

## Original

# Meaning in life mediates the relationship between neuroticism traits and depression and binge eating in participants with morbid obesity

José H. Marco<sup>\*1,2</sup>, Cristina Martínez-Brotons<sup>3</sup>, Sandra Pérez<sup>1</sup>

<sup>1</sup>Universidad de Valencia. Facultad de Psicología.

<sup>2</sup>Ciber Fisiopatología Obesidad y Nutrición (CB06/03 Instituto Salud Carlos III), Spain

<sup>3</sup>Psicoforma Integral Psychology Center, 46001 Valencia, Spain

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## A B S T R A C T

Bariatric surgery is one of the most effective treatments for morbid obesity. However numerous studies have reported elevated rates of depression in bariatric surgery patients. Neuroticism has been identified as a significant risk factor for depression, obesity and binge-eating behaviors. MIL has been identified as a mediator of neuroticism, depression, and binge eating in individuals with and without eating disorders. To date, there are no studies that analyze the protective role of MIL in the relationship between neuroticism and depression or binge eating in participants with morbid obesity who are candidates for bariatric surgery. The objective of this study was to investigate the mediating role of meaning in life in the association between neuroticism, depression, and binge eating. The sample was composed of 122 participants with morbid obesity who were candidates for bariatric surgery. The mean Body Mass Index was 44.42(6.06). A multiple mediation model was proposed. Neuroticism was positively associated with binge-eating disorder symptoms and depression. Meaning in life was a mediating and protective factor in the relationship between neuroticism and both depression and binge-eating disorder symptoms. This study suggests that increasing meaning in life in people with morbid obesity could reduce their levels of depression and binge eating.

## El sentido en la vida media la relación entre el neuroticismo y la depresión y los atracones en personas con obesidad mórbida”

## R E S U M E N

La cirugía bariátrica es uno de los tratamientos más efectivos para la obesidad mórbida. Sin embargo, numerosos estudios han mostrado tasas elevadas de depresión en pacientes sometidos a cirugía bariátrica. El neuroticismo se ha identificado como un factor de riesgo significativo para la depresión, la obesidad y las conductas de atracón. El sentido en la vida (MIL, por sus siglas en inglés) se ha identificado como un mediador del neuroticismo, la depresión y los atracones en personas con y sin trastornos de la conducta alimentaria. Hasta la fecha, no existen estudios que analicen el papel protector del sentido en la vida en la relación entre neuroticismo y depresión o atracones en participantes con obesidad mórbida candidatos a cirugía bariátrica. El objetivo de este estudio fue investigar el papel mediador del sentido en la vida en la asociación entre neuroticismo, depresión y atracones. La muestra estuvo compuesta por 122 participantes con obesidad mórbida candidatos a cirugía bariátrica. El índice de masa corporal medio fue de 44.42 (6.06). Se propuso un modelo de mediación múltiple. El neuroticismo se asoció positivamente con los síntomas de trastorno por atracón y con la depresión. El sentido en la vida fue un factor mediador y protector en la relación entre neuroticismo y tanto la depresión como los síntomas de trastorno por atracón. Este estudio sugiere que aumentar el sentido en la vida en personas con obesidad mórbida podría reducir sus niveles de depresión y de atracones.

\* Corresponding author.

Email address: [jose.h.marco@uv.es](mailto:jose.h.marco@uv.es) (J. H. Marco).

## Introduction

Bariatric surgery is one of the most effective treatments for morbid obesity, with research demonstrating significant and sustained weight loss over the long term. However, despite the reduction in overall mortality observed among individuals who undergo this procedure, numerous studies have reported elevated rates of depression and suicide in bariatric surgery patients compared to non-surgical control groups (Martens et al., 2021; Peterhansel et al., 2013). Thus, an antecedent of depression prior to surgery has been associated with a substantially increased risk of suicide following the procedure (Kauppila et al., 2022), and postoperative weight loss is not associated with reductions in depressive symptoms (Wnuk et al., 2018). Together, these findings highlight the need to investigate protective factors that may buffer against depression and suicide risk in individuals with obesity who are candidates for bariatric surgery.

Neuroticism has consistently been associated with an increased vulnerability to depression. Meta-analytic evidence indicates that neuroticism is one of the strongest personality predictors of major depressive disorder (Altaweel et al., 2023; Kotov et al., 2010), and longitudinal studies have demonstrated that high levels of neuroticism are predictive of future depressive episodes (Ormel et al., 2013). Individuals high in neuroticism are more likely to perceive ordinary situations as threatening and respond to stress with greater emotional distress, which can predispose them to the development and persistence of depressive symptoms (Lahey, 2009). Although most of the studies suggest that the association between neuroticism and depression may be direct, other researchers propose that there are factors that might mediate this association (e.g. Roelfs et al., 2008). Therefore, it is important to investigate possible mediating factors between neuroticism and depression.

Neuroticism has consistently been identified as a significant risk factor for both obesity (Gerlach et al., 2015) and binge-eating (Gilmartin et al., 2023). Individuals high in neuroticism are prone to heightened emotional reactivity and a persistent experience of negative affect and mood instability, which may impair their capacity for effective emotion regulation (Lahey, 2009). Given that neuroticism is also associated with increased vulnerability to depressive symptoms (Diop et al., 2023), it may indirectly elevate the risk of binge eating through its influence on mood dysregulation. In this context, binge eating may function as a maladaptive coping strategy aimed at alleviating psychological distress through compulsive food intake (Klein et al., 2011; Mcelroy et al., 2011). Empirical evidence supports this view, indicating that neurotic traits not only predict the onset and severity of binge eating, but they also negatively influence treatment outcomes. For instance, neuroticism has been identified as a negative prognostic factor in individuals with obesity and a comorbid binge-eating disorder who are undergoing cognitive behavioral therapy (CBT), with poorer recovery observed after six months (Van Riel et al., 2023). Moreover, longitudinal studies suggest that neuroticism may perpetuate disordered eating patterns by reinforcing maladaptive emotional and behavioral cycles, thus exacerbating psychological distress and impeding recovery (Fischer et al., 2013; Javaras et al., 2008).

However, despite the relationship between neuroticism and both depression and binge eating, it is important to emphasize that not everyone with morbid obesity and neuroticism suffers from depression or binge eating. Thus, it is necessary to investigate protective factors that could buffer the relationship between neuroticism and depression or binge eating in participants with morbid obesity.

Meaning in life (MIL) has been identified as a mediating variable in the relationship between neuroticism, depression, and binge

eating. In the case of depression, a high level of MIL has been found to be a protective factor against depression (e.g., Volkert et al., 2014) because people who have a high level of MIL feel that their life is organized towards a purpose or important vital goals within a coherent and organized whole, with their contribution to this whole being their unique and inescapable responsibility. This perspective allows them to believe that life is worth living despite their circumstances. In contrast, people with a low level of MIL perceive their lives as fragmented and incoherent. They experience an absence of vital goals, nothing seems valuable in their future, and they perceive that their life and what they do in it lacks importance (Marco et al., 2021).

With regard to binge eating and eating disorder psychopathology, previous studies found that baseline MIL moderates eating-disorder symptom severity, underscoring its protective role (Marco et al., 2020). MIL is negatively associated with core eating-disorder symptoms, such as body dissatisfaction, hopelessness, and maladaptive attitudes toward food (Marco et al., 2017). Additionally, a study using the Meaning-Making Model of Eating Disorders demonstrated that MIL partially mediates the association between emotional dysregulation and binge-eating episodes and depression, both in clinical samples and in individuals with obesity (Marco et al., 2021).

MIL has been identified as a psychological resource that can buffer the detrimental effects of neuroticism. Although neuroticism is strongly associated with an increased risk of depression, individuals with high MIL often report greater psychological well-being and resilience despite having high neurotic tendencies (Kleiman et al., 2013; Steger et al., 2006). MIL provides a sense of coherence and purpose that can mitigate negative emotional reactivity, facilitating better coping strategies and reducing the likelihood of maladaptive responses such as rumination or avoidance (Park, 2010). Thus, MIL could serve as a protective factor in clinical and non-clinical populations that are vulnerable to the emotional dysregulation associated with high neuroticism.

MIL could be a key psychological mediator in the relationship between neuroticism and binge eating through several mechanisms. Individuals high in neuroticism often experience heightened emotional reactivity and maladaptive coping responses. However, the presence of MIL has been shown to enhance emotional regulation and psychological resilience, thus reducing reliance on behaviors such as binge eating to manage distress (Lin et al., 2021; Steger et al., 2006). Furthermore, the process of *making meaning*—particularly in response to stress or adversity—can provide cognitive structure and coherence, diminishing the impact of negative affect associated with neurotic tendencies (Park, 2010). Simultaneously, engagement in the *search for meaning* may promote goal-directed behavior and value-based choices, which serve as protective factors against impulsive or emotionally driven eating patterns (Steger et al., 2006). Taken together, these dimensions of meaning in life contribute to greater perceived self-efficacy and purpose, offering a pathway to attenuate the negative effects of neuroticism on disordered eating.

In summary, MIL is a previously studied variable that has been identified as a mediator of neuroticism, depression, and binge eating in individuals with and without eating disorders. To date, there are no studies that analyze the protective role of MIL in the relationship between neuroticism and depression or binge eating in participants with morbid obesity who are candidates for bariatric surgery. Demonstrating that MIL plays a mediating role between neuroticism and depression or binge eating will allow us to improve intervention programs (e.g. CBT) designed to reduce depression symptoms and binge eating in participants with morbid obesity who are candidates for bariatric surgery.

Therefore, the objectives of this study were: a) to analyze the mediating role of meaning in life in the relationship between neuroticism and depression and b) to analyze the mediating role of meaning in life in the relationship between neuroticism and binge-eating symptoms. We hypothesize that: a) meaning in life could be a mediator in the association between neuroticism and both depressive symptoms and binge-eating behavior.

**Methods**

*Participants*

The sample was composed of 122 participants with morbid obesity. Table 1 shows the demographic and clinical characteristics of the sample.

**Table 1.** Demographic and clinical characteristics of the participants

	Bariatric Surgery Candidates (n= 122)
Age means (SD)	46.75 (9.89)
Body Mass Index	44.42 (6.03)
Gender n (%)	
Female	79 (64.8%)
Male	43 (35.2%)
Marital status n (%)	
Married or couple	73 (59.8%)
Single	23 (18.9%)
Separated /divorced	21 (17.2%)
Widower	5 (4.1%)
Level of education n (%)	
Without studies	3 (2.5%)
Elementary education	53 (43.4%)
Secondary education	50 (41%)
Higher education	16 (13.1%)
Diabetes	
No	75 (61.5%)
Yes	47 (38.6%)
Mental disorder diagnosis	
No mental disorders	110 (90.2%)
Depressive Disorder	9 (7.4%)
Anxiety Disorder	2 (1.6%)
ADHD	1 (0.8%)
Comorbid illness	
No	27 (22.1%)
Yes	95 (75.4%)

*Procedure*

The sample was recruited at the bariatric surgery outpatient unit in Spain. The inclusion criteria were: individuals who had morbid obesity and were on the waiting list for bariatric surgery. Two psychologists specialized in clinical psychology conducted two interviews to confirm that the participants met the inclusion criteria, explain the objectives of the research, and obtain the participants' informed consent. The exclusion criteria were moderate or severe intellectual disability, diagnosis of an eating disorder, schizophrenia, and bipolar disorders. Participants signed an informed consent and received no compensation for their participation. The participants completed the questionnaires and handed them to the researchers in person. The study protocol was approved by the ethical committee of the hospital La Fe" in Valencia, Spain, n° 2015/0402.

*Measures*

Purpose in Life (PIL; Crumbaugh & Maholick, 1969). The PIL is a 20-item Likert type scale that assesses the level of meaning in life. Scores below 90 indicate a low MIL, scores between 90-104 indicate an undefined MIL, and scores above 105 indicate a consolidated MIL. The PIL showed adequate reliability ( $\alpha = .93$ ) in our sample.

NEO-Personal Inventory Manual (NEO-PI-R; Costa & McCrae, 1985). It assesses the Big-Five personality factors: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. In this study, we only used the Neuroticism scale, which showed adequate reliability ( $\alpha = .88$ ). The average score in the Spanish population for women is 78.23 (20.12) and for men 68.79 (20.56) (García-Vera, & Sanz, 2009).

Bulimic Test of Edinburgh (BITE, Henderson & Freeman, 1987). This test is a 33-item self-report that assesses the presence of clinical symptoms of binge-eating disorder. In individuals with obesity, scores equal to or greater than 10 on the symptom subscale of the Bulimic Investigatory Test, Edinburgh (BITE) suggest the possible presence of binge-eating disorder, given that this cutoff point has demonstrated high sensitivity in detecting this condition (Orlandi et al., 2005). In our sample, the reliability was adequate ( $\alpha = 0.79$ )

Brief Symptom Inventory-18 (BSI-18; Derogatis, 2000). This inventory is used to measure psychological distress in the past 7 days. It is scored on a 5-point Likert scale (0 = not at all; 4 = extremely) and consists of three scales: Somatization (6 items), Depression (6 items), and Anxiety (6 items). However, only the Depression scale was used in this study. The internal consistency obtained in the present study was ( $\alpha = 0.96$ ). In studies with adults, the cutoff score for depression was equal to or higher than 3 (Almeida et al., 2010).

*Statistical Analysis*

For the multiple mediation model, the variable neuroticism (NEO-PI-R) was used as the predictor variable, meaning in life (PIL) as the mediator variable, and both the depression subscale (BSI) and binge-eating disorder symptoms (BITE) as predicted variables. All the analyses were carried out controlling for age and gender. We used the "Bootstrap" method (1000 replications) with the JASP statistical program.

**Results**

As Table 2 reveals, the participants showed clinical levels of binge-eating disorder BITE = 10.27 (5.88), Depression (BSI Depression = 4.02 (5.88), and Neuroticism (NEO-PI-R = 83.47 (21.38). As you can see in Table 2, neuroticism was moderately and positively associated with binge-eating disorder symptoms and depression. MIL was highly and negatively associated with Neuroticism and moderately and negatively associated with both depression and binge-eating disorder symptoms. Binge-eating disorder symptoms had a low and positive association with depression.

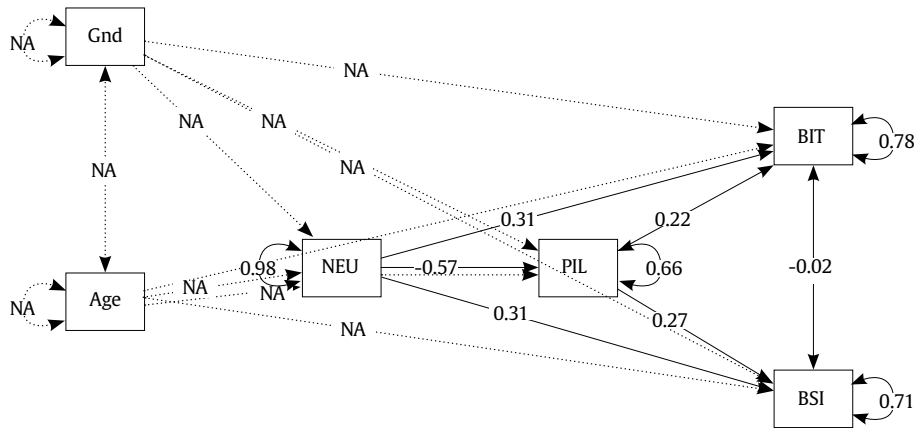
**Table 2.** Mean and zero-order correlations for the variables

	M(SD)	2	3	4
1. Meaning in life (PIL)	107.71 (19.17)	-.39*	-.44**	-.56**
2. Binge eating (BITE)	10.27 (5.88)		.22**	.43**
3. Depression (BSI)	4.02(5.44)			.47**
4. Neuroticism (NEO-PI-R)	83.47 (21.38)			

Note. PIL= Purpose in Life; BITE = Bulimic Inventory Test Edinburgh; BSI= Brief Symptoms Inventory; NEO-PI-R = NEO-Personal Inventory Revised.  
\*p < .05, \*\*p < .01

**Table 3.** Multiple mediation model of meaning in life between neuroticism and binge-eating symptoms and depression

	Estimate	Standard Error	z-value	p	95% Confidence Interval	
					Lower	Upper
Neuroticism-Meaning in life –Binge-eating symptoms						
Total Effect	0.429	0.083	5.159	< .001	0.266	0.592
Direct Effect	0.307	0.100	3.061	<.01	0.110	0.503
Indirect Effect	0.123	0.059	2.070	<.05	0.007	0.268
Neuroticism-Meaning in life-Depression						
Total Effect	0.469	0.080	5.847	< .001	0.312	0.626
Direct Effect	0.313	0.095	3.314	<.001	0.128	0.499
Indirect Effect	0.155	0.057	2.700	< .01	0.043	0.268



**Figure 1.** Multiple mediation model of meaning in life between neuroticism and binge-eating symptoms and depression, with gender and age controlled.

As Table 3 reveals, meaning in life (PIL) showed a partial multiple mediation effect in the association between neuroticism (NEO-PI-R) and depression (BSI) (Direct Effect  $\beta = 0.313$ ,  $z = 3.314$ ,  $p < .001$ ) (Indirect effect  $\beta = 0.155$ ,  $z = 2.700$ ,  $p < .01$ ), (with 28% variance explained) as well as binge-eating disorder symptoms (BITE) (Direct Effect  $\beta = 0.307$ ,  $z = 3.061$ ,  $p < .01$ ) (Indirect Effect  $\beta = 0.123$ ,  $z = 2.070$ ,  $p < .05$ ) (with 21% of the variance explained) (Figure 1).

**Discussion**

People with morbid obesity who are candidates for bariatric surgery have high levels of neuroticism (Altaweel et al., 2023), depression (Martens et al., 2021), and altered eating behaviors, such as binge eating (Gilmartin et al., 2023), and so the objective of this study was to investigate the mediating role of MIL. Our results indicate that MIL was a mediating and protective factor in the relationship between neuroticism and both depression and binge-eating. Our results confirm previous studies that found that MIL was a mediator and protective factor against depression in samples without eating disorders (Volkert, et al., 2014) and those with eating disorders (Marco et al., 2017).

Following the Meaning Making Model of Eating Disorders (Marco et al., 2021), we can suggest several ways meaning in life could act as a mediator: a) by developing a purpose in life, that is, having a life oriented towards values and goals that allow us to develop an identity that is incompatible with morbid obesity or binge eating (for example, a life oriented towards sports or nature); b) by developing coherence in one’s life, given that to the

extent that individuals’ behaviors and decisions are consistent with their values, the feeling of fullness increases, which is associated with less emotional dysregulation, thus reducing binge eating; c) by developing a greater presence of meaning, which is positively associated with positive affect, which in turn has been shown to buffer depression; and d) by increasing the sense of existential importance, which is closely related to self-esteem and self-concept, with both constructs lying at the base of eating disorders in people with binge-eating disorder and bulimia nervosa (Marco et al., 2021).

Bariatric surgery is the most effective treatment for obesity. Nevertheless, there is a long-term risk of deleterious physical and psychological effects: regained weight (30% of patients), depression, and body image dissatisfaction (Cheroutre et al., 2020). Thus, providing psychotherapy before or after bariatric surgery allows us to improve its results. Cognitive behavioral therapy (CBT), applied before or after surgery, has been shown to be effective in improving eating patterns, binge eating, and body weight. However, its application has some limitations (Cheroutre et al., 2020). CBT can be constrained by patients’ unrealistic expectations about the surgery’s outcomes and their resistance to behavioral change, particularly when motivation is low (Sarwer et al., 2010). Motivating patients to change their goals and values is the therapeutic aim of meaning-based therapy (MBT). The overall aim of MBT is to build a fulfilling life oriented toward functional goals, having a purpose, and the feeling that life is worth living. According to the Meaning-Making Model of Eating Disorders, binge eating and extreme dieting are assumed to be dysfunctional life goals that will never give meaning to patients’ lives and that lead directly to depression, hopelessness, and emptiness. Only by learning new adaptive sources of meaning (doing something, loving someone, and coping with suffering in an adaptive way) will patients

be able to build a meaningful and fulfilling life (Marco & Guillen, 2023). MBT psychotherapy has proven effective in increasing individuals' level of meaning in life and reducing depression in several studies involving non-obese (Marco et al., 2024) and obese (Van Doornik et al., 2023) participants.

Therefore, future research should explore whether conducting interventions that target meaning in life could improve the levels of depression and reduce disordered eating behaviors in individuals with morbid obesity prior to undergoing bariatric surgery. If we manage to reduce the level of depression before the operation, this could result in greater adherence to medical recommendations, increased satisfaction, and better quality of life of the participants.

This study has several limitations, and so the results must be interpreted with caution. Given that this is not an experimental study, we cannot establish causal relationships between the variables. In addition, the cross-sectional nature of the study does not allow us to confirm the directionality of the associations. Although the study controlled for gender and age, other important variables that could affect the mediation analyses were not controlled for, such as the presence of a mental disorder or the participants' educational level. Furthermore, self-reports were primarily used, which could lead to response bias. The sample was collected from two hospitals in the same city in Spain, and so the results cannot be generalized to other cultures or countries. Future studies should analyze the mediating role of MIL in the relationship between neuroticism and depression and binge eating longitudinally, controlling for the age, sex, psychiatric history, and educational level of the participants, with a more representative sample of the population of morbidly obese people who are candidates for bariatric surgery.

## Conclusion

MIL was a mediating and protective factor in the relationship between neuroticism and both depression and binge-eating symptoms. Our study suggests that conducting interventions that target MIL could improve the levels of depression and reduce disordered eating behaviors in individuals with morbid obesity prior to undergoing bariatric surgery.

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