

Emotional eating in women with generalized anxiety disorder

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Abstract

Introduction: Individuals diagnosed with generalized anxiety disorder (GAD) seek pleasurable foods to avoid their negative emotional experiences. Ineffective regulation of negative emotions may be a risk factor for emotional eating (EE), leading to suffering, dysfunctional behaviors, and weight gain.

Objectives: The aim of this study is to understand the relationship between emotional dysregulation and EE, investigating potential mediators such as the intensity of the worry, avoidance of internal experiences, mindfulness, and self-compassion in female patients with anxiety.

Methods: In this cross-sectional study, participants from a randomized clinical trial diagnosed with GAD answered the following instruments at baseline: the Difficulties in Emotion Regulation Scale (DERS), the Three Factor Eating Questionnaire (TFEQ-R21), the Penn State Worry Questionnaire (PSWQ), the Action and Acceptance Questionnaire (AAQ), the Five Facet Mindfulness Questionnaire (FFMQ), and the Self-Compassion Scale (SCS). We estimated Pearson correlation coefficients and performed mediation analyses.

Results: We evaluated 51 female individuals, 34 of whom completed all the questionnaires. Our data showed that EE was positively correlated with emotional dysregulation ($r = 0.593$; $p < 0.001$), worry trait ($r = 0.402$; $p = 0.018$), and avoidance of internal experiences ($r = 0.565$; $p < 0.001$), whereas it was negatively correlated with self-compassion ($r = -0.590$; $p < 0.001$) and mindful state ($r = -0.383$; $p = 0.026$). Moreover, we demonstrated that self-compassion mediates the relationship between emotional dysregulation and EE (ab product estimate = 0.043, 95% confidence interval [95%CI] 0.003-0.084).

Conclusion: Our findings contribute to the literature by identifying psychological factors that could mediate the association between emotional dysregulation and EE, enabling identification of more effective eating behavior intervention targets for patients with GAD.

Keywords: Emotional eating, generalized anxiety disorder, emotional dysregulation, self-compassion.

Introduction

Emotional eating (EE) is characterized by eating in response to generally negative emotional stimuli.¹ Studies have found a significant association between EE and high levels of symptoms of anxiety and depression.

In anxious young people, EE may be a way of coping with hyper-arousal experiences, whereas in depression, EE may offer positive emotions.^{2,3} Dysregulation of negative emotions may be an important risk factor for EE,⁴ and experiencing negative emotions has been associated with subsequent overeating in some individuals.⁵

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Submitted Sep 14 2021, accepted for publication Feb 06 2022.

Suggested citation: Fonseca NKOD, Costa MA, Gosmann NP, Dalle Molle R, Gonçalves FG, Silva AC, et al. Emotional eating in women with generalized anxiety disorder. *Trends Psychiatry Psychother.* 2023;45:e20210399. <http://doi.org/10.47626/2237-6089-2021-0399>

Presence of EE brings maladaptive behaviors and feeling of guilt besides being a significant risk factor for development of eating disorders such as binge eating disorder.^{6,7} A previous study reported that EE is more common in obese individuals than in normal weight individuals.⁸ Furthermore, EE was identified as an independent risk factor for weight gain in a 4-year follow-up of Korean twins.⁹ Moreover, EE is also associated with weight fluctuations, weight gain, and weight regain after treatment.¹⁰⁻¹³

Emotion regulation is characterized by the interaction between automatic and cognitive processes that influence the intensity, duration, and expression of emotions.¹⁴ Deficits in emotion regulation are often associated with employment of maladaptive strategies to regulate negative emotions, such as avoidance, rumination, self-harm, substance abuse, and/or eating.^{14,15} Facets of emotion dysregulation may contribute to development of EE¹⁶ and have been linked to weight gain.¹⁷ A meta-analysis of emotion regulation across different psychopathologies reported that individuals diagnosed with generalized anxiety disorder (GAD) presented deficits in emotion regulation related to emotional clarity, understanding, reactivity, and acceptance.¹⁸

GAD is a prevalent and disabling disorder¹⁹ and is associated with eating disorders²⁰ and obesity.²¹ During the coronavirus disease 2019 (COVID-19) pandemic, it seems that anxiety rates in the general population may have been more than three times higher.²² The negative emotions experienced in GAD impair eating behavior, but there are very few studies evaluating the relationships between GAD, eating behavior, and body weight.

Mindfulness contributes to regulation of emotions and a more mindful state is associated with fewer symptoms of anxiety, depression, and binge eating disorder, among others.²³⁻²⁷ Self-compassion has been described as the non-judgmental acceptance of one's own suffering, whilst also directing kindness towards one-self.^{28,29} Lower self-compassion scores are consistently associated with mental health symptoms such as anxiety, depression, narcissism, self-criticism, and avoidance.²⁹⁻³³ Preliminary evidence suggests that emotion regulation may be a mechanism of change in the relationship between self-compassion and mental health.³³⁻³⁵

There is an association between self-compassion and health behaviors such as healthy eating and physical activity.³⁶ In addition, in a sample of university students, self-compassion had a negative correlation with consumption of sugar and fat (associated with isolation and over-identification).³⁷ Brewer et al.³⁸

suggest that self-compassion improves the relationship with food through the self-regulatory mechanism by moderating possible negative responses to failures and encouraging individuals to act from internal perceptions rather than extrinsic reward mechanisms.

Since GAD occurs twice as often in female patients³⁹ and the risk for eating disorders is also higher in women,⁴⁰ we aimed to investigate the relationship between emotional dysregulation and EE in women, evaluating potential mediators of this association. Based on the literature, we established an a priori hypothesis that self-compassion would mediate the relationship between emotional dysregulation (predictor) and EE as an outcome. Knowledge of these mechanisms may help to improve more effective strategies to deal with eating behavior in women with GAD.

Methods

Participants

The sample originated from a randomized clinical trial that evaluated the effectiveness of a mindfulness intervention in patients from the community diagnosed with GAD.⁴¹ Individuals were recruited to participate in this study through a local media advertisement. Potential participants were screened by telephone using the Generalized Anxiety Disorder 7-item Scale (GAD-7) and those who scored ≥ 10 on this scale were invited to go to the hospital to undergo an extensive clinical evaluation (assessed with the Mini International Neuropsychiatric Interview [MINI]) with a trained psychiatrist or psychologist.

Patients were included in the study if they were over 18 years old and had a primary diagnosis of GAD, according to the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), diagnostic criteria. Exclusion criteria were presence of eating disorders, bipolar disorder, psychotic disorders, substance use disorders (except tobacco), or suicidal ideation in the last 6 months. Patients could be recruited for the study if they fulfilled the diagnosis of major depression, providing it was not the primary diagnosis and depression symptom severity did not exceed 23 according to the Hamilton Depression Rating Scale (HAM-D). See the original paper for more details about the sample.⁴¹ This study was carried out in a hospital in Porto Alegre/Brazil, and was approved by the Ethics Committee at the Hospital de Clínicas de Porto Alegre (CAAE 61336416.0.0000.5327). All participants gave written informed consent before entering the study.

Measures

Difficulties in Emotion Regulation Scale (DERS)

This instrument assesses levels of emotional dysregulation in six domains: non-acceptance of negative emotions; inability to engage in goal-driven behaviors when experiencing negative emotions; difficulty controlling impulsive behavior when experiencing negative emotions; limited access to emotional regulation strategies that are perceived as effective; lack of emotional awareness; and lack of emotional clarity. It contains 36 items scored on a 5-point Likert scale from 1 to 5.¹⁴ This scale has been validated for Portuguese from Portugal,⁴² and there is a version adapted for the Brazilian population.

Penn State Worry Questionnaire (PSWQ)

This is a self-rated scale designed to measure worry trait that has excellent internal consistency and good test-retest reliability.⁴³ It comprises 16 Likert type items scored from 1 to 5 and has demonstrated good ability to discriminate individuals with GAD, not correlating with other measures of anxiety and worry.⁴³ There is a validated version for Brazilians with adequate internal consistency.⁴⁴

Action and Acceptance Questionnaire (AAQ)

This scale measures avoidance of internal experiences⁴⁵ and is validated for Portuguese-Brazilian populations.⁴⁶ It evaluates psychological flexibility, which is defined as the ability to contact more completely with the present moment, as a conscious human being, and to change or persist in behavior when to do so serves valued ends.⁴⁷

Five Facet Mindfulness Questionnaire (FFMQ)

According to the authors of the FFMQ, mindfulness is a multifaceted construct with five distinct facets. This questionnaire consists of 39 self-report items that assess each individual's tendency to be mindful in daily life. All items are answered on a Likert scale from 1 to 5. The five facets (subscales) of the original version achieved values indicating good internal consistency: observe = α 0.83; describe = α 0.91; act consciously = α 0.87; not judging = α 0.87; and not reacting = α 0.75.⁴⁸ There is a translated and validated version for Brazilian samples.⁴⁹

Self-Compassion Scale (SCS)

The self-compassion scale was designed to measure self-compassion in three components: self-judgment versus self-kindness, sense of isolation versus common humanity, and hyper-identification versus mindfulness.²⁹ Respondents score how they usually behave at difficult

times on a scale comprising 26 5-point items. It has been translated and adapted to Brazilian Portuguese.⁵⁰

The Three Factor Eating Questionnaire (TFEQ-R21)

This questionnaire is a self-administered instrument that evaluates cognitive restraint behaviors (six questions), EE (six questions), and uncontrolled eating (nine questions) and has good internal consistency.¹ It contains 21 questions in which individuals rate statements as true or false on a four-point scale, where "1" is totally true and "4" is totally false. This instrument has been translated into Portuguese and validated for Brazilian women.⁵¹

Anthropometric evaluation

The anthropometric evaluation was based on body mass index (BMI) and body composition. Body weight was measured using a digital, calibrated scale, with capacity of 200kg (Toledo®, São Bernardo do Campo, Brazil). We measured height using a vertical millimeter stadiometer (HoltainLimited®, Crosswell, Wales, UK). Both were measured twice and we took the average of both measurements. We calculated BMI, defined as the weight in kilograms divided by the square of height in meters squared (kg/m^2), to evaluate nutritional status. We used bioimpedance equipment (InBody230®, Perafita, Portugal) to assess body composition (percentage fat), following the requirements for bioimpedance assessment.

Procedure

Female participants who met the criteria for a primary diagnosis of GAD signed an Informed Consent Form and answered the DERS, PSWQ, FFMQ, SCS, and AAQ questionnaires at baseline, before randomization. The anthropometric assessment was conducted afterwards.

Statistical analysis

Data were expressed as mean and standard deviation (SD) for normally distributed continuous variables and as median and interquartile range (IQR) for non-normal distributed data. The distributions of variables were assessed using the Shapiro-Wilk test. We performed bivariate correlation analyses between all variables by estimating Pearson correlation coefficients. The SCS and FFMQ scales were reversed before the mediation analysis so that higher scores indicated lower levels of self-compassion and mindful state, facilitating interpretation.

Considering power of 80%, a 5% significance level,⁵²⁻⁵⁴ and a moderate correlation of $r = 0.40$ to 0.6 ,⁵⁵ a sample of 30 individuals would be able to detect differences in the EE variable (TFEQ-EE and DERS), in accordance with previous studies that considered a

correlation between EE and emotion regulation of 0.3 as clinically relevant.^{56,57}

We conducted mediation analyses using bootstrapping techniques, a conditional modeling analysis that utilizes an ordinary least squares-based path analytical framework to test for both direct and indirect effects.⁵⁸ The mediation model is a causal process in which X, the independent variable, affects Y, the dependent variable. Path c quantifies this effect, called the total effect of X on Y.⁵⁹ Path a represents the causal effect of the independent variable on the proposed mediator, M. Path b represents the causal effect of the mediator on the dependent variable, controlling for the independent variable, whereas path c' represents the causal effect of the independent variable on the dependent variable controlling for the mediator. In the language of causal analysis, c' is the direct effect of X on Y and is distinguishable from the total effect, c, in that the direct effect partials out from the total effect that part of the causal effect that is shared with M. An indirect effect is the product of path a (the association between the predictor [x] and the proposed explanatory intermediary variable [m]) and path b (the association between the proposed intermediary variable [m] and the dependent variable [y], controlling for x). The indirect pathway is considered statistically significant if the 95% confidence interval (95%CI) around a*b does not include 0.⁵⁹

All assumptions for the analysis were assessed and met (linear regression R² = 0.926; autocorrelation p = 0.292; collinearity VIFs = 3.02, VIFders = 1.04) and data were analyzed using Jamovi Computer Software (version 1.0). Tests were two-tailed with a significance level of < 0.05.

Results

Participants

The whole sample comprised 51 female patients diagnosed with GAD, but 17 were excluded because of missing data. In this study, we excluded individuals for not completely answering the following questionnaires: DERS (n = 15), the EE-TFEQ (n = 2), the SCS (n = 17), the FFMQ (n = 16), the PSWQ (n = 16), and the AAQ (n = 13).

The median age of the 34 participants who completed all measures and questionnaires was 29 (IQR, 19 to 60) years and their socioeconomic data classified them at a medium socioeconomic level. Mean body fat percentage was high (36.9%) (SD = 8.69) and mean BMI was 27.9 (SD = 6.86), classified as overweight. The majority of our sample (65%) had excess weight. Table 1 shows the clinical and demographic characteristics of the sample.

Table 1 - Descriptive statistics and Pearson's coefficients for correlations between emotional dysregulation (Difficulties in Emotion Regulation Scale [DERS]), self-compassion (Self-Compassion Scale [SCS]), mindful state (Five Facet Mindfulness Questionnaire [FFMQ]), worry trait (Penn State Worry Questionnaire [PSWQ]), avoidance of internal experiences (Action and Acceptance Questionnaire [AAQ]), and emotional eating (Three Factor Eating Questionnaire [TFEQ])

	Mean	SD		1	2	3	4	5	6	7
1 Age	29 [†]	19-60 [†]		—						
2 Emotional eating	19 [†]	11-24 [†]	r	-0.182	—					
			p	0.302	—					
3 Emotional dysregulation	116	17.8	r	-0.390*	0.593***	—				
			p	0.023	< .001	—				
4 Self-compassion	2.4	0.6	r	0.404*	-0.590***	-0.511**	—			
			p	0.018	< .001	0.002	—			
5 Mindful state	110	20.1	r	0.491**	-0.383*	-0.358*	0.572***	—		
			p	0.003	0.026	0.037	< .001	—		
6 Worry trait	61.1	8.2	r	-0.419*	0.402*	0.541***	-0.469**	-0.411*	—	
			p	0.014	0.018	< .001	0.005	0.016	—	
7 Avoidance	33.2	7.9	r	-0.411*	0.565***	0.410*	-0.684***	-0.655***	0.486**	—
			p	0.016	< .001	0.016	< .001	< .001	0.004	—

SD = standard deviation.

* p < 0.05; ** p < 0.01; *** p < 0.001.

[†] Median and interquartile range (IQR).

Bivariate correlation analysis

EE was positively correlated with DERS (Pearson’s $r = 0.593$; $p < 0.001$; 95%CI 0.776-0.319), PSWQ (Pearson’s $r = 0.402$; $p = 0.018$; 95%CI 0.652-0.074), and AAQ (Pearson’s $r = 0.565$; $p < 0.001$; 95%CI 0.758-0.281); and negatively correlated with SCS (Pearson’s $r = -0.590$; $p < 0.001$; 95%CI -0.314 to -0.774) and FFMQ (Pearson’s $r = -0.383$; $p = 0.026$; 95%CI -0.051 to -0.638). BMI and percentage body fat were not correlated with any other variables (Table 1).

Mediation analysis

The mediation analysis for the relationship between DERS and EE only showed significant results when SCS *inv* was the mediator (Figure 1). All analyses

conducted are described in the Supplementary Material S1 (online-only). Impairment in emotion dysregulation mediated 33.4% of the total effect of self-compassion impairment on EE impairment. The results indicated that higher reported levels of emotion dysregulation were associated with higher levels of EE, mediated by lower reported levels of self-compassion ($a * b = 0.043$, standard error [SE] = 0.02, 95%CI 0.003-0.084).

The total effects mediation model with emotion dysregulation predicting EE was significant ($E = 0.131$ SE = 0.0313 $\beta = 0.593$ $t = 4.17$ $p < 0.001$). The full model with self-compassion as mediator was significant ($E = 2.4935$, SE = 0.9841, $\beta = 0.388$, $t = 2.53$, $p = 0.017$). See Table 2 for more details.

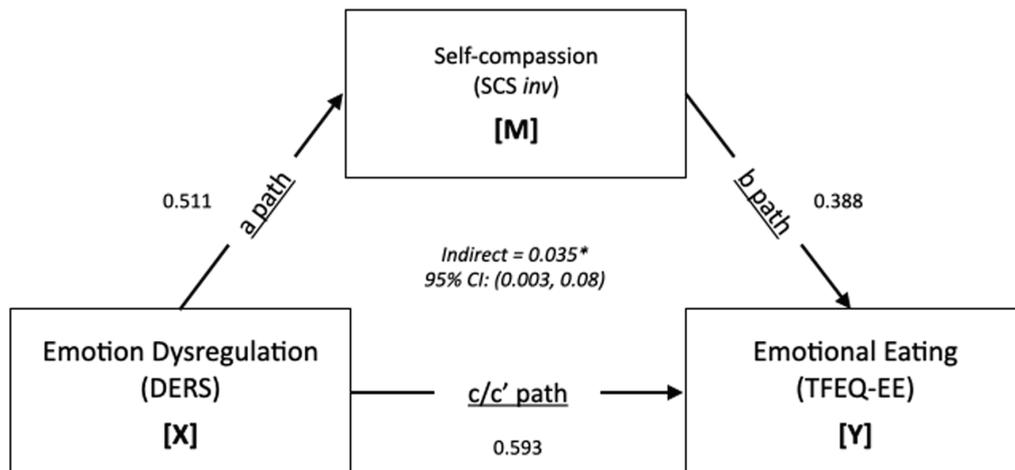


Figure 1 - Conceptual model. A single path was conducted (X) on the outcome (Y). The Self-Compassion Scale (SCS) was reversed. 95%CI = 95% confidence interval; a path = effect of X on M; b path = effect of M on Y, controlling for X; c path = total effect of X on Y; c’ path = direct effect of X on Y controlling for M; DERS = Difficulties in Emotion Regulation Scale; EE = emotional eating; TFEQ = Three Factor Eating Questionnaire. * $p < 0.05$.

Table 2 - Indirect and total effects of emotion dysregulation on emotional eating via self-compassion

Type	Effect	Estimate	SE	95%CI*		β	z	p
				Lower	Upper			
Indirect	DERS \Rightarrow SCS_inv \Rightarrow EE	0.0436	0.02071	0.00304	0.0842	0.198	2.11	0.035
Component	DERS \Rightarrow SCS_inv	0.0175	0.00505	0.00760	0.0274	0.511	3.47	< .001
	SCS_inv \Rightarrow EE	2.4935	0.93970	0.65171	4.3353	0.388	2.65	0.008
Direct	DERS \Rightarrow EE	0.0870	0.03219	0.02387	0.1500	0.395	2.70	0.007
Total	DERS \Rightarrow EE	0.1306	0.03086	0.07011	0.1911	0.593	4.23	< .001

95%CI = 95% confidence interval; SE = standard error.
 * Computed with method: Standard (delta method).

Discussion

This study investigated some mediators of the relationship between emotional dysregulation and EE in women with GAD. Our data showed that EE was positively correlated with emotional dysregulation, worry trait, and avoidance of internal experiences, whereas it was negatively correlated with self-compassion and mindful state. Moreover, we demonstrated that self-compassion mediates the relationship between emotional dysregulation and EE.

EE is a dysfunctional coping strategy and a risk factor for various health conditions, including eating disorders.^{60,61} Anxiety seems to be associated with EE behaviors.^{3,62} Higher levels of EE were related to more severe neuroticism (e.g., anxiety and depression) in a treatment-seeking sample of adults with obesity.⁶³ Moreover, EE is associated with emotion dysregulation⁶⁴ and increased weight gain.^{9,12,65,66}

Studies suggest that emotion dysregulation is independently related to eating in response to aversive events in adults with obesity.⁶⁴ EE is considered a learned behavior⁶⁷ and emotions become a trigger for eating impulsivity.⁶⁸ Emotional eaters report greater consumption of sweet and high fat foods and more frequent snacking as compared to non-emotional eaters.^{69,70} Individuals with sweet craving had higher rates of uncontrolled eating and EE whereas anxiety symptoms are independently associated with sweet craving.⁷¹ This environment-reactive behavior is influenced by learning and experience⁷² and, in a similar way, some individuals with GAD paired pleasurable eating stimulus with a negative emotional experience. EE may regulate affect through release of dopamine after food consumption, which could increase positive affect, associated with subjective pleasure.^{73,74}

Adults who endorsed the highest levels of EE were 13.38 times more likely to be overweight or obese than subjects who endorsed low levels of EE.⁷⁵ EE is predictive of weight gain over time¹² and of difficulty in losing weight.⁷⁶ Jones et al.⁴ presented a mediation model in which higher levels of emotion dysregulation were associated with higher reported levels of EE, which in turn were related to higher BMI in adult smokers. This finding indicated that emotion dysregulation had an indirect effect on BMI mediated by EE.⁴ Mantau et al.⁷⁷ investigated determinants of EE and showed that biological determinants (e.g., weight status) were less important than psychological (i.e., restrained eating) and situational (i.e., stress) factors in explaining food choice in response to a negative affective state.

In our sample, 65% of the women were overweight, and the level of self-compassion reported was lower

than in the general population. The effect of emotion dysregulation on EE via lower self-compassion observed in our data is in agreement with the importance of psychological aspects and might represent a context in which higher levels of self-criticism and suffering could increase triggering of avoidance of negative feelings, driving eating to achieve prompt relief.

Elements of mindfulness and mindful eating are increasingly being incorporated into interventions designed to manage obesity-related eating behaviors.⁷⁸ The skills that mindfulness fosters seem to increase self-regulation, improving awareness of emotions and sensations,⁷⁹⁻⁸² which may be important for improving eating behaviors.⁸³ However, we did not find a mediation effect via mindful state in our study.

According to Mantzios et al.,⁸⁴ psychological interventions have identified that self-compassion may be the most relevant construct within mindfulness in terms of weight maintenance and loss. Meanwhile, Braun et al.⁸⁵ propose that self-compassion can protect against dysfunctional eating behaviors through various mechanisms. The importance of developing self-compassion as a protective factor for emotional regulation in mental health and well-being is therefore highlighted.³¹

Self-compassion plays important roles in losing and maintaining weight,⁸⁶⁻⁸⁹ besides helping to develop more motivation and positive behaviors related to food.³² It also breaks the negative cycle of shame, dissatisfaction with body image, and the drive for thinness in women with and without eating disorders.⁹⁰

Shame is a self-conscious emotion involving negative self-evaluation compounded by a desire to escape.^{67,91,92} Shame was strongly associated with unhealthy eating and with eating disorders.^{67,93,94} Liu et al.⁹⁵ suggested that when shame was elicited in healthy women, they ate a higher number of snacks than women in whom shame was not elicited. Furthermore, individuals in an anxiety-with-shame group reported higher binge impulse than those in a group without shame.⁶⁷ Self-compassion interventions aim to promote improvement in emotional regulation, facing negative emotions with self-kindness rather than negative self-appraisals (for example, self-criticism, shame).^{15,96,97}

The main limitations of our study are its cross-sectional design and the small sample size. Although the sample size calculation showed that the study had the power to detect differences,⁵⁵⁻⁵⁷ our results must be interpreted with caution considering the multiple testing. Another possible limitation is assessment of participants with five different instruments totaling almost 150 items in a single assessment session, which could have influenced the reliability of the

data collection process. Despite these limitations, our study has important strengths, including the a priori hypothesis tested with a robust analysis. We suggest more studies are needed to support our findings, but our data ensures future investigations on this theme.

These outcomes contribute to the literature by incorporating data on the functioning of EE in anxious patients and enriching possible alternative strategies for intervention in treatments for this condition. Further studies, especially longitudinal studies, are needed to indicate the best approach to improve EE in anxious patients.

Conclusion

Findings highlight the influence of self-compassion as a mediator of the association between emotional dysregulation and EE in women with anxiety. Our findings could add to the literature by identifying psychological factors that are associated with EE, facilitating development of more effective interventions for this population with GAD and eating behavior dysfunction.

Acknowledgements

The current study was funded by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq; PPS, 478820/2010), Fundo de Incentivo à Pesquisa e Eventos, Hospital de Clínicas de Porto Alegre (FIPE/HCPA; 16-0552), and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). The financial backers played no role in the design and analysis of the study or in the writing of this article. We thank the participants for their time and support.

Disclosure

No conflicts of interest declared concerning the publication of this article.

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