

The Influence of Childhood Emotional Abuse On Adult Obesity

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Abstract

Background: Early life stress induces long-lasting changes in adulthood, such as psychiatric and metabolism abnormality. The prevalence of childhood emotional abuse in clinical obese subjects remains unclear.

Method: A set of questionnaires, including the Childhood Trauma Questionnaire (CTQ), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), and Eating Disorder Inventory (EDI) was sent out. Clinical data from 37 obese subjects (Age: 29.65 ± 5.35 , Body Mass Index (BMI): 37.59 ± 6.34) and 37 healthy subjects with normal body weight (Age: 31.35 ± 10.84 , BMI: 22.16 ± 3.69) came into the investigation. Multiple mediation analysis was performed with BMI as the outcome variable, childhood trauma as the predictive variable. Depression, anxiety, and bulimia as the mediating variables.

Result: Obese group reported higher childhood emotional abuse ($t=2.157$, $p=0.034$), worse mood state (anxiety: $t=5.466$, $p<0.001$; depression: $t=2.220$, $p=0.030$), and increased bulimia ($t=3.400$, $p=0.001$), when compared to healthy group. Childhood emotional abuse was positively associated with BMI ($\beta = 1.312$, 95% CI = 0.482–2.141). Anxiety and bulimia showed multiple mediating roles in the relationship of childhood emotional abuse and obesity (indirect effect = 0.739, 95% CI = 0.261–1.608), accounting for 56.33% of the total effect.

Conclusion: Childhood emotional abuse may contribute to adulthood obesity, potentially mediated by anxiety and bulimia.

Introduction

Early life adverse events, such as childhood trauma, results in a long-term effect on personal development and adulthood, such as alterations in psychiatric performance and metabolism states (Mullen, Martin, Anderson, Romans, & Herbison, 1996; Wekerle et al., 2001). For instance, individuals with childhood emotional, physical, and sexual abuse experiences are more likely to become obese in adulthood (Gustafson & Sarwer, 2004; Jia, Li, Leserman, Hu, & Drossman, 2004; Williamson, Thompson, Anda, Dietz, & Felitti, 2002). In general, a stressful and traumatic childhood environment act as one risk factor for adulthood overweight (Bell, Walley, & Froguel, 2005; Marti, Moreno-Aliaga, Hebebrand, & Martínez, 2004).

Childhood trauma triggers lasting changes in emotional states. Accumulating evidence suggests the association between childhood trauma and the onset of depression and anxiety symptoms (Friis, Wittchen, Pfister, & Lieb, 2002; Gibb, Chelminski, & Zimmerman, 2007; Huh, Kim, Lee, & Chae, 2017). Childhood sexual abuse accompanied by higher anxiety traits, emotional abuse and emotional neglect highly predicts depression in adulthood (Brown, Cohen, Johnson, & Smailes, 1999; Mancini, Van Ameringen, & MacMillan, 1995). At the same time, such a distressing psychological state also likely to increase indulgent food intake (Polivy, Herman, & McFarlane, 1994). Anxiety or dysphoric mood is associated with binge eating and emotional eating in overweight and has been considered a critical target to reduce excess body weight. (Cooper & Bowskill, 1986; Ostrovsky, Swencionis, Wylie-Rosett, & Isasi, 2013; Wilkinson, Rowe, Robinson, & Hardman, 2018). Depression is also related to appetite increment (Paykel, 1977). The prevalence of lifetime diagnosed anxiety and depression in obesity is significantly higher than in ordinary people (Zhao et al., 2009).

Based on the connection between childhood trauma, anxiety, and depression. Together with the high comorbidity of anxiety, depression, and obesity. Here, we aim to figure out (1) whether anxiety and depression could serve as intermediate factors between childhood maltreatment and obesity, and (2) whether anxiety and depression play equal main mediate effect in this relationship.

Method

Participants

From September 2020 to January 2021, we retrospectively analyzed clinical data from 37 obese subjects and 37 demographic well-matched healthy people. All participants (1) aged above 18 years old; (2) could read and understand the description of each item of the questionnaire; (3) be voluntary participation in the survey and had signed the informed consent. The ethics committee had approved the study at Shanghai Sixth People's Hospital. All procedures followed the Declaration of Helsinki.

Clinical Measurement

Basic demographic information (age, education years, height, weight) and a series of clinical scales (Childhood Trauma Questionnaire, CTQ; Beck Anxiety Inventory, BAI; Beck Depression Inventory, BDI and Eating Disorders Inventory, EDI) were collected. Body Mass Index (BMI, equals weight (kilogram) divided by height (metre) squared) was calculated to describe the severity of obesity.

Childhood Trauma Questionnaire (CTQ) is designed for adolescents and adults to obtain a brief, reliable and valid assessment of traumatic experiences in childhood (Bernstein et al., 1994; Bernstein et al., 2003). It assesses the incidents of abuse and neglect in childhood, including physical abuse, emotional abuse, sexual abuse, emotional neglect, and physical neglect (Bernstein, Ahluvalia, Pogge, & Handelsman, 1997). CTQ has 28 items, and each item adopts a 5-point Likert score from 1 "never" to 5 "very often" according to the frequency of the experiences that occurred (Bernstein et al., 1994). A higher CTQ score indicates more severe childhood trauma. The total Cronbach's α of the Chinese version CTQ is 0.73 (MD Zhang, 2011).

Beck Anxiety Inventory (BAI) assess the severity of generalized anxiety symptoms (A. T. Beck, Epstein, Brown, & Steer, 1988). It had good reliability, validity, internal consistency, and convergence (Fydrich, Dowdall, & Chambless, 1992; Muntingh et al., 2011). The total Cronbach's α of the Chinese version BAI is 0.95 (Kin-Wing, 2002). BAI has 21 items, with each response based on a 4-point Likert scale ranging from 0 means "not at all" to 3 means "severely". A higher score indicates greater anxiety severity.

Beck Depression Inventory (BDI) version 2 is a widely used clinical instrument to evaluate the depression severity in normal populations (Aaron T. Beck, Steer, & Carbin, 1988; Kühner, Bürger, Keller, & Hautzinger, 2007; Whisman, Perez, & Ramel, 2000). It had good reliability and validity (Kühner et al., 2007). The total Cronbach's α of the Chinese version BDI is 0.94 (Lu, 2011). BDI has 21 items, and each item consists of four self-evaluative statements scored 0 to 3, with an increasing score indicating greater depression severity.

Eating Disorder Inventory version 2 (EDI) measures the eating disorder symptoms and the cognitive and behavioral characteristics of anorexia nervosa, bulimia. EDI contains 91 items, with each response based on a 6-point Likert scale ranging from 0 "Never" to 5 "Always" (Garner, Olmstead, & Polivy, 1983). It consists of 11 subscales. Three measuring the primary eating disorder symptoms: (1) Drive for thinness; (2) Bulimia; (3) Body dissatisfaction. Eight measuring correlated psychological traits: (4) Ineffectiveness; (5) Perfectionism; (6) Interpersonal distrust; (7) Interceptive awareness; (8) Maturity fear; (9) Asceticism; (10) Impulse regulation; (11) Social insecurity.

Statistical Analysis

To test the common method biases, we performed Harman's single-factor test to exam this issue (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Unrotated factors analysis revealed that the eigenvalues of 27 factors were >1 . The first factor

explained only 26.42% of the variance, which was much lower than the threshold of 40%. The result indicated the absence of severe common method biases in the investigation.

Statistical analysis was carried out with SPSS 21. The comparison between obesity and healthy control was performed through the independent t-test (sex distribution comparison was verified through χ^2 -test). Then, the factors, which had a significant between-group difference, were selected to perform Pearson correlation analysis. The significance level alpha is 0.05 (two-tailed).

Multiple mediation analysis was conducted by the PROCESS macro in SPSS, developed by Hayes (Andrew F. Hayes, 2013). The multiple mediate models could estimate a specific indirect effect is to describe how the independent variable leads the dependent variable through the intermediate factors (Andrew F Hayes, 2017). A bootstrap method was adopted to construct a 95% confidence interval for significance testing of mediating effects.

Results

The demographic information and clinical variables of the obese subjects and the healthy control group are exhibited in Table 1. There was no significant difference in gender distribution, age, and education years between the two groups.

Obese subjects were more depressive ($t=2.220$, $p=0.030$, $df=72$, Cohen's $d=0.517$) and anxious ($t=5.466$, $p<0.001$, $df=68.487$, Cohen's $d=1.270$), experienced more childhood emotional abuse ($t=2.157$, $p=0.034$, $df=72$, Cohen's $d=0.502$) and had higher intensity of drive for thinness ($t=4.914$, $p<0.001$, $df=72$, Cohen's $d=1.141$), bulimia ($t=3.400$, $p=0.001$, $df=61.806$, Cohen's $d=0.792$), body dissatisfaction ($t=5.953$, $p<0.001$, $df=72$, Cohen's $d=1.385$) and impulse ($t=2.278$, $p=0.026$, $df=72$, Cohen's $d=0.531$) than healthy control. Significant correlations existed among these variables (except BMI and BDI, emotional abuse and body dissatisfaction, impulse regulation). Specifically, positive correlations were found for the pairwise combination of BMI, anxiety, childhood emotional abuse and bulimia (Figure 1). The correlation coefficients are shown in Table 2. Since these variables would mutually influence each other from clinical respect, we further analyzed the overall relationships among these correlated variables.

Mediation effect testing

To ensure better external and ecological validity of this multiple mediation model, we performed the mediation effect testing with original data. With controlling of demographic information (age and education years), the PROCESS macro was used to verify the multiple mediating roles of anxiety, depression, and bulimia in the relationship between childhood emotional abuse and BMI. Table 3 presents the results of the mediation analysis, and Figure 2 shows the mediation pathway models.

We used the bootstrap method to test the significance of the mediating effects, in which the sampling process was repeated 1000 times to calculate the 95% confidence interval (Table 4). The mediation pathway would be significant if the 95% confidence intervals of the various path coefficients do not contain 0. In both models, the total effect (Emotional abuse→BMI) was significant. For model 1, in which anxiety and bulimia as multiple mediate variables, the total indirect effects accounted for 56.33% of the total effects. Specifically, the effect of the Emotional abuse→Anxiety→Bulimia→BMI pathway was significant (Effect size=0.082, 95% CI=0.018-0.283), accounting for 6.24% of the total effects. The effect of the Emotional abuse→Anxiety→BMI pathway was also significant (Effect size=0.473, 95% CI=0.0126-1.608), accounting for 36.03% of the total effects. But the effect of the Emotional abuse→Bulimia→BMI was not significant.

For model 2, in which depression and bulimia as multiple mediate variables, the total indirect effects accounted for 26.45% of the total effects. Specifically, the effect of Emotional abuse→Depression→Bulimia→BMI pathway was significant (Effect size=0.140, 95%CI=0.003-0.423), accounting for 10.67% of the total effects. But the Emotional abuse→Depression→BMI pathway and Emotional abuse→Bulimia→BMI pathway were not significant.

When compare the multiple mediation result of these two models (Table 4), we found that (1) the indirect effects of model 1 (Effect size = 0.739, Percentage of total effects = 56.33%) was much higher than that of model 2 (Effect size = 0.347, Percentage of total effects = 26.45%). (2) For both models, the Emotional abuse→Anxiety/Depression→Bulimia→BMI pathways effects were significant (model 1: Effect size = 0.082, 95% CI= 0.018-0.283; model 2: Effect size = 0.140, 95% CI= 0.003-0.423), but the Emotional abuse→Bulimia→BMI pathway effects were not (model 1: Effect size = 0.185, 95% CI= -0.026-0.700; model 2: Effect size = 0.222, 95% CI= -0.037-0.784). (3) The Emotional abuse→Anxiety→BMI pathway of model 1 was significantly existed (Effect size = 0.473, 95% CI= 0.126-1.287), while the Emotional abuse→Depression→BMI pathway of model 2 was not (Effect size = -0.014, 95% CI= -0.376-0.396). These results indicated that anxiety plays an important role in multiple mediations model.

Discussion

The present study illustrates the association between childhood emotional abuse and adult obesity, which is the first time to describe the intermediate effect of anxiety and depression in such a relationship. The anxiety-bulimia pathway demonstrates that childhood emotional abuse would probably lead to obesity by aggravating anxiety and bulimic behavior.

The results showed that the obese subjects experienced more emotional abuse in childhood. Childhood emotional abuse is highly prevalent and easy to occur because passionate, verbal insults are instantaneous, less effort spent. In contrast, the consequence of emotional hurt is insidious and difficult to detect. Therefore, early life emotional abuse is central to understanding child maltreatment's latent effects (Viola et al., 2016). Furthermore, childhood emotional abuse would result in a series of difficulties identifying emotions and emotional awareness (Goldsmith & Freyd, 2005), which would increase the susceptibility of developing anxiety and depression. Further, the anxious and depressive state would contribute to the incidence of abnormal eating behavior (Levinson et al., 2017). In this way, the obese subjects were more anxious and depressive than healthy people.

Previous studies reported that anxiety is strongly associated with binge eating and emotional eating (Ostrovsky et al., 2013). The obese subjects would eat more when they feel anxious, and the aroused effect would significantly reduce after a gluttonous eating (Slochow & Kaplan, 1980). Therefore, anxiety is a critical factor in childhood emotional abuse–obesity, since the high likelihood of an anxious emotional state triggers bulimic behavior. By contrast, the connection between depression and bulimia is ambiguous. A depressive state does not always increase eating. In a sample of depressed patients, only in 14% appetite was increased, while in 66%, appetite decreased, and in 20%, it showed no change (Paykel, 1977). Bradley M.Appelhans et al. reported that more severe depression is associated with more inferior diet quality (Appelhans et al., 2012). For these reasons, we believe that anxiety plays a vital role in leading these obese subjects to perform more bulimic behavior, which could release their anxious impulse but causing excessive fat accumulation.

To further prove the connection sequence of anxiety and bulimia, we built and examined another model in which bulimia is the first multiple mediating variable and anxiety is the second multiple mediating variable. The model fitting result is less satisfactory than the original model (anxiety was the first multiple mediate variable; see supplementary: the regression coefficient of Emotional abuse→Bulimia→Anxiety/Depression→BMI was not significant). According to previous studies, anxiety disorders commonly had onset in childhood and frequently exists before eating disorders (Godart, Flament, Lecrubier, & Jeammet, 2000; Kaye, Bulik, Thornton, Barbarich, & Masters, 2004). Model fitting and

clinical evidence indicated that childhood emotional abuse might primarily lead to anxious traits. The recurring anxious emotional state triggers more bulimic behavior and further leads to obesity.

Obesity is difficult to prevent and treat since its etiology is complex and not completely understood (Wadden, Brownell, & Foster, 2002). Few studies have revealed the relationship between childhood emotional abuse and adult obesity or compare the mediating effect between anxiety and depression. Our study described one indirect pathway of childhood emotional abuse contributing to obesity and demonstrated that anxiety plays an important mediate role in this relationship. This result provides a new perspective to treat the obese subjects with early life adverse events. Except for bariatric surgery, psychological intervention also helpful in reducing the influence of predisposing pathogenic factors. In future treatment, it would be beneficial to offer obese subjects with psychological therapy to reduce their anxiety and reduce bulimic behavior.

Some limitations should be noticed. First of all, the sample size of the present study is relatively small. Future studies need to collect a larger sample to make a firmer conclusion. Second, the present study is a cross-sectional investigation. Longitudinal designs and interventional experiments should be adopted in future studies to reveal the causality. Finally, the data collection based on the self-reported questionnaire, which inevitably concludes reported biases even though we had strictly controlled the response quality. More objective indicators of behavior tasks and evidence from neuroimaging are necessary.

In conclusion, obese subjects experienced more childhood emotional abuse, be more anxious, depressive, and bulimic than healthy people. Childhood emotional abuse may contribute to adulthood obesity, potentially mediated by anxiety and bulimia. In obesity treatment, psychological intervene would be helpful to reduce anxious emotion and then decrease bulimic behavior.

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Tables

Table1: Independent t-test of demographic information and clinical measurements between obesity and healthy control group. BMI: Body Mass Index; BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	Obesity n=37		Healthy control n=37		<i>df</i>	<i>t/χ²</i>	<i>p</i>	<i>Effect size</i>
	Female	Male	Female	Male		χ²	<i>p</i>	<i>φ</i>
Gender distribution	27	10	28	9	1	0.071	0.790	0.001
Demographic information	Mean	SD	Mean	SD		<i>t</i>	<i>p</i>	<i>Cohen's d</i>
Age	29.650	5.345	31.350	10.840	52.527	-0.857	0.395	-0.199
Education years	14.140	2.605	15.220	4.217	72	-1.327	0.190	-0.308
BMI	37.592	6.336	22.156	3.687	57.867	12.808***	0.000	2.978
Mood state								
Anxiety (BAI)	9.810	8.356	1.950	2.603	68.487	5.466***	0.000	1.270
Depression (BDI)	11.300	9.279	6.970	7.369	72	2.220*	0.030	0.517
Childhood Trauma Questionnaire (CTQ)								
Emotional abuse	7.110	2.558	6.000	1.795	72	2.157*	0.034	0.502
Physical abuse	5.700	1.648	5.160	0.688	48.175	1.842	0.072	0.428
Sexual abuse	5.220	0.750	5.220	0.712	72	0.000	1.000	0
Emotional neglect	18.650	1.783	18.840	1.708	72	-0.466	0.643	-0.144
Physical neglect	7.950	2.877	8.220	2.849	72	-0.406	0.686	-0.094
Eating disorder Inventory (EDI)								
Drive for thinness	1.154	0.587	0.537	0.490	72	4.914***	0.000	1.141
Bulimia	0.514	0.533	0.158	0.346	61.806	3.400***	0.001	0.792
Body dissatisfaction	1.955	0.411	1.330	0.488	72	5.953***	0.000	1.385
Ineffectiveness	0.838	0.519	0.722	0.353	72	0.368	0.714	0.261
Perfectionism	0.748	0.595	0.928	0.563	72	-1.337	0.185	-0.311
Interpersonal distrust	1.236	0.657	1.290	0.645	72	-0.367	0.722	-0.083
Interoceptive awareness	0.468	0.324	0.397	0.309	72	0.955	0.343	0.224
Maturity fear	1.497	0.459	1.368	0.453	72	1.212	0.230	0.282
Asceticism	0.470	0.286	0.446	0.348	72	0.319	0.750	0.075
Impulse regulation	0.381	0.384	0.189	0.338	72	2.278*	0.026	0.531
Social insecurity	1.298	0.567	1.318	0.655	65.487	-0.129	0.897	-0.033

Table2: Correlation coefficients of variables with significant differences between groups. BMI: Body Mass Index; BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	BMI	BDI	BAI	Emotional abuse	Drive for thinness	Bulimia	Body dissatisfaction	Impulse regulation
BMI	-							
BDI	0.218	-						
BAI	0.527***	0.593**	-					
Emotional abuse	0.331**	0.415**	0.309**	-				
Drive for thinness	0.428**	0.330**	0.324**	0.258*	-			
Bulimia	0.393**	0.282*	0.295*	0.244*	0.492**	-		
Body dissatisfaction	0.266*	0.342**	0.354**	0.104	0.384**	0.414**	-	
Impulse regulation	0.251*	0.445**	0.553**	0.103	0.359**	0.475**	0.277*	-

Table3: Bootstrap analysis of multiple mediation effects. BMI: Body Mass Index. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Regression model		Goodness-of-fit indices			Regression coefficient and significance	
Outcome variable	Predictor variable	<i>R</i>	<i>R</i> ²	<i>F</i>	β	<i>t</i>
Total effects						
BMI		0.391	0.153	4.721		
	Emotional abuse				1.312	3.154***
Model1: Anxiety as one of the multiple mediate variables						
Anxiety		0.391	0.153	4.069		
	Emotional abuse				0.971	2.644**
Bulimia		0.360	0.129	2.02		
	Anxiety				0.017	2.029*
	Emotional abuse				0.037	1.350
BMI		0.617	0.380	6.604		
	Anxiety				0.487	2.511*
	Bulimia				4.979	2.247*
	Emotional abuse				0.573	1.432
Model2: Depression as one of the multiple mediate variables						
Depression		0.436	0.190	6.534		
	Emotional abuse				1.538	3.577***
Bulimia		0.346	0.120	1.688		
	Depression				0.013	1.568
	Emotional abuse				0.033	1.286
BMI		0.514	0.264	5.291		
	Depression				-0.009	-0.081
	Bulimia				6.756	3.130**
	Emotional abuse				0.965	2.017*

Table4: Results of the multiple mediation analysis. BMI: Body Mass Index.

	Effect size	SE	Percentage of total effects	95% CI	
				Lower limit	Upper limit
Total effects					
Emotional abuse→BMI	1.312	0.416	100.00%	0.482	2.141
Model1: Anxiety and bulimia as multiple mediate variables					
Indirect effects	0.739	0.356	56.33%	0.261	1.608
Pathway1: Emotional abuse→Anxiety→BMI	0.473	0.293	36.03%	0.126	1.287
Pathway2: Emotional abuse→Bulimia→BMI	0.185	0.185	14.06%	-0.026	0.700
Pathway3: Emotional abuse→Anxiety→Bulimia→BMI	0.082	0.052	6.24%	0.018	0.283
Model2: Depression and bulimia as multiple mediate variables					
Indirect effects	0.347	0.282	26.45%	-0.106	0.996
Pathway4: Emotional abuse→Depression→BMI	-0.014	0.189	-1.07%	-0.376	0.396
Pathway5: Emotional abuse→Bulimia→BMI	0.222	0.208	16.92%	-0.037	0.784
Pathway6: Emotional abuse→Depression→Bulimia→BMI	0.140	0.102	10.67%	0.003	0.423

Figures

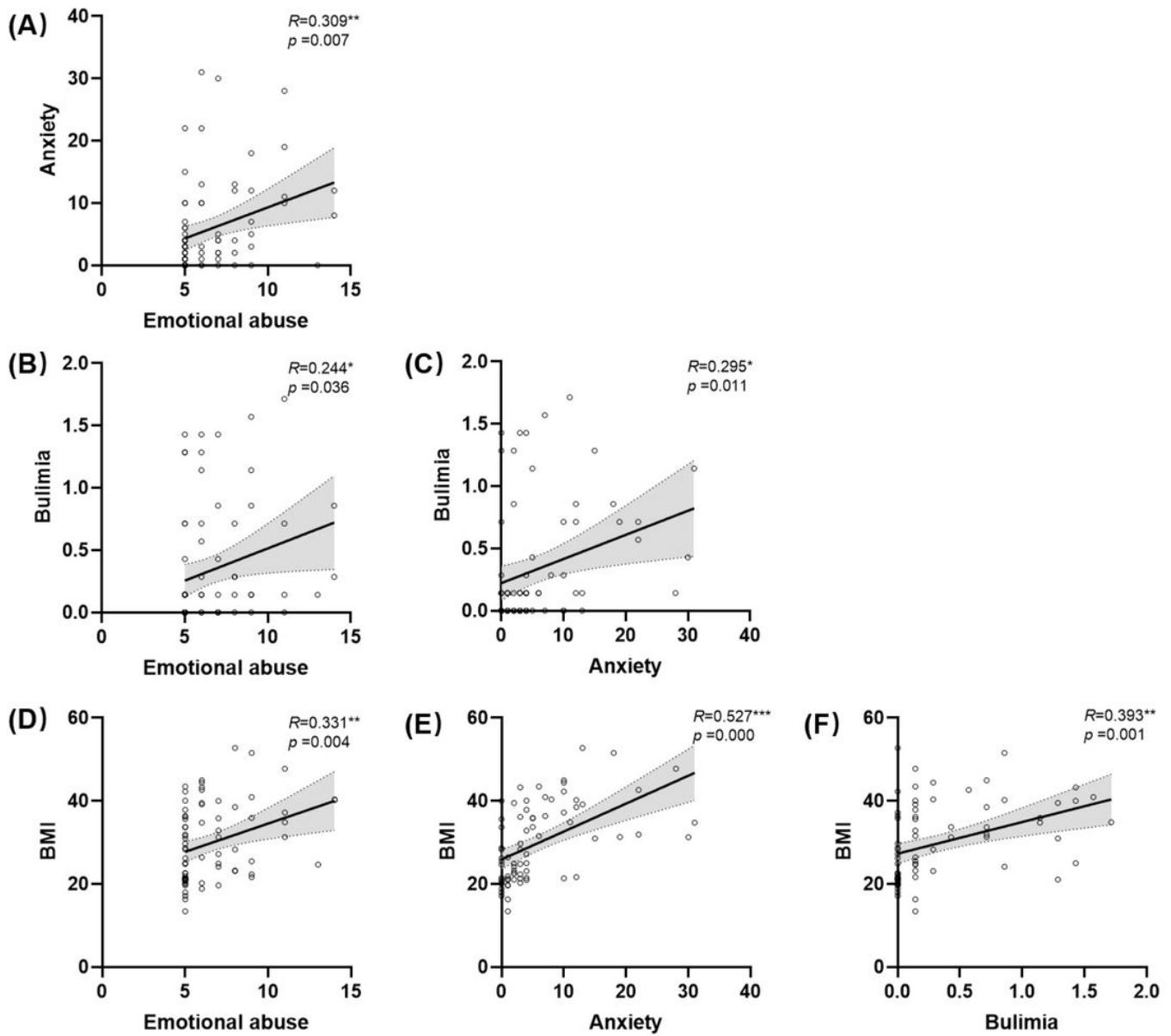


Figure 1

Pair correlation diagram of emotional abuse, anxiety, bulimia, and BMI. BMI: Body Mass Index.

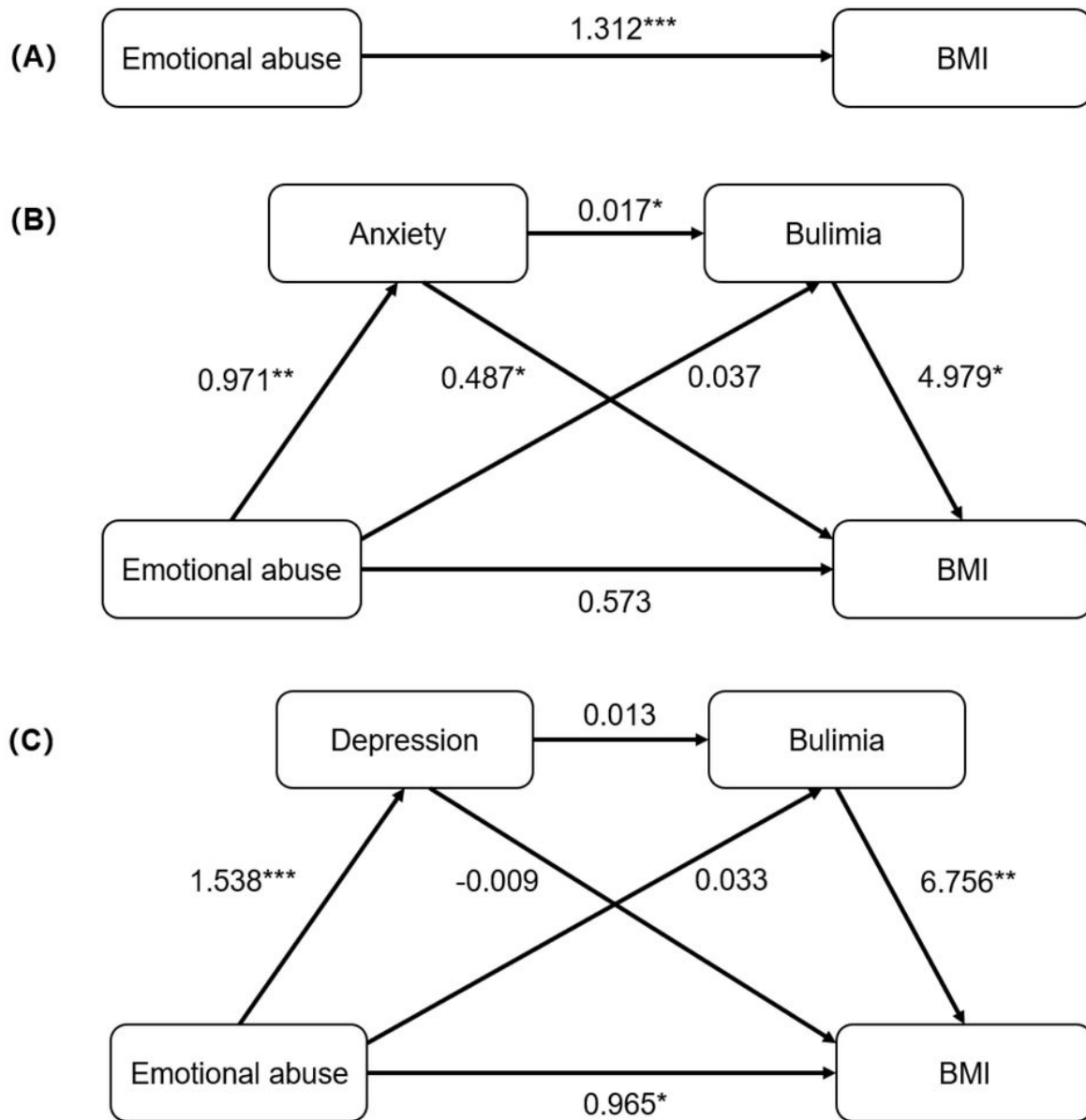


Figure 2

Multiple mediation pathway models. (A) Total effects of emotional abuse on BMI; (B) Model1: Anxiety and bulimia as multiple mediate variables; (C) Model2: Depression and bulimia as multiple mediate variables. BMI: Body Mass Index. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Supplementary Files

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