

# Sex and Body Mass Index differences after one-year follow-up of an eating disorders risk factors universal prevention intervention in university students in Mexico City

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Received: 9 May 2022

Accepted: 16 November 2022

## Citation:

Unikel Santoncini, C., Barajas Márquez, M. W., Díaz de León Vázquez, C., Parra Carriedo, A., Rivera Márquez, J. A., Bilbao y Morcelle, G., & Díaz Gutiérrez, M. (2023). Sex and Body Mass Index differences after one-year follow-up of an eating disorders risk factors universal prevention intervention in university students in Mexico City. *Salud Mental*, 46(3), 147-154.

DOI: 10.17711/SM.0185-3325.2023.019



## ABSTRACT

**Introduction.** Interventions based on cognitive dissonance theory are the most effective for preventing eating disorders. **Objective.** To identify the changes at one year follow-up of a universal prevention intervention in disordered eating behaviors (DEB), thin-ideal internalization (TII), and drive for muscularity (DM). **Method.** A pre-experimental, pretest-posttest study was conducted on 602 university student subjects (76.1% women and 23.9% men) with an average age of 20.74 years at a public (30.6%) and a private university (69.4%) in Mexico City. A Split Plot ANOVA was performed with the intrasubject variable equal to each measurement (pretest, posttest, and follow-up), as well as the sex and body mass index (BMI) intersubject variables to analyze whether there was a significant interaction between these variables and the changes in dependent variables, as well as the changes through each measurement by group. **Results.** In the intrasubject analyses, statistically significant differences were found for DEB through the various measurements, without taking the interactions into account. Statistically significant interactions were observed between each measurement and BMI, and between each measurement and sex and BMI for the DM variable. **Discussion and conclusion.** Since a reduction of TII in women and DM in men was achieved, together with a decrease in DEB in women, the workshop can be said to have fully achieved its objectives for women and partly so for men.

**Keywords:** Prevention, youth, eating disorders, risk factors, disordered eating, thin-ideal internalization, body mass index.

## RESUMEN

**Introducción.** Las intervenciones basadas en la teoría de la disonancia cognoscitiva son las más efectivas para la prevención de los trastornos de la conducta alimentaria. **Objetivo.** Conocer los cambios a un año de seguimiento de una intervención de prevención universal en las conductas alimentarias de riesgo (CAR), interiorización del ideal estético de la delgadez (IED) y la motivación por la musculatura (MM). **Método.** Se llevó a cabo un estudio pre-experimental pretest-postest en 602 (76.1% mujeres y 23.9% hombres) sujetos estudiantes universitarios con una edad promedio de 20.74 años en una universidad pública (30.6%) y una privada (69.4%) de la Ciudad de México. Se realizó un ANOVA split plot con la variable intrasujetos igual a cada medición (pretest, postest y seguimiento) así como el sexo y el índice de masa corporal (IMC) variables intersujetos, para analizar si existía una interacción significativa entre dichas variables y los cambios sobre las variables dependientes, así como los cambios a través de cada medición por grupo. **Resultados.** en los análisis intrasujetos se encontraron diferencias estadísticamente significativas para las CAR a través de las distintas mediciones, sin tomar en cuenta las interacciones. Se observaron interacciones estadísticamente significativas entre cada medición y el IMC, y entre cada medición con el sexo y el IMC para la variable MM. **Discusión y conclusión.** Se logró la reducción de la IED en las mujeres y de la MM en los hombres, así como la disminución de las CAR en las mujeres por lo que se considera que el taller logra sus objetivos para las mujeres y parcialmente para los varones.

**Palabras clave:** Prevención, jóvenes, trastornos de la conducta alimentaria, factores de riesgo, conductas alimentarias de riesgo, interiorización del ideal de belleza delgado, índice de masa corporal.

## INTRODUCTION

Eating disorder (ED) risk factors prevention is an area of research that has received increasing attention in the past three decades (Le, Barendregt, Hay, & Mihalopoulos, 2017; Watson et al., 2016) and Mexico is no exception in this regard (Gómez Péresmitré et al., 2013; León, 2010; Pineda, Gómez, & Méndez, 2010; Rodríguez & Gómez Péresmitré, 2007; Saucedo, Villarreal, Oliva, Unikel, & Guzmán, 2018; Castillo, Solano, & Sepúlveda, 2016; Unikel, Díaz de León, Rivera, Bojorquez, & Méndez, 2019).

ED risk factors prevention interventions that have proved most effective are those based on cognitive dissonance theory (Festinger, 1962), which achieves effects of up to three years after the intervention and prevents the emergence of ED in the population (Stice, Marti, Spoor, Presnell, & Shaw, 2008).

The Body Project intervention is based on some of the risk factors that lead to bulimic pathology, such as the aesthetic thin-ideal internalization (TII), body dissatisfaction, which, in the case of men, is expressed as the drive for muscularity (DM); engaging in restrictive diets and negative affect, included in the dual-pathway model of bulimic psychopathology (Stice, 2001). This model posits that sociocultural influences encourage the pursuit of an ideal of unattainable thinness, which is internalized. Since this is incompatible with reality, it promotes body dissatisfaction, which, in turn, leads to engaging in restrictive diets and negative affect, and subsequently bulimic symptoms. This intervention uses verbal, written, and behavioral exercises with an interactive format, coordinated by previously trained facilitators to reduce the thin-ideal internalization, body dissatisfaction, and disordered eating behaviors (DEB).

Preventing ED risk factors is a priority for public health, since they include serious chronic diseases that emerge in adolescence and early adulthood, in subjects of either sex. There are many reasons why it is essential to undertake the early detection of at-risk cases and ED prevention in the youth population. Foremost among these are medical complications (Mitchell & Crow, 2006), psychiatric comorbidity (National Institute for Health and Care Excellence, 2017), treatment seeking delay (Rowe, 2017), high mortality rates (Zerwas et al., 2015), the tendency to relapse (Molin, von Hausswolff-Juhlin, Norring, Hagberg, & Gustafsson, 2016), and lack of effective treatments (Keel & Brown, 2010).

In Mexico, data from the National Health and Nutrition Surveys (ENSANUT 2006 and 2018-19; Olaiz-Fernández et al., 2006; Shamah-Levy et al., 2020), indicate that from 2006 to the most recent measurement taken in 2018-2019 disordered eating behaviors in the adolescent population aged 10 to 19 have increased from .7% to 1.3%. Data from this latest survey indicate that young people between the ages of 14 and 19 are at the greatest risk. In university stu-

dents, the prevalence of DEB in different countries, can fluctuate between 5.5% (Sáenz-Duran, González-Martínez, & Díaz-Cárdenas, 2011) and 61.1% (Fragkos & Frangos, 2013) in women, and between 1.9% (Morán-Álvarez, Cruz-Licea, & Iñárritu-Pérez, 2009) and 38.9% (Fragkos & Frangos, 2013) in men, depending on the means of evaluation and the country where the study is conducted.

The predominance of women diagnosed with ED is widely known in the literature (Smink, van Hoeken, & Hoek, 2012), and constitutes a well-defined risk factor (Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004). However, prevalence in men is increasing (Sangha, Oliffe, Kelly, & McCuaig, 2019), and one in four people with an ED is thought to be male (Dakanalis et al., 2014). According to data from ENSANUT 2018-2019 (Villalobos, Unikel, Hernández-Serrato, & Bojorquez, 2020), .7% percent of males in the sample are at high risk of developing an ED in the adolescent population aged between 10 and 19 years old compared to 1.9% of females. On the other hand, the study by Díaz de León-Vázquez (2013) found no statistically significant differences in the prevalence of DEB between university men and women in the sample (4.1% vs. 6.1%; Díaz de León-Vázquez, 2013).

Studies undertaken in Mexico on the association between body mass index (BMI) and DEB have indicated that the higher the BMI, the higher the percentage of DEB (Palma et al., 2011; Unikel, Saucedo, Villatoro, Medina-Mora, & Fleiz, 2002). Yoon, Mason, Hooper, Eisenberg, and Neumark-Sztainer (2020) found comparable results in American adolescents: the higher the DEB percentage, the higher the BMI at follow-up. Likewise, in a nationally representative sample in the United States, Nagata, Garber, Tabler, Murray, and Bibbins-Domingo (2018) found that the higher the BMI, the higher the percentage of DEB. Conversely, in the study conducted by Argyrides, Anastasiades, and Alexiou (2020) on a sample of 2605 adolescents with a mean age of 15.22 years (SD = 1.23) in Cyprus, BMI showed no differences when risk and protective factors for DEB were evaluated.

Given the above, the objective of this study was to evaluate the differences of an ED risk factors universal prevention intervention based on cognitive dissonance theory at one-year follow-up in university students, comparing the sex and BMI of subjects. Results were obtained by measuring DEB, thin-ideal internalization (TII), and drive for muscularity (DM).

## METHOD

A pre-experimental, pretest-posttest study was conducted on 602 university students (76.1% women and 23.9% men) with an average age of 20.74 years at a public (30.6%) and a private university (69.4%) in Mexico City. The distribution characteristics of the sample are shown in Table 1.

**Table 1**  
*Distribution characteristics of sample by sex, type of university, and BMI*

Sex	Pretest				Posttest				Follow-up			
	Women		Men		Women		Men		Women		Men	
	f	%	f	%	f	%	f	%	f	%	f	%
	458	76.1	144	23.9	375	77.2	111	22.8	122	83	25	17
University	Public		Private		Public		Private		Public		Private	
	f	%	f	%	f	%	f	%	f	%	f	%
	184	30.6	418	69.4	153	31.5	333	68.5	90	61.2	57	38.8
BMI	Normal		Overweight / Obesity		Normal		Overweight / Obesity		Normal		Overweight / Obesity	
	f	%	f	%	f	%	f	%	f	%	f	%
	443	80.1	110	19.9	354	81.8	132	18.2	112	80.6	27	19.4

## Instruments

### *Brief Questionnaire to Measure Disordered Eating Behaviors (BQDEB)*

The questionnaire consists of 10 questions with four response options (never or almost never, sometimes, often twice a week), and very often (more than twice a week), which measure concern about gaining weight, binge eating, and restrictive and purging behaviors in the three months prior to the evaluation. The higher the score on the questionnaire, the greater the eating pathology. A reliability of .83 was obtained in female students in Mexico City (Unikel, Bojorquez, & Carreño, 2004), .80 in adolescent female students from the State of Mexico (Unikel, Díaz de León, & Rivera, 2017) and .64 in male university students (Díaz de León-Vázquez, 2013).

### *Eating Disorder Examination Questionnaire (EDE-Q)*

This seven-item questionnaire measures the specific psychopathology of eating disorders (Fairburn & Beglin, 1994; Grilo, Reas, Hopwood, & Crosby, 2015). In the validation conducted with students and patients with eating disorders in Mexico, a reliability of .98 and a factorial structure in three factors (restriction, concern about figure and weight, dissatisfaction with figure and weight) were obtained (Unikel et al., 2018). The response options of the questionnaire range from 0 to 6, either for frequency of behavior or attitude, with a rating rising from less to more eating pathology (Unikel et al., 2018). The reliability of the questionnaire in men obtained for this study was .77 ( $N = 144$ ).

### *Body Figure Attitudes Questionnaire (BFAQ)*

This questionnaire, comprising 15 questions with four response options (never or almost never, sometimes, often, and always), measures the aesthetic thin-ideal internalization. In its validation with adolescent female students and young adults from Mexico City (Unikel, Juárez, & Gómez Peresmitré, 2006) and the State of Mexico (Unikel et al., 2017), reliability indices of .93 and .90 respectively were obtained. The questionnaire has a cut-off point of 37 to determine at-risk cases: the higher the score, the greater the internalization.

### *Drive for Muscularity Questionnaire (DMQ)*

The items in this questionnaire reflect an individual's perception of whether they are muscular enough and whether they need to increase their muscle mass (regardless of the individual's actual body fat or muscle mass percentage). Muscle motivation is more prevalent in males, in whom a muscular mesomorphic body figure has been found to be most desirable. It comprises 15 questions scored from 1 to 6 and is divided into three subscales: 1. Favorable attitudes towards muscularity ( $\alpha = .88$ ), 2. Consumption of supplements ( $\alpha = .77$ ) and 3. Adherence to training ( $\alpha = .68$ ), Items 2, 6, 8 and 12 (Escoto et al., 2013).

### *Body Mass Index (BMI)*

Students self-reported their body weight and height in each measurement, which was subsequently used to calculate their BMI ( $\text{kg}/\text{m}^2$ ) and classify it according to the World Health Organization criteria: malnutrition  $\leq 18.4$ , normal from 18.5 to 24.9, overweight from 25 to 29.9 and obesity  $\geq 30$  (WHO, 2013). Self-reported BMI is considered reliable according to reports on the Mexican adult population (Osuna-Ramírez, Hernández-Prado, Campuzano, & Salmerón, 2006), as well as Colombian university students (Martínez-Torres et al., 2013).

## Procedure

The Body Project workshops were held in groups of eight to ten students comprising men and women, each coordinated by one or two trained facilitators (Unikel et al., 2019). Five hour-and-a-half to two-hour sessions were given, in which verbal, written, and interactive behavioral exercises were performed under the guidance of the facilitator of the Body Project, which had been translated into Spanish by the University of Valencia, Spain.<sup>1</sup> Although the guide was strictly adhered to, changes were made to the format of the sessions, which involved using images by local artists, and increasing the length of the sessions from one to one and a

<sup>1</sup> The version of the facilitator's guide used was translated at the University of Valencia for the Prevent of Eating Disorders in the Adolescent Population, with the coordination of David Bisetto Pons.

half hours, as well as incorporating the concept of the male muscular body ideal for working with men.

Pretest, posttest and one-year follow-up evaluations were conducted using a battery of 13 instruments previously validated in the Mexican population. The results of five of these are reported in this study, together with self-reported BMI. The study was conducted from 2012 to 2019, during which the sample was collected at the beginning and end of the groups' academic years at various times.

## Statistical analysis

All subjects formed part of the experimental group that attended the Body Project workshop. The objective of the study was to analyze whether sex and BMI had an effect on the dependent variables when interacting with the workshop received by the students.

A Split Plot ANOVA was performed with the intrasubject variable equal to each measurement (pretest, posttest, and follow-up), as well as the sex and BMI intersubject variable to analyze whether there was significant interaction between these variables and the changes in the dependent variables, as well as the changes through each measurement by group. This design is shown in Table 2.

## Ethical considerations

The project was approved by the Research Ethics Committees of the Universidad Iberoamericana (Registration number CONBIOETICA-0-CEI-008-20160601), the Ramón de la Fuente Muñiz National Institute of Psychiatry (Registration number CONBIOETICA-09-CEI-010-20170316) and the Biological and Health Sciences Division Committee of the Universidad Autónoma Metropolitana, campus Xochimilco (Registration number 10/12 8.1). Authorization was requested from the university authorities, as well as group teachers to be able to undertake the interventions with the students. Students signed a written informed consent form prior to their participation in the study, which outlined the voluntary nature of the latter and the possibility of dropping out if they wished.

## RESULTS

### Descriptive statistics

At the beginning of the study, 602 university students enrolled in various degree courses (76.1% women and 23.9%

Table 2  
Design of mixed variance or split plot analysis

	Pretest	Intervention	Posttest	One-year Follow-up
Sex				
BMI	T <sub>0</sub>	Workshop	T <sub>1</sub>	T <sub>2</sub>

men) with an average initial age of 20.74 years (SD = 1.85) participated. Subjects were classified by their BMI into normal (80%) and overweight/obesity (20%).

### Mixed variance analysis

A mixed variance or Split Plot analysis was conducted to compare the effect of the workshop intervention on the interaction between sex and BMI, considering the following measurements: pretest (t<sub>0</sub>), posttest (t<sub>1</sub>), and one year later (t<sub>2</sub>) as a follow-up measure. Due to the fact that two out of the three necessary assumptions in this analysis (equality of samples and homogeneity of variances) were not fulfilled to compare the DEB and TII variables, lower limit correction was used.

As can be seen from Table 3, for the tests of intra-subject effects, it was found that there are statistically significant differences for the DEB variables measured with the BQDEB and EDE-Q instruments, and TII and DM through the different measurements, without taking the interactions into account. At the same time, statistically significant interactions were observed between each measurement and BMI, and between each measurement and sex and BMI for the DM variable.

To analyze the effect of BMI on the dependent variables through each measurement, comparisons were made in pairs (pretest vs. posttest and pretest vs. follow-up), yielding the following results. Table 4 shows that for the DEB variable, measured with the BQDEB, statistically significant differences were observed between the scores obtained in the pretest and posttest, as well as between the pretest and the follow-up for women with normal weight, with a downward trend, whereas in the group of overweight women, differences were only observed between the pretest and posttest. In the case of men, no statistically significant differences were found, which suggests that the results obtained in the DEB variable are not affected by the body weight of male subjects.

Table 5 shows that for the DEB variable measured with the EDE-Q, statistically significant differences were observed between the scores obtained in the pretest and posttest, as well as between the pretest and follow-up for women with normal weight, with a downward trend, where-

Table 3  
Test of intra-subject effects and interaction

Intrasubjects	F	Df	p	$\eta^2$
DEB (BQDEB)	6.20	1	.015	.06
DEB (EDE-Q)	9.05	2	< .000	.09
TII (BFAQ)	14.59	1	< .000	.14
DM (DMQ)	12.57	2	< .000	.12
Time *BMI	F	Gl	Sig	$\eta^2$
DM	9.92	2	< .000	.10
Time*Sex*BMI	F	Gl	Sig	$\eta^2$
DM	6.35	2	.002	.07



**Table 4**  
Comparisons by pretest-posttest pairs and follow-up for the DEB variable measured with the BQDEB

Measurement			Pretest		Posttest		Follow-up		Pretest vs Posttest (1 vs 2)	Pretest vs Follow-up (1 vs 3)
			Mean	SD	Mean	SD	Mean	SD		
DEB	Women	Normal	5.40	3.98	3.67	3.82	2.80	2.60	.001	.001
		Overweight	7.38	4.50	5.15	3.80	5.31	3.40	.01	.09
	Men	Normal	4.54	3.01	2.90	2.30	3.09	2.46	.12	.48
		Overweight	4.60	1.81	5.00	4.63	3.80	3.19	1.00	1.00

**Table 5**  
Comparisons by Pretest-Posttest Pairs and Follow-up for the DEB variable measured with the EDE-Q

Measurement			Pretest		Posttest		Follow-up		Pretest vs Posttest (1 vs 2)	Pretest vs Follow-up (1 vs 3)
			Mean	SD	Mean	SD	Mean	SD		
DEB	Women	Normal	9.37	8.91	4.73	6.07	5.33	6.07	.001	.001
		Overweight	17.38	9.34	11.85	9.45	11.85	8.41	.003	.02
	Men	Normal	8.90	6.86	6.54	6.40	6.36	6.24	.56	.74
		Overweight	11.20	7.98	8.60	11.26	7.20	10.73	.98	.66

as in the group of overweight women, differences were only observed between the pretest and posttest. In the case of men, no statistically significant differences were found, regardless of the subjects' body weight.

Table 6 shows that for the TII variable, statistically significant differences were observed between the scores obtained in the pretest and posttest, as well as between the pretest and the follow-up both for women with normal weight and overweight, with a downward trend and a slight increase at follow-up. In the case of men, statistically significant differences were only found between pre-test and post-test in the group with normal weight, with a downward trend.

Finally, Table 7 shows that for the DM variable, there were differences between the pretest and the posttest for

women, regardless of their body weight. This means that changes between the first and the second moment were not influenced by the body weight of the subjects. In the case of men, statistically significant differences were found between pretest and posttest, as well as between pretest and follow-up, with a downward trend in each case. This was only observed for the group of overweight people.

## DISCUSSION AND CONCLUSION

The objective of this study was achieved, namely, to evaluate the differences of an ED risk factors universal interactive prevention intervention based on cognitive dissonance

**Table 6**  
Comparisons by pretest-posttest pairs and follow-up for the TII variable

Measurement			Pretest		Posttest		Follow-up		Pretest vs Posttest (1 vs 2)	Pretest vs Follow-up (1 vs 3)
			Mean	SD	Mean	SD	Mean	SD		
TII	Women	Normal	28.15	9.40	21.50	8.37	22.58	8.35	.001	.001
		Overweight	32.23	10.56	24.38	9.04	26.62	8.85	.001	.03
	Men	Normal	31.18	7.93	25.00	7.21	27.82	8.98	.001	.49
		Overweight	28.60	6.98	25.60	11.08	24.80	10.82	.71	.86

**Table 7**  
Comparisons by Pretest-Posttest Pairs and Follow-up for the DM variable

Measurement			Pretest		Posttest		Follow-up		Pretest vs Posttest (1 vs 2)	Pretest vs Follow-up (1 vs 3)
			Mean	SD	Mean	SD	Mean	SD		
DM	Women	Normal	23.58	8.62	21.23	8.64	22.57	9.10	.01	.84
		Overweight	23.31	8.43	18.92	4.32	20.38	5.99	.04	.45
	Men	Normal	37.54	15.24	35.63	17.25	38.90	20.30	.96	1.00
		Overweight	54.00	26.85	44.40	25.63	38.80	28.07	.003	.001

theory at one-year follow-up in university students, comparing the sex and BMI of subjects.

The analysis by sex found that the intervention had the expected effect at the follow-up measure, of reducing DEB scores measured with the EDE-Q, in normal weight and overweight women, DEB with the BQDEB only in normal weight women, TII scale scores in normal weight and overweight women, and DM in overweight men.

These data support the proposal to undertake the Body Project in groups with both men and women. This makes it possible to answer the question posed by the National Association for Males with Eating Disorders (National Association for Males with Eating Disorders, Naples, Florida, USA; Cohn, Murray, Walen, & Wooldridge, 2016) in one of its publications: Should men be told about the modifications to the images of men on magazine covers, such as body makeup and photoshop? The workshop version, examined in this study, included images of actors and models with “six-pack” abdominal muscles and developed pectorals. The origin of this beauty ideal was discussed, together with the consequences and costs of pursuing it. Although body ideals differ between women and men, in both cases, the health risks and costs of achieving them converge towards poor nutrition and ED. More current data show that the 10:1 ratio of ED in women and men has changed. Hudson, Hiripi, Pope, and Kessler (2007) report that 25% of people with anorexia nervosa and bulimia nervosa and 36% with binge-eating disorder are men.

Including a reflection on the body ideals required of both sexes in the workshop can make subjects more aware of the needs, insecurities and fears men and women may have about their bodies. It would therefore not be necessary to design a version of the Body Project workshop exclusively for men. Instead, it is more important to target the highest risk groups, including athletes such as boxers, gymnasts, endurance and long-distance runners, jockeys, and wrestlers.

Stice, Rohde, Butryn, Shaw, and Marti (2015) have found effects of the Body Project intervention for up to three years on various variables such as body dissatisfaction, negative affect, and psychosocial disability, but not on BMI. In the present study it was observed that the internalization of body ideals decreased in women regardless of body weight, and in overweight men, so that it can be said that the workshop had the expected effect, which consists of increasing body acceptance and not decreasing the BMI. As could be seen in the present study, the average BMI remained within the normal range, without changes at one year of follow-up; therefore, if the goal of lowering participants' BMI was to be achieved, other approaches would have to be considered. Analysis of the differences between BMI and DEB indicates that DEB are more prevalent in overweight and obese adolescents and young people of both sexes, as indicated in the studies by Yoon et al. (2020) and Lampard et al. (2016)

in the United States, and Palma et al. (2011) and Unikel et al. (2002) in Mexico. However, these results have not been replicated in all studies (Argyrides et al., 2020; Ko et al., 2015). As we can see from the descriptive data of this study, mean DEB is higher in students with overweight and obesity, compared to those with normal weight, thus corroborating findings previously reported in Mexico and the United States.

The prevalence of overweight and obesity in young people between 20 and 29 years of age in Mexico is 35.9% and 24.1% in men and 32.7% and 26.2% in women, respectively, according to data from the National Survey of Nutrition and Health 2018-19 (Shamah-Levy et al., 2020) and in the sample in this study, 20% met some of these conditions. Given that these figures increase with age according to data from this same survey (43.9% and 34% in men and 37% and 39% in women, from 30 to 39 years old respectively), it is essential that action be taken to influence in biopsychosocial risk factors such as DEB, TII, and DM, and in this way reduce the effects they may entail in overweight and obese population product of the prevailing obesity reject.

This study has two significant limitations: on the one hand, experimental death from the baseline measurement to one-year follow-up, and on the other, the lack of a control group. Follow-up evaluations were hampered by students' absence on the day of the evaluation or their refusal to answer the questionnaires on the grounds that they were not interested in doing so. This occurred more in the control group, which is why there was not a large enough sample to perform the data analyses. Other limitations were the lack of other demographic data, such as distinguishing non-binary gender identities, socioeconomic differences, and the diagnosis of ED among the participants.

## Funding

None.

## Conflict of interest

The authors declare they have no conflicts of interest.

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