8	11.4	22.7	3.21	34.1	9.83	.383
GI Symptoms	33.3	13	35.2	13.5	20	7	32.8	10.5	.005

Regression Analysis

To explore whether the experience of childhood maltreatment is a significant predictor of binge eating, a simple linear regression was conducted. The total score on the CTQ was used as an independent variable, while the total score on the BES was used as a dependent variable. Using a series of tests, assumptions of linear regression were tested. The residuals of the model were normally distributed. Additionally, the assumption of homoscedasticity was met. However, the model presented a non-linear relationship between the outcome variable and the predictor. To correct for this violation, a higher order term of the predictor variable was included. Following, the final regression model revealed childhood maltreatment to be a significant predictor of binge eating ($F(2, 299) = 28.44, p < .001$). To follow up the significant effect of overall childhood maltreatment on binge eating, an exploratory analysis was performed. More specifically, a multiple regression model was built to simultaneously test all the five subtypes of childhood maltreatment as predictors binge eating.

The results of the model indicated that individual forms of maltreatment varied in their effect on binge eating. Based on the results of the model, emotional abuse ($\beta = 0.48$, $t = 2.44$, $p < .05$), and sexual abuse ($\beta = 0.30$, $t = 2.05$, $p < .05$) were the only subtypes to have a significant association with binge eating. Detailed results can be found in Table 3.

Table 3.

Regression Analyses of the Association Between the Five Subtypes of Childhood Maltreatment and Binge Eating

Variable	β	SE	t
Emotional Abuse	.48	.20	2.44*
Physical Abuse	.47	.37	1.27
Sexual Abuse	.30	.14	2.05*
Emotional Neglect	.21	.21	1.00
Physical Neglect	.08	.22	.36

Note: $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$; $F(8, 294) = 7.54^{***}$, $\text{Adj. } R^2 = .15$

Mediation Analysis

As mentioned above, the PROCESS macro for RStudio (Hayes, 2022) was used to explore whether the gastrointestinal symptoms were a significant mediator for the relationship between childhood maltreatment and binge eating. According to the results of the mediation model, the indirect effect was not significant because the lower limit of the bootstrap 95% confidence interval (CI) contained a zero (see Table 4). Thus, gastrointestinal symptoms were revealed not to be a significant mediator for the relationship between childhood maltreatment and binge eating. Furthermore, the effect of childhood maltreatment on gastrointestinal symptoms (*path a*) was significant ($B = 0.29$, $p < .001$). Moreover, results of the *path b* also revealed a positive and significant association between gastrointestinal symptoms on binge eating ($B = 0.4$, $p < .001$). Finally, the direct effect (*c'-path*) also pointed to a significant effect childhood maltreatment has on binge eating ($B = 0.13$, $p = .0003$). Finally, similarly, to the *path a* and *b*, based on both the lower and higher confidence intervals of the indirect effect, the results would indicate significant mediation effect.

This indicates that gastrointestinal symptoms were a significant mediator for the association found between childhood maltreatment and binge eating. Detailed results of the mediation analysis can be found in Table 4.

Table 4.

Results of the Mediation Model: Mediating effect of Functional Gastrointestinal Symptoms between Childhood Maltreatment and Binge eating

Predictors	B	SE	t	95% Confidence Intervals	
				LL	UL
Childhood					
Maltreatment → GI Symptoms (<i>path a</i>)	.29	.05	6.25***	.20	.38
GI Symptoms →					
Binge Eating (<i>path b</i>)	.40	.04	9.38***	.32	.49
Direct Effect (<i>path c'</i>)	.13	.037	3.66***	.06	.21
Indirect Effect					
Mediator	Effect	SE		LL	UL
GI Symptoms	.12	.02		.08	.16

Note: $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Discussion

The aim of this study was to examine the relationship between self-reported history of childhood maltreatment and binge eating. Additionally, the study also aimed to explore whether the presence of functional gastrointestinal symptoms could potentially explain the association between the two. The main findings of the study were: (1) childhood maltreatment was positively and significantly associated with binge eating; (2) emotional and sexual abuse were the only subtypes of childhood maltreatment significantly associated with binge eating; and (3) gastrointestinal symptoms did act as a significant mediator for the relationship between childhood maltreatment and binge eating.

Firstly, in line with the first hypothesis of the study as well as previous studies in this field (Emery et al., 2021; Molendijk et al., 2017), the current study did find a positive and significant relationship between childhood maltreatment and binge eating- This would suggest that individuals who reported experiencing maltreatment in childhood were at a heightened risk of binge eating. Emery et al. (2021) found childhood maltreatment to have a significant effect on eating attitudes and behaviors in adulthood, possibly contributing to the development of binge eating tendencies. As previously mentioned, according to the WHO (2020) childhood maltreatment is a highly prevalent occurrence with a wide spectrum of severity. In line with these findings, current study also found majority of participants to have experienced some degree of abuse and or neglect in their childhood, potentially contributing to the significant association found between childhood maltreatment and binge eating. However, it is important to mention that majority of participants in the collected sample reported experiencing mildest forms of maltreatment. When examining the association between all the subtypes of childhood maltreatment (emotional, physical, and sexual abuse, and emotional and physical neglect) and binge eating, only emotional and sexual abuse continued to have a significant effect on binge eating. Previous studies have reported similar results regarding emotional abuse and binge eating. For example, Amianto et al. (2018) found emotional trauma to be a strong predictor of binge eating in adulthood, reporting 40% of a higher risk. Similarly, Burns and colleagues (2012) have found emotional childhood abuse, unlike physical and sexual abuse, to be the only type of abuse consistently associated with the current eating disorder symptomology including a greater frequency of binge eating episodes.

According to Guillaume et al. (2016), the association between childhood maltreatment and disordered eating might arise from emotional dysregulation caused by the abuse and/or neglect, in turn prompting the onset of disordered eating. However, past research has argued that emotional trauma, unlike physical and sexual, may be the strongest predictor of emotional dysregulation (Emery et al., 2020; Waller et al., 2007). It is important to mention that emotional abuse was the most prevalent type of maltreatment in our sample, with 68.27% of participants experiencing some form of emotional abuse in their childhood. Additionally, from those who have reported experiencing some form of emotional abuse, 48.23% have experienced severe to extreme emotional abuse. On the other hand, the occurrence of other forms of maltreatment were not equally present in our sample and were mostly prevalent in low to moderate severity. As mentioned above, the current study found childhood sexual abuse to also be significantly associated with binge eating, which may be in contrast with some of the previous studies in the field (Burns et al., 2012; Kennedy et al., 2007). However, as stated by Dworkin and colleagues (2014), individuals who have experienced childhood sexual abuse, impulsive and compulsive behaviors or tendencies have an important role in explaining the relationship between childhood sexual abuse and disordered eating, whereby binge eating, and other forms of disordered eating may develop to serve as impulsive/compulsive coping mechanisms.

Secondly, the mediation analysis did support the hypothesized mediation model which stated that the experience of functional gastrointestinal symptoms mediated the relationship between the experience of childhood maltreatment and binge eating. More specifically, in line with previous research, the model has revealed a significant association between the experience of childhood maltreatment and functional gastrointestinal symptoms (Hashemi et al., 2020; Koloski et al., 2005; Leserman & Drossman, 2007; Tilburg et al., 2010). Previous research has shown the negative impact the experience of childhood maltreatment has on physical and mental health, as well as overall quality of life (Herzog & Schmahl, 2018). The association between childhood maltreatment and functional gastrointestinal symptoms may arise through several mechanisms such as increased experience of emotional distress, physical injuries, and increased visceral sensitivity (Hashemi et al., 2020; Tilburg et al., 2010). Furthermore, the mediation model also revealed a positive and significant association between functional gastrointestinal symptoms and binge eating. These results would indicate that individuals who experience gastrointestinal symptoms are at a higher risk of binge eating.

The findings of the study are consistent with those found by Cremonini and colleagues (2009), who have found both upper and lower gastrointestinal symptoms to be associated with binge eating, independent of BMI as well as level of physical activity. Firstly, according to a study conducted by Peat et al. (2013), the association may arise from stress. More specifically, heightened levels of experienced psychosocial stress have been well documented among those with functional gastrointestinal disorders (Labanski et al., 2020). The experience of stressful events has also been recognized as a strong risk factor for the development of functional gastrointestinal disorders, as well as symptom exacerbation, symptom severity, more frequent seeking of health care, and poorer treatment outcome in regard to functional gastrointestinal symptoms and disorders (Van Oudenhove et al., 2016). Similarly, multiple studies have found an association between the experience as well as perception of heightened stress to be associated with the desire and occurrence of binge eating (Groesz, et al., 2012; Rosenbaum & White, 2015; Thurston et al., 2018). It has been suggested that individuals may turn to binge eating in hopes of alleviating the experienced stress (Peat et al., 2013; Thurston et al., 2018). While the current study did not examine the role of stress, and its impact on the association between functional gastrointestinal symptoms and binge eating, it would be a beneficial direction to go in the future research. Secondly, individuals experiencing functional gastrointestinal symptoms often turn to strict dietary restrictions to relieve, and avoid the gastrointestinal symptoms (Satherley et al., 2015). However, dietary restriction has been shown to put individuals at a higher risk for the development of eating disorder symptomology including binge eating (Peat et al., 2013; Schaumberg et al., 2016). Thus, traditional form of therapy for those experiencing functional gastrointestinal symptoms may not be suitable for individuals diagnosed with a history of disordered eating. Finally, as mentioned above, the indirect effect of the mediation model was significant, indicating that functional gastrointestinal symptoms did mediate the association found between childhood maltreatment and binge eating. The significant effect of functional gastrointestinal symptoms may be explained by the high occurrence of gastrointestinal symptoms present in the collected sample (50.9%). However, most individuals in the current study experienced low to moderate gastrointestinal symptoms. Thus, individuals who experience severe gastrointestinal symptoms were not properly represented in the current study. This could potentially affect the strength and significance of the effect of functional gastrointestinal symptoms.

It is important consider the current study and its findings in the context of certain limitations. Firstly, childhood maltreatment, binge eating, and gastrointestinal symptoms were all assessed using retrospective self-report, which could result in recall as well as reporting bias. Secondly, the study included a limited sample diversity which may lead results to not be generalizable to individuals with the history of severe experiences of childhood maltreatment as well as binge eating. Thirdly, current study was a cross-sectional study, preventing the causal relationship to be investigated. Thus, future studies would possibly benefit from using a longitudinal design as it would allow for more information to be gathered.

In conclusion, the results of the present study exhibit the experience of childhood maltreatment to be associated with the occurrence of binge eating. It is one of many studies to highlight the complex relationship found between the two. As previously stated, at this time Cognitive Behavioral Therapy (CBT) has been the main therapeutic choice for binge eating, although approximately 50% individuals experience relapse and remain symptomatic following CBT (Södersten et al., 2017). Additional efforts aimed to further explore the association found between childhood maltreatment and binge eating could potentially have clinical relevance, possibly providing a platform, and the direction for the development of more effective therapeutic choices, which are crucial at this point of time. Moreover, while functional gastrointestinal symptoms were not revealed to be a significant factor impacting the association, it is essential to consider its presence when studying disordered eating. Traditional therapeutic options for those suffering with functional gastrointestinal disorders potentially may not be adequate for individuals with the history of disordered eating and vice versa.

Lastly, this study, as many other previous studies, aimed to highlight the detrimental consequences childhood maltreatment poses on an individual. Therefore, detailed screening for presence of any signs of abuse or neglect must continue to be a priority. However, it is important to consider that health care is unfortunately not equally available to everyone, especially to vulnerable groups such as children experiencing maltreatment. Thus, it is of great importance to continuously provide help and education through other institutions such as schools, public campaigns, safe houses, and hotlines.

Appendix A

The Informed Consents

Please read this information carefully!

In the present survey, you will be asked questions regarding binge eating, the experience of childhood maltreatment (abuse and neglect) and gastrointestinal problems. This consent form asks you to allow the researchers to use the data generated from the present survey to enhance understanding of the topic.

Your participation in this study is voluntary. It is not obligatory to take part in it and you have the right to quit it at any time without further explanation.

Due to the sensitive nature of the topic explored in this study, possible risks include potential discomfort with personal questions asked.

This study is not designed to benefit you directly, but to expand the knowledge around the subject of binge eating and potential risk factors.

All your responses and data generated are fully anonymous. At first, all of your answers will be stored in an anonymized manner on Qualtrics, protected by a password and not accessible to anyone apart from the researcher. Later on, the anonymized data will be downloaded from Qualtrics, coded and stored on researchers' computer which is secured by passwords and only accessible to them.

Results of our statistical analyses will serve educational purposes. All data will be used exclusively in the context of this research.

If you are interested in the results of our analysis, you are welcome to contact us.

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References

- Afifi, T. O., Sareen, J., Fortier, J., Taillieu, T., Turner, S., Cheung, K., & Henriksen, C. A. (2017). Child maltreatment and eating disorders among men and women in adulthood: Results from a nationally representative United States sample. *The International Journal of Eating Disorders*, *50*, 1281–1296. <https://doi.org/10.1002/eat.22783>.
- Agüera, Z., Lozano-Madrid, M., Mallorquí-Bagué, N., Jiménez-Murcia, S., Menchón, J. and Fernández-Aranda, F., 2020. A review of binge eating disorder and obesity. *Neuropsychiatrie*, *35*, 57-67. <https://doi.org/10.1007/s40211-020-00346-w>
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®). Washington, DC: American Psychiatric Pub; 2013.
- Amianto, F., Spalatro, A. V., Rainis, M., Andriulli, C., Lavagnino, L., Abbate-Daga, G., & Fassino, S. (2018). Childhood emotional abuse and neglect in obese patients with and without binge eating disorder: Personality and psychopathology correlates in adulthood. *Psychiatry Research*, *269*, 692–699. <https://doi.org/10.1016/j.psychres.2018.08.089>
- Bernstein, D. P., & Fink, L. (1998). *Childhood Trauma Questionnaire: A retrospective self-report manual*. San Antonio, TX: The Psychological Corporation, Harcourt Brace & Company.
- Bernstein, D., Stein, J., Newcomb, M., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J., Handelsman, L., Medrano, M., Desmond, D., & Zule, W. (2003). Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse & Neglect*, *27*, 169–190. [https://doi.org/10.1016/S0145-2134\(02\)00541-0](https://doi.org/10.1016/S0145-2134(02)00541-0)
- Burns, E. E., Fischer, S., Jackson, J. L., & Harding, H. G. (2012). Deficits in emotion regulation mediate the relationship between childhood abuse and later eating disorder symptoms. *Child Abuse & Neglect*, *36*, 32–39. <https://doi.org/10.1016/j.chiabu.2011.08.005>
- Burton, A. L., & Abbott, M. J. (2019). Processes and pathways to binge eating: Development of an integrated cognitive and behavioural model of binge eating. *Journal of Eating Disorders*, *7*. <https://doi.org/10.1186/s40337-019-0248-0>

- Chandan, J. S., Keerthy, D., Zemedikun, D. T., Okoth, K., Gokhale, K. M., Raza, K., Bandyopadhyay, S., Taylor, J., & Nirantharakumar, K. (2020). The association between exposure to childhood maltreatment and the subsequent development of functional somatic and visceral pain syndromes. *EClinicalMedicine*, *23*, 100392. <https://doi.org/10.1016/j.eclinm.2020.100392>
- Cremonini, F., Camilleri, M., Clark, M. M., Beebe, T. J., Locke, G. R., Zinsmeister, A. R., Herrick, L. M., & Talley, N. J. (2009). Associations among binge eating behavior patterns and gastrointestinal symptoms: A population-based study. *International journal of obesity*, *33*, 342–353.
- Dimenas E, Glise H, Hallerback B, Hernqvist H, Svedlund J, Wiklund I. (1995). Well-being and gastrointestinal symptoms among patients referred to endoscopy owing to suspected duodenal ulcer. *Scand J Gastroenterol*, *30*, 1046–1052.
- Dvir, Y., Ford, J. D., Hill, M., & Frazier, J. A. (2014). Childhood maltreatment, emotional dysregulation, and psychiatric comorbidities. *Harvard Review of Psychiatry*, *22*, 149–161. <https://doi.org/10.1097/hrp.0000000000000014>
- Dworkin, E., Javdani, S., Verona, E., & Campbell, R. (2014). Child sexual abuse and disordered eating: The mediating role of impulsive and compulsive tendencies. *Psychology of Violence*, *4*, 21–36. <https://doi.org/10.1037/a0031779>
- Emery, R. L., Yoon, C., Mason, S. M., & Neumark-Sztainer, D. (2021). Childhood maltreatment and disordered eating attitudes and behaviors in adult men and women: findings from project EAT. *Appetite*, *163*, 105224. <https://doi.org/10.1016/j.appet.2021.105224>
- Gormally, J., Black, S., Daston, S., & Rardin, D. (1982). The assessment of binge eating severity among obese persons. *Addictive Behaviors*, *7*, 47–55. [https://doi.org/10.1016/0306-4603\(82\)90024-7](https://doi.org/10.1016/0306-4603(82)90024-7)
- Groesz, L. M., McCoy, S., Carl, J., Saslow, L., Stewart, J., Adler, N., Laraia, B., & Epel, E. (2012). What is eating you? stress and the drive to eat. *Appetite*, *58*, 717–721. <https://doi.org/10.1016/j.appet.2011.11.028>
- Guillaume, S., Jausent, I., Maimoun, L., Ryst, A., Seneque, M., Villain, L., Hamroun, D., Lefebvre, P., Renard, E., & Courtet, P. (2016). Associations between adverse childhood experiences and clinical characteristics of eating disorders. *Scientific Reports*, *6*, 35761. <https://doi.org/10.1038/srep35761>

- Hashemi, S. M., Yousefichaijan, P., Salehi, B., Almasi-Hashiani, A., Rafiei, M., Zahedi, S., Khedmati Morasae, E., & Maghsoudlou, F. (2020). Comparison of child abuse history in patients with and without functional abdominal pain: A case-control study. *BMC Psychiatry*, 20. <https://doi.org/10.1186/s12888-020-02675-0>
- Hazzard, V. M., Bauer, K. W., Mukherjee, B., Miller, A. L., & Sonnevile, K. R. (2019). Associations between childhood maltreatment latent classes and eating disorder symptoms in a nationally representative sample of young adults in the United States. *Child Abuse & Neglect*, 98, 104171. <https://doi.org/10.1016/j.chiabu.2019.104171>
- Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.
- Herzog, J. I., & Schmahl, C. (2018). Adverse childhood experiences and the consequences on neurobiological, psychosocial, and somatic conditions across the lifespan. *Frontiers in Psychiatry*, 9. <https://doi.org/10.3389/fpsy.2018.00420>
- Hetterich, L., Mack, I., Giel, K. E., Zipfel, S., & Stengel, A. (2019). An update on gastrointestinal disturbances in eating disorders. *Molecular and Cellular Endocrinology*, 497, 110318. <https://doi.org/10.1016/j.mce.2018.10.016>
- Hudson, J. I., Hiripi, E., Pope, H.G, Jr, Kessler, R. C. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*, 72, 348-358. <https://doi.org/10.1016/j.biopsych.2012.05.016>
- Javaras, K. N., Pope, H. G., Lalonde, J. K., Roberts, J. L., Nillni, Y. I., Laird, N. M., Bulik, C. M., Crow, S. J., McElroy, S. L., & Walsh, B. T. (2008). Co-occurrence of binge eating disorder with psychiatric and medical disorders. *The Journal of Clinical Psychiatry*, 69, 266–273. <https://doi.org/10.4088/jcp.v69n0213>
- Jowik, K., Dutkiewicz, A., Słopień, A., & Tyszkiewicz- Nwafor, M. (2020). A multi-perspective analysis of dissemination, etiology, clinical view and therapeutic approach for binge eating disorder. *Psychiatria Polska*, 54, 223–238.
- Labanski, A., Langhorst, J., Engler, H., & Elsenbruch, S. (2020). Stress and the brain-gut axis in functional and chronic-inflammatory gastrointestinal diseases: A transdisciplinary challenge. *Psychoneuroendocrinology*, 111, 104501. <https://doi.org/10.1016/j.psyneuen.2019.104501>
- Leserman, J., & Drossman, D. A. (2007). Relationship of abuse history to functional gastrointestinal disorders and symptoms. *Trauma, Violence, & Abuse*, 8, 331–343. <https://doi.org/10.1177/1524838007303240>

- Lippard, E. T. C., & Nemeroff, C. B. (2020). The devastating clinical consequences of child abuse and neglect: Increased disease vulnerability and poor treatment response in mood disorders. *American Journal of Psychiatry*, *177*, 20–36. <https://doi.org/10.1176/appi.ajp.2019.19010020>
- Kennedy, M. A., Ip, K., Samra, J., & Gorzalka, B. B. (2007). The role of childhood emotional abuse in disordered eating. *Journal of Emotional Abuse*, *7*, 17–36. https://doi.org/10.1300/j135v07n01_02
- 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., Maria Haro, J., 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*, 904–914. <https://doi.org/10.1016/j.biopsych.2012.11.020>
- Kim, K., Mennen, F. E., & Trickett, P. K. (2016). Patterns and correlates of co-occurrence among multiple types of child maltreatment. *Child & Family Social Work*, *22*, 492–502. <https://doi.org/10.1111/cfs.12268>
- Koloski, N. A., Talley, N. J., & Boyce, P. M. (2005). A history of abuse in community subjects with irritable bowel syndrome and functional dyspepsia: The role of other psychosocial variables. *Digestion*, *72*, 86–96. <https://doi.org/10.1159/000087722>
- Latzer, Y., Rozenstain-Hason, M., Kabakov, O., Givon, M., Mizrachi, S., Alon, S., & Tzischinsky, O. (2020). Childhood maltreatment in patients with binge eating disorder with and without night eating syndrome vs. control. *Psychiatry Research*, *293*, 113451. <https://doi.org/10.1016/j.psychres.2020.113451>
- Leserman, J., & Drossman, D. A. (2007). Relationship of abuse history to functional gastrointestinal disorders and symptoms. *Trauma, Violence, & Abuse*, *8*, 331–343. <https://doi.org/10.1177/1524838007303240>
- Mitchison, D., Touyz, S., González-Chica, D. A., Stocks, N., & Hay, P. (2017). How abnormal is binge eating? 18-year time trends in population prevalence and burden. *Acta Psychiatrica Scandinavica*, *136*, 147–155. <https://doi.org/10.1111/acps.12735>
- Melchior, C., Desprez, C., Riachi, G., Leroi, A.-M., Déchelotte, P., Achamrah, N., Ducrotté, P., Tavolacci, M.-P., & Gourcerol, G. (2020). Anxiety and depression profile is associated with eating disorders in patients with irritable bowel syndrome. *Frontiers in Psychiatry*, *10*. <https://doi.org/10.3389/fpsy.2019.00928>

- Molendijk, M. L., Hoek, H. W., Brewerton, T. D., & Elzinga, B. M. (2017). Childhood maltreatment and eating disorder pathology: A systematic review and dose-response meta-analysis. *Psychological Medicine*, *47*, 1402–1416.
- Peat, C. M., Huang, L., Thornton, L. M., Von Holle, A. F., Trace, S. E., Lichtenstein, P., Pedersen, N. L., Overby, D. W., & Bulik, C. M. (2013). Binge eating, body mass index, and gastrointestinal symptoms. *Journal of Psychosomatic Research*, *75*, 456–461. <https://doi.org/10.1016/j.jpsychores.2013.08.009>
- Rosenbaum, D. L., & White, K. S. (2015). The relation of anxiety, depression, and stress to binge eating behavior. *Journal of Health Psychology*, *20*, 887–898. <https://doi.org/10.1177/1359105315580212>
- Satherley, R., Howard, R., & Higgs, S. (2015). Disordered eating practices in gastrointestinal disorders. *Appetite*, *84*, 240–250. <https://doi.org/10.1016/j.appet.2014.10.006>
- Schaumberg, K., Anderson, D. A., Anderson, L. M., Reilly, E. E., & Gorrell, S. (2016). Dietary restraint: What's the harm? A review of the relationship between dietary restraint, weight trajectory and the development of eating pathology. *Clinical Obesity*, *6*, 89–100. <https://doi.org/10.1111/cob.12134>
- Södersten, P., Bergh, C., Leon, M., Brodin, U., & Zandian, M. (2017). Cognitive behavior therapy for eating disorders versus normalization of eating behavior. *Physiology & Behavior*, *174*, 178–190. <https://doi.org/10.1016/j.physbeh.2017.03.016>
- Thurston, I. B., Hardin, R., Kamody, R. C., Herbozo, S., & Kaufman, C. (2018). The moderating role of resilience on the relationship between perceived stress and binge eating symptoms among young adult women. *Eating Behaviors*, *29*, 114–119. <https://doi.org/10.1016/j.eatbeh.2018.03.009>
- Van Oudenhove, L., Levy, R. L., Crowell, M. D., Drossman, D. A., Halpert, A. D., Keefer, L., Lackner, J. M., Murphy, T. B., & Naliboff, B. D. (2016). Biopsychosocial aspects of functional gastrointestinal disorders: How central and environmental processes contribute to the development and expression of functional gastrointestinal disorders. *Gastroenterology*, *150*. <https://doi.org/10.1053/j.gastro.2016.02.027>
- van Tilburg, M. A., Runyan, D. K., Zolotor, A. J., Graham, J. C., Dubowitz, H., Litrownik, A. J., Flaherty, E., Chitkara, D. K., & Whitehead, W. E. (2010). Unexplained gastrointestinal symptoms after abuse in a prospective study of children at risk for abuse and neglect. *The Annals of Family Medicine*, *8*, 134–140. <https://doi.org/10.1370/afm.1053>

- Vachon, D. D., Krueger, R. F., Rogosch, F. A., & Cicchetti, D. (2015). Assessment of the harmful psychiatric and behavioral effects of different forms of child maltreatment. *JAMA Psychiatry*, 72, 1135. <https://doi.org/10.1001/jamapsychiatry.2015.1792>
- Waller, G., Corstorphine, E., & Mountford, V. (2007). The role of emotional abuse in the eating disorders: Implications for treatment. *Eating Disorders*, 15, 317–331. <https://doi.org/10.1080/10640260701454337>
- Wick, M. R., Fitzgerald, E. H., & Keel, P. K. (2020). Epidemiology of Binge Eating. *Binge Eating*, 3–12. https://doi.org/10.1007/978-3-030-43562-2_1
- World Health Organisation. (2020). Childhood maltreatment. <https://www.who.int/news-room/fact-sheets/detail/child-maltreatment>.