

Effects of disordered eating behaviors and sedentary lifestyle prevention program in male and female Mexican adolescents

Teresita de Jesús Saucedo-Molina,¹ Frida Josselyn Canales Ramírez,¹ Orquidea Galdina Arellano-Pérez¹

¹ Área Académica de Nutrición, Instituto de Ciencias de la Salud, Universidad Autónoma del Estado de Hidalgo, México.

Correspondence:

Orquidea Arellano Pérez
Área Académica de Nutrición, Instituto de Ciencias de la Salud, Universidad Autónoma del Estado de Hidalgo.
Abasolo # 600, Col. Centro, CP. 42000, Pachuca de Soto, Hidalgo, México.
Phone: 771 71 - 72000
Ext. 4343/4321
Email: orquidea_arellano5663@uah.edu.mx

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ABSTRACT

Introduction. Adolescents are the group with the highest risk of developing disordered eating behaviors (DEB). Preventing this problem is of the utmost importance due to the physical and psychological consequences. **Objective.** To evaluate the effects of a universal prevention program for disordered eating behaviors (DEB), thin ideal internalization (TII), drive for muscularity (DM), and sedentary lifestyle among Mexican adolescents. **Method.** A quasi-experimental study with repeated measures (pre-test, post-test, six-month, and one-year follow-up) was carried out in a non-probabilistic sample of 523 adolescents (46.7% of females) aged 15-19 years ($M_{age} = 16.07$). We worked in two private high schools, one of them was designed as control group (CG), and the other as intervention group (IG). For both, female and male adolescents', data were collected using the Brief Questionnaire for Disordered Eating Behaviors (BQDEB) and the short form of the International Physical Activity Questionnaire (IPAQ). To evaluate TII the Attitudes toward Body Figure Questionnaire was applied in females, while in males Drive for Muscularity Scale (DMS) was used. **Results.** After one-year, repeated measures analyses of variance (ANOVAs) revealed a significant reduction of the mean DEBs scores both in female ($p = .01$) and male ($p = .03$) adolescents of the IG with respect to CG. In IG, females decreased significantly the mean TII score as well as the mean DM score in males. Physical Activity increased in IG females from pre-test to posttest; however, the effect was not maintained over time. **Discussion and conclusion.** These findings have important implications for future interventions with Mexican adolescents. We must take sex differences into account to choose activities and strategies that will enhance the effects of the program.

Keywords: Disordered eating behaviors, thin ideal internalization, drive for muscularity, sedentary lifestyle, Mexican adolescents.

RESUMEN

Introducción. Los adolescentes constituyen el grupo con mayor riesgo de desarrollar conductas alimentarias de riesgo (CAR). Prevenir las es de suma importancia debido a las consecuencias físicas y psicosociales. **Objetivo.** Evaluar los efectos de un programa de prevención universal en conductas alimentarias de riesgo (CAR), interiorización del ideal de delgadez (IID), obsesión por la musculatura (OM) y sedentarismo en adolescentes mexicanos. **Método.** Estudio cuasi-experimental con medidas repetidas (*pre-test*, *post-test*, seguimiento a seis meses y un año) en una muestra no probabilística de 523 adolescentes (46.7% mujeres) de 15-19 años de edad ($M_{edad} = 16.07$). Se trabajó en dos escuelas preparatorias privadas, una como grupo control (GC) y otra como grupo intervenido (GI). Para mujeres y hombres, los datos se recolectaron usando el Cuestionario Breve para Conductas Alimentarias de Riesgo (CBCAR) y la versión corta del Cuestionario Internacional de Actividad Física (IPAQ). Para evaluar el IID en mujeres, se utilizó el Cuestionario de Actitudes hacia la Figura Corporal (CAFC) y en hombres la Escala para Obsesión por la Musculatura (DMS). **Resultados.** Después de un año, el ANOVA de medidas repetidas mostró una reducción significativa en la media de CAR, tanto en mujeres ($p = .01$) como en hombres ($p = .03$) del GI respecto al GC. En el GI, la media de IID en mujeres disminuyó significativamente, así como la media de OM en hombres. La actividad física aumentó en las mujeres del GI desde el *pre-test* hasta el *post-test*, sin embargo, el efecto no se mantuvo en el tiempo. **Discusión y conclusión.** Estos hallazgos tienen implicaciones para futuras intervenciones con adolescentes mexicanos. Se deben tomar en cuenta las diferencias por sexo para elegir las actividades y las estrategias que potenciarían los efectos del programa.

Palabras clave: Conductas alimentarias de riesgo, interiorización del ideal de delgadez, obsesión por la musculatura, sedentarismo, adolescentes mexicanos.

INTRODUCTION

Adolescents are the group with the highest risk of developing disordered eating behaviors (DEB; Neumark-Sztainer et al., 2018), also known as unhealthy eating behaviors (Neumark-Sztainer, Wall, Story, & Perry, 2003). Eating disorders (ED; American Psychiatric Association [APA], 2014) such as anorexia nervosa and bulimia nervosa and pathologies as muscle dysmorphia (MD) have a common factor: the DEB. MD is characterized by the obsession that one's body is not sufficiently lean and muscular (Pope, Olivardia, Gruber, & Borowiecki, 1999; Olivardia, Pope, & Hudson, 2000; Strother, Lemberg, Stanford, & Turberville, 2012) and is considered a subcategory of body dysmorphic disorder (APA, 2014).

While females prefer to engage in behaviors such as dieting, self-induced-vomiting, laxative abuse, and fasting (Sepúlveda, Carrobbles, & Gandarillas, 2008; Saucedo-Molina & Unikel, 2010), males focus on DEB associated with increasing muscle mass, like excessive exercising, binge eating, and anabolic steroids use (Compte, Sepúlveda, de Pellegrin, & Blanco, 2015; Arellano-Pérez, Vázquez-Cervantes, Fernández, & Saucedo-Molina, 2019). These male behaviors have been associated with the drive for muscularity (DM; Cafri et al., 2005), a factor linked to the development of MD (Pope, Gruber, Choi, Olivardia, & Phillips, 1997). In males, higher DM has been associated with higher ranges of DEB including use of anabolic steroids and supplements (Parent & Bradstreet, 2017; Lavender, Brown, & Murray, 2017). Another central risk factor associated with eating pathology is thin ideal internalization (TII). Mexican studies have identified a positive association between DEB and TII (Chávez, Saucedo-Molina, Peña, & Unikel, 2015; Saucedo-Molina & Unikel, 2010).

Adolescents often have sedentary lifestyles that include behaviors such as the time spent in front of a screen, sitting or lying down doing activities such as reading, watching television, playing video games, cell phone usage, or working at a computer (Noriega et al., 2015). Sedentary behaviors have a detrimental effect on health by increasing, adiposity, cardiovascular disease, cancer risk, risks of metabolic disorders (diabetes mellitus, hypertension, dyslipidemia, musculoskeletal disorders), and cognitive impairment (Park, Moon, Kim, Kong, & Oh, 2020). Although, at present, there are no global estimates of sedentary behaviors, the World Health Organization [WHO] (2018) has reported that over 80% of adolescents worldwide fail to engage in sufficient physical activity (PA). In our country, according to the Mexican National Health and Nutrition Survey (Encuesta Nacional de Salud y Nutrición [ENSANUT]) 2018-19 (Shamah-Levy et al., 2020) the average time sitting in front of a screen of adolescents aged 15 to 19 was 292.3 minutes/day, and 46.3% of them engage in less than the recommended amount of moderate-vigorous PA (WHO, 2020).

There are several effective eating disorder prevention programs with a range of approaches for a variety of populations that help to reduce existing eating disorder pathology. All these programs include multiple group sessions with interactive content delivered in a group format and targeting one or more eating disorder risk factors (Ciao, Loth, & Neumark-Sztainer, 2014). This is the case of "The Body Project," a dissonance-based eating disorder prevention intervention, which has been tested on 15 year-olds (Stice, Rohde, & Shaw, 2013). It has been applied in both male and female adolescents, showing that a prevention program focused on creating cognitive dissonance as regards pursuing the thin-ideal, for females, and the lean-muscular ideal, for males, can reduce body image concerns, ED and MD symptoms, as well as the risk of future onset of ED. The Body Project was recently implemented in male and female university students in Mexico, showing a significant effect on the TII (Unikel-Santoncini, Díaz de León-Vázquez, Rivera-Márquez, Bojorquez-Chapela, & Méndez-Ríos, 2019).

Various studies have shown that school-based prevention programs should be universal, as in the case of the "Eating, Aesthetic Feminine Models and the Media Program[®]." This program was administered to female junior high school students, showing that the perceived pressure to be thin was reduced and eating attitudes and knowledge of nutrition in all participants improved, with greater effect sizes being found among particularly high-risk groups (Raich, Portell, & Peláez-Fernández, 2010). "Torera" is a German school-based primary prevention program used in secondary schools. At-risk girls showed significant improvement, with small to medium effect sizes in eating behavior, significantly mediated by body self-esteem, whereas boys only improved with respect to eating attitudes, revealing a small effect size (Berger et al., 2014). Another example is the pilot study named "MABIC" (Medios de comunicación, Alimentación alterada, Burlas relacionadas con el peso, Insatisfacción Corporal/Means of Communication, Altered Eating, Weight-related Jokes and Body Dissatisfaction) applied to female Spanish adolescents. At one-year follow-up, girls in the intervention group showed significantly greater reductions in beauty ideal internalization, disordered eating attitudes, weight-related teasing, and body dissatisfaction (Sánchez-Carracedo et al., 2016). Another study called "StopOBEyTA" (Stop Obesity and Eating Disorders) was conducted in Mexican male and female university students. At three-month follow-up, a significant decrease in unhealthy eating behaviors was observed only in females. Self-esteem and body satisfaction were significantly improved in both males and females (Castillo, Solano, & Sepúlveda, 2016). The "POPS-program" (Potsdam Prevention at Schools) was applied to German male and female adolescents. The intervention group showed a more favourable course compared to the control group regarding all observed risk factors for ED. After one-year follow-up,

a significant effect on DEB was observed (Warschburger & Zitzmann, 2018). Recently also, in Germany, the universal prevention program “Mainz School Training of Eating Disorder Prevention” (MaiStep) designed to address a healthy population of adolescent school students, including males and females (Buerger et al., 2019), showed a significant difference in eating disorders diagnosis between the intervention groups and the active control group for post-intervention, relative risk and 12-month follow-up (Wolter, Hammerle, Buerger, & Ernst, 2021).

Against this background, the purpose of this study was to evaluate the effects of a universal prevention program for disordered eating behaviors (DEB), thin ideal internalization (TII), drive for muscularity (DM), and a sedentary lifestyle among male and female Mexican adolescents. Our hypotheses predicted that in the intervention group: 1. DEB would be significantly reduced in both male and female Mexican high school students over time, with differences by gender; 2. in females, the thin ideal internalization would significantly decrease over time; 3. in males, the drive for muscularity would significantly decrease from pre-to-post-test and would continue to decrease during follow-up; and 4. participants would report increased moderate physical activity (MPA) from pre- to post-test with a significant sustained increase at follow-ups.

METHOD

Design of the study

A quasi-experimental study with repeated measures (pre-test, post-test, six-month and one-year follow-up) was designed.

Participants

A non-probabilistic sample of 523 adolescents (46.7% females) aged 15 to 19 ($M_{age} = 16.07$; $SD = .99$) was used.

Places

We worked with two private high schools in Hidalgo, Mexico, one of which was used as a control group (CG) and the other as an intervention group (IG). The IG received the prevention program named PECANSS while the CG received the usual health education. Both schools are in the same urban setting from Hidalgo, Mexico, and pupils were drawn from similar socioeconomic backgrounds.

Procedure

Recruitment took place during the August 2016-August 2017 school year and included students from the first to the

fifth semesters. Once approval to carry out the study had been obtained from the school authorities, we distributed the consent forms. Before launching the program, we obtained informed consent from the parents or legal guardians and the participating students. All students who agreed to participate were asked to complete the questionnaires in the classroom four times. Students enrolled in the undergraduate degree program in nutrition at the Universidad Autónoma del Estado de Hidalgo (UAEH) were trained as facilitators. The prevention program used, called “Prevention of Unhealthy Eating Behaviors and Sedentary Lifestyle” (Spanish acronym PECANSS, Prevención de Conductas Alimentarias No Saludables y Sedentarismo) was based on the Body Project Program (Stice, Shaw, Burton, & Wade, 2006) and the “Eating, Aesthetic, Feminine Models, and Media Program”[®] (Raich, Sánchez, & López, 2008). It consisted of five activity-based sessions, delivered on five consecutive days. The program was the same for males and females and incorporated a variety of dissonance-based interventions together with interactive psychoeducational strategies to enable participants to express their opinions, engage in discussions and examine the information provided at each session. Together, these activities have been shown to produce cognitive dissonance, which encourages subjects to reduce their pursuit of a muscular but lean body for males and the body-thin ideal in females (Stice, Rohde, Shaw, & Gau, 2011).

Session one began with an appraisal of the concept of beauty in history, emphasizing the drastic changes in size for female and male models. Students critique and discuss these body ideals promoted through advertising. At the end of the second session, which focuses on myths and realities about dieting and supplements, students are invited to write a dissuasive letter to a friend or family member who engages in certain DEBs or is obsessed with muscularity. This dissonance-based intervention has been used by Stice et al. (2007; 2008; 2011; 2012; 2015) in several of his studies. Sessions three and four contain nutritional content to correct false beliefs about eating and nutrition and to provide information on nutrients’ food content, healthy eating behaviors, and sample healthy menus. Each one of these visual presentations was produced by a professional designer in a multimedia Microsoft Power-Point format, including multiple visual effects, keywords, and various photos of famous Mexican personalities who represent dominant aesthetic models which can be updated in keeping with their popularity levels in Mexico. These first four sessions (lasting one hour) were followed by another hour of enjoyable PA. This hour of PA took place inside or outside the classroom depending on the weather. The goal was for all groups to receive the same session on the same day.

The final 90-minute session consisted of three parallel workshops and was organized in such a way that all groups participated in the three workshops on the same day.

The materials used in the workshops are cheap and easily available. For example, in the first one, in which participants make posters opposing the thinness culture, they were asked to bring in magazines from which they would be asked to cut out photographs and images, bond paper or cardboard, colored markers, scissors, sticky tape, and glue sticks. For the second workshop, students, organized into teams, received a box kit containing several color photos of foods so that they can make a healthy menu, sticking the photos on bond paper or cardboard. It is important to note that the foods chosen for the box kit were based on the Mexican System of Equivalent Foods (Pérez-Lizaur, Palacios, & Castro Becerra, 2014).

The third workshops were a rally in which participants, organized into teams, engaged in various physical activities using materials such as gunny sacks, balloons, balls of diverse sizes, clothes (sweaters, pants, sweatshirts), plastic bottles, chairs, wooden sticks, and yarn.

PECANNS has three manuals whose contents and activities were developed by a multidisciplinary team (including nutritionists, psychologists, and a physical trainer) and designed by the same professional designer in the InDesign program. This makes it possible to have both printed and digital manuals.

Presentation manual: this was developed as a theoretical-practical guide providing a description of how each session should be given including the duration of each slide and presentation.

Physical activity manual: this manual consists of two sections. The first corresponds to the physical activities that can be performed outside. The second includes the physical activities that can be carried out inside. Physical activity sessions are described both in the text and visually through specific photographs together with the duration of each activity including warm-up and relaxation phases. The manual describes the material required to perform the corresponding physical activity session. Each of the first four presentations described above, has its own physical activity session.

Multiactivity manual: Participants are divided into three one-and-a-half-hour workshops conducted in parallel. Each participant takes part in each group in turn. The first workshop involves making posters opposing thinness culture. The second involves the design of healthy menus using teaching materials such as food photographs. The third is a competition in which students have to overcome various challenges and engage in enjoyable physical activity such as races, the high jump and so on. Participants work in teams of seven to ten. At the end of each workshop, the winning team is announced and given a prize. The remaining activities and content of the PECANSS are described in Table 1.

Measurements

The Brief Questionnaire on Disordered Eating Behaviors (BQDEB; Spanish acronym CBCAR) was used to measure

DEB in both males and females. It consists of 10 questions scored using a standard, 4-point Likert-type scale (never or rarely = 0 to very often/more than twice a week = 3; Unikel-Santoncini, Bojórquez-Chapela, & Carreño-García, 2004). For the females sample, the questionnaire reported a Cronbach's alpha coefficient of .722 (95% CI = [.66, .77]) and .67 for males (95% CI = [.61, .73]). These values were very similar to that obtained by Saucedo-Molina and Unikel (2010).

In females, thin ideal internalization (TII) was measured using the Attitudes toward Body Figure Questionnaire. This instrument consists of 15 items and has a four-point Likert-type scale for responses ranging from 1 (never or rarely) to 4 (very often; Unikel-Santoncini, Juárez, & Peresmitré, 2006). The internal consistence of the scale for the females sample studied was .91 (95% CI = [.89, .93]).

Male respondents answered the Mexico version of the DMS (Escoto et al., 2013). The instrument is based on 15 items in a standard, six-point Likert-type scale ranging from 1 (always) to 6 (never). The Cronbach's alpha coefficient for male participants was .85 (95% CI = [.82, .87]).

The short form of the International Physical Activity Questionnaire (IPAQ), using the version validated in Mexico (Medina, Barquera, & Janssen, 2013), was used to evaluate PA in both females and males. The instrument asks about walking as well as moderate and vigorous physical activities (in days and minutes over the past week). To achieve a better interpretation of PA duration, WHO (2012) recommendations for adolescents (adolescents should engage in 30 minutes of vigorous PA daily or 60 minutes of moderate (MPA) were taken into account. On the basis of these recommendations, three levels of MPA were defined by multiplying 60 minutes by seven days of the week: 1. < 420 minutes/week being equivalent to a low level of MPA, 2. \geq 420 minutes/week being equivalent to a MPA level, and 3. \geq 840 minutes/week being a high MPA level.

Statistical analysis

All calculations were performed using SPSS (version 24). Repeated measures analysis of variance (ANOVA; RMA) was used to determine the effects of the program (PECANNS). Since not all the variables met the Mauchly Sphericity assumption criteria, they will be reported through Wilks' Lambda. RMA tests were therefore performed by group to assess evolution over time and pairwise comparisons were made using the Bonferroni test. In the DEB and MPA models, time was a four-level within-subjects factor (pre-test, post-test, six-month, and one-year follow-ups) and gender was a two-level between-subjects factor. For the TII model in females and the DM model in men, time was a four-level within-subjects factor. Finally, Eta square (η^2) was calculated to indicate the size effect of the intervention. A value of $p < .05$ was adopted as an indicator of an adequate level of significance.

Table 1
Disordered eating behaviors and sedentary lifestyle prevention program (Programa de Prevención de Conductas Alimentarias No Saludables y Sedentarismo [PECANSS])

Sessions	Activities
Session 1* What does thinness culture mean?	We discuss the culture of thinness, the way it is promoted in the media and how the latter convey messages with unrealistic ideas about body image, the thin-ideal and healthy bodies. Participants engage in a discussion about these false ideas with the aim of creating inconsistent cognitions between them in order to achieve a change of attitudes regarding thinness culture.
Session 2* Myths and realities: dieting and supplements	We describe the focus of this second session: namely, 'magic diets', 'supplements' (anabolic steroids) and the main myths surrounding them. We establish the difference between real dietary supplements and anabolic steroids and their main health risks. We also discuss the most common disordered eating behaviors and outline the concept of a healthy diet. At the end of the session, participants are invited to write a letter to discourage a friend or relative who has engaged in some form of DEB or has used 'supplements', or had obsessive ideas about muscularity.
Session 3* To eat or not to eat? That is the question	This session concerns eating, nutrition, nutrients and healthy eating behaviors. The aim is to provide relevant information and help correct misconceptions in order to change basic cognitive concepts about these topics. Young people are asked to engage in verbal exercises answering the question of whether or not to eat. They are also asked about the meaning of nutrition and eating as well as each nutrient, and their importance and functions in our everyday diet. These activities theoretically result in psychological discomfort (cognitive dissonance), which encourages participants to reduce behaviors such as dieting and meal skipping and to understand the real meaning of diet.
Session 4* We are not just any machine	First, an overview is provided of the previous session. Participants are then told that the purpose of this session is to help them identify the food groups and the nutrients provided by each one. Healthy eating strategies are discussed together with the importance of regular meals, especially breakfast. We end with an example of a healthy menu for both young women and men. A healthy menu based on the Mexican System of Equivalent Foods (Pérez-Lizaur & Palacios, 2014)
Session 5 Multiactivity	Participants are divided into three one-and-a half-hour workshops conducted in parallel. Every participant participates in each group in turn. The first workshop involves making posters opposing thinness culture. The second involves the design of healthy menus using the food-box kit. The third workshop is a competition in which students face various challenges, engage in enjoyable physical activity such as races, the high jump and so on. Participants work in teams of seven to ten. At the end of each workshop, the winning team is announced and given a prize.

Note: *At the end of the first four sessions, participants engage in one hour of enjoyable physical activity. (Saucedo-Molina et al., 2018)

Ethical considerations

This study was performed in line with the principles of The Declaration of Helsinki, and it was approved by the Ethics and Research Committee of the Institute of Health Sciences of the UAEH (No. 044).

RESULTS

Demographic characteristics and the mean of the primary outcomes for the IG and CG are summarized in Table 2. Findings indicated no significant baseline differences between them regarding sex, DEB, TII, or DM. Significant differences were found for age ($p < .01$) and MPA ($p < .04$), with emphasis being placed on the fact that the CG performed more minutes of MPA per week than the IG.

With respect to the first hypothesis, in IG females, a statistically significant interaction effect between group and

time was observed from baseline to one-year follow-up (Table 3). Significant differences also emerged for both time and group ($p < .05$). Unlike the CG, the mean DEB score significantly decreased over time in the IG (T_0 , $M = 6.31$ vs. T_1 , $M = 5.03$ vs. T_3 , $M = 5.07$ vs. T_4 , $M = 4.70$) with a moderate effect size. In IG males, group x time interaction showed significant differences. Though the mean DEB score significantly decreased over time in males of the IG (T_0 , $M = 4.78$ vs. T_1 , $M = 4.73$ vs. T_3 , $M = 4.61$ vs. T_4 , $M = 3.79$), but not in those in the CG, the effect size was small. Results failed to reveal any significant differences by group or time ($p > .05$).

In relation to the second hypothesis, the results showed a significant reduction over time ($\lambda = .832$, $F [3,168] = 11.335$, $p < .01$, $\eta^2 = .168$). However, group x time interaction showed a marginal significance ($\lambda = .958$, $F [3,168] = 2.458$, $p = .065$, $\eta^2 = .042$). In IG females, mean TII decreased over time, a change that was maintained over time, while the mean TII of the CG increased significantly at one-year follow-up (Table 3).

Table 2
Comparison of demographic, characteristics, and dependent variables on the baseline (pre-test) between Intervention Group vs. Control Group

Characteristics	M (SD)		p
	Intervention Group (IG) (n = 257)	Control Group (CG) (n = 266)	
Demographic characteristics			
Age	15.96 (0.90)	16.18 (1.04)	2.53 (.01)*
Sex			
Females	46.7%	44.7%	.20 (.65)**
Males	53.3%	55.3%	
Dependent variables			
DEB	5.46 (3.93)	5.59 (4.19)	.38 (.71)*
TII (females)	30.13 (9.95)	28.89 (8.75)	1.02 (.31)*
DM (males)	37.58 (12.53)	39.91 (14.0)	1.43 (.15)*
MPA (min/wk)	330.14 (159.97)	358.35 (148.05)	2.09 (.04)*

Notes: * Statistically significant $p < .05$ for t-test; **Statistically significant $p < .05$ for χ^2 -test; DEB = Disorder Eating Behaviors; TII = Thin Ideal Internalization; DM = Drive for Muscularity; MPA = Moderate Physical Activity.

In male adolescents in the IG, the hypothesis was accepted, because findings showed a significant reduction of DM over time ($\lambda = .839$, $F [3.167] = 10.69$, $p < .01$, $\eta^2 = .16$). In IG, the mean drive for muscularity score significantly decreased from pre-test to post-test. This change was maintained over time, which was not observed in the CG (Table 4).

Finally, the last hypothesis in which it was posited that subjects would report an increased MPA from pre- to post-test with a significant sustained increase at follow-up was not answered. Females in both groups showed a significant difference with respect to time ($\lambda = .950$, $F [3.169] = 2.99$, $p < .05$, $\eta^2 = .05$). The mean of MPA measured in minutes/week showed the same tendency, yet it was a decreasing one in both groups at follow-up. In males, MPA did not showed a

significant interaction group x time. However, a significant difference was observed over time ($\lambda = .941$, $F [3.176] = 3.67$, $p = .01$, $\eta^2 = .06$). The mean of MPA in minutes/week in both groups showed an overall linear decrease. Likewise, significant differences were observed between groups ($F [1.178] = 4.45$, $p < .05$, $\eta^2 = .02$), probably because we found a significant difference between groups at baseline. The CG engaged in more MPA than the IG and that difference was maintained from pre-test to one-year follow-up.

DISCUSSION AND CONCLUSION

Our findings answered the first hypothesis, which predicted that in the intervention group DEB would be significantly reduced in both males and females. PECANSS significantly decreased the mean DEB scores of the IG over time, compared with the subjects in the CG, which was similar to the results reported by Warschburger and Zitzmann (2018) in a universal school-based eating prevention program applied to male and female adolescents. Our results also agree with those of other Mexican studies, which using universal prevention programs based on dissonance cognitive theory were able to significantly reduce DEB in similar samples of students (Saucedo-Molina, Villarreal, Oliva, Unikel, & Guzmán, 2018; Unikel-Santoncini et al., 2019; Castillo et al., 2016). However, it is important to underline that in males in the IG, the decrease in mean DEB scores was statistically significant after reinforcement at six-month follow-up and more evident in the one-year follow-up measure. Even though the mean DEB score significantly decreased in males in the IG, as in Berger et al. (2014), the size effect in this group was small, possibly because their DEB rates were already low, producing a floor effect (Saucedo-Molina et al., 2018; Stice, Shaw, & Marti, 2007; Stice et al., 2011). The existence of a floor effect is supported by the men’s mean baseline score (4.78), which was far below the

Table 3
Intervention effects between Control Group vs. Intervention Group, time and interaction in females

Dependent Variables	N	Pre-test (baseline)	Post-test	Six-month follow-up	One-year follow-up	ANOVA F (G; T; GT)	Effect Size η^2 (G; T; GT)	W-L
		M (SD)	M (SD)	M (SD)	M (SD)			
DEB								
CG	71	6.56 (4.64)	6.20 (4.86)	6.28 (4.59)	6.56 (4.64)	3.99*; 4.72*; 3.88*	.02; .08; .06	.920
IG	102	6.31 (4.29)	5.03 (3.51)	5.07 (3.55)	4.70 (3.33)			
TII								
CG	71	29.42 (8.94)	28.30 (10.27)	28.28 (8.59)	30.31 (9.57)	1.68; 11.33*; 2.45	.01; .16; .04	.832
IG	101	29.50 (9.75)	26.73 (8.68)	26.60 (8.67)	26.93 (9.14)			
MPA (min/wk)								
CG	71	296.46 (149.92)	304.63 (134.45)	271.95 (129.66)	282.32 (119.60)	1.94; 2.99*; .33	.01; .05; .00	.950
IG	102	262.81 (131.58)	287.06 (137.93)	258.56 (119.65)	259.56 (145.10)			

* Statistically significant $p < .05$.

Notes: G = Group; T = Time; GT = Group interaction by time; Effect Size η^2 : .01 = small; .06 = moderate; .14 = big.

W-L = Wilks’ Lambda; DEB = Disorder Eating Behaviors; TII = Thin Ideal Internalization; MPA = Moderate Physical Activity.

Table 4
Intervention effects between Control Group vs. Intervention Group, time and interaction in males

Dependent Variables	N	Pre-test (baseline) M (SD)	Post-test M (SD)	Six-month follow-up M (SD)	One-year follow-up M (SD)	ANOVA F (G; T; GT)	Effect Size η^2 (G; T; GT)	W-L
DEB								
CG	87	5.03 (3.79)	4.63 (3.87)	5.15 (4.05)	5.73 (5.69)	2.04; .25; 3.01*	.01; .00; .05	.950
IG	93	4.78 (3.27)	4.73 (4.43)	4.61 (4.26)	3.79 (3.46)			
DM								
CG	81	38.79 (13.23)	36.41 (13.49)	35.98 (12.61)	35.46 (13.96)	3.33; 10.69*; 1.09	.02; .16; .02	.839
IG	90	37.44 (11.98)	32.48 (12.54)	32.05 (11.69)	32.35 (14.51)			
MPA (min/wk)								
CG	87	400.41 (132.92)	383.83 (132.04)	356.10 (132.04)	377.59 (148.42)	4.45*; 3.67*; .64	.04; .06; .01	.941
IG	93	358.02 (156.55)	360.34 (168.55)	328.27 (178.79)	325.41 (154.48)			

* Statistically significant $p < .05$.

Notes: G = Group; T = Time; GT = Group interaction by time; Effect Size η^2 : .01 = small; .06 = moderate; .14 = big.

W-L = Wilks' Lambda; DEB = Disorder Eating Behaviors; DM = Drive for Muscularity; MPA = Moderate Physical Activity.

BQDEB (> 10) cut-off point for identifying adolescents at risk of developing an ED.

With respect to the second hypothesis, concerning females only, the data showed a significant decrease in the mean TII score in IG after the intervention, which was sustained in the long-term. These findings tally with previous studies in which a reduction of this variable has been achieved in female samples (Unikel-Santoncini et al., 2019; Sánchez-Carracedo et al., 2016; Stice et al., 2013; McVey, Tweed, & Blackmore, 2007). It is worth mentioning that in females in the CG, both the mean DEB score and the mean TII score significantly increased over time, perhaps because they did not receive the prevention program and, it has been reported that both TII and DEB increased (Chávez et al., 2015; Saucedo-Molina & Unikel, 2010).

Our third hypothesis, proposed exclusively for males, was only proven partially because we did not find significant group interaction effects on the mean DM score. Nevertheless, in the IG, DM significantly decreased after the intervention and it was sustained until one-year follow-up. A decrease in the mean DM score from pre-test to post-test was also observed in the CG, but was not statistically significant, meaning that the changes were related to time. These findings agree with those of other studies which have included men in similar prevention programs, and whose results have not been as expected (McVey et al., 2010; Sepúlveda, Carrobes, Gandarillas, Poveda, & Pastor, 2007). Even though the prevalence of eating pathologies in men has increased in recent years (Escoto, Camacho, Álvarez, Díaz, & Morales, 2012; Compte et al., 2015; Chávez et al., 2015), they are difficult to address (Murray et al., 2017). Whereas females engage in eating behaviors in the quest for thinness, males are more motivated to gain weight rather than lose it, mainly in the form muscle mass (Magallares, 2016; Strother et al., 2012). Some approaches (Murray et al., 2017; Lavender et al., 2017) therefore argue that different features of ED are related to the DM. Rodgers, Ganchou, Franko, and

Chabrol (2012) have proposed a model in which there is a relationship between DEB and the DM, therefore, programs designed to reduce DEB could directly impact DM.

In relation to the last hypothesis that in the IG, participants would report increased MPA from pre- to post-test with a significant sustained increase at follow-up, our outcomes did not identify a significant increase in subjects in the IG over time, suggesting that the program failed to bring them closer to the WHO (2012) recommendations regarding PA for adolescents. This finding differs from that of Saucedo-Molina et al. (2018), whose data identified a significant increase in MPA duration in the total sample at six-month follow-up. One explanation could be that Saucedo-Molina et al. (2018) worked with a public high school, where subjects engaged in less physical activity at the beginning of the program compared to the sample in the present study. Another reason could be associated with the fact that our sample was drawn from private high schools where more MPA was recorded at baseline measurement. It has been reported that private schools have access to a greater and more varied number of sports thus offering their students a broader array of activities, and at the same time, placing a greater curricular value on physical education subject. Moreover, levels of PA are higher in adolescents of upper and upper-middle socioeconomic status (Estrada, Cruz, & Aguirre, 2010).

Regarding MPA, females in the IG showed a small increase from pre- to post-test, although this change was not sustained in any of the follow-ups. This result is consistent with some research (McVey, Davis, Tweed, & Shaw, 2004; Stice et al., 2011) in which similar changes were not maintained over time. The basal measure of MPA in males in the IG was 358.02 min/week, value which is quite close to the WHO (2012) recommendations (420 min/week). This non-significant change in the duration of PA in this group may be reflecting a ceiling effect (Stice et al., 2007; 2008; 2011) since all the subjects scored near the top of the cut-off

score (Clark-Carter, 2004). It should be noted that a significant difference was observed between groups in males because subjects in the CG (400.41 min/week) engaged in more PA than IG subjects with these differences being maintained over time. Lastly, our data confirm that males, in both the IG and CG, tend to engage in more physical activity than females (Carrillo et al., 2017; Saucedo-Molina et al., 2015; Estrada et al., 2010).

The main contribution of this study was to offer empirical knowledge on the field of ED in both male and female Mexican adolescents so as to provide an effective strategy for bringing about changes in them that will benefit their health and well-being. Another important contribution lies in the fact that the program was universal, and therefore benefitted a larger number of participants. Moreover, according to Marchand, Stice, Rohde, and Becker (2011) this intervention considerably reduces the stigmatization that may occur in selective and indicated interventions because including subjects with different characteristics and risk levels strengthens the bond between group members and prevent prejudices that make them feel uncomfortable or even discriminated against. In addition, the facilitators were young university students, which created greater empathy with the participants, who regarded them as peers (Stice et al., 2015).

The main limitation of this study is the inability to generalize outcomes to Hidalgo adolescents as we were not dealing with a state-wide probabilistic sample. Nevertheless, the findings are valid because the same questionnaires and methods were administered at two high schools from the same geographic zone with similar economic status. Moreover, we were able to avoid contaminating the groups because one of the schools was designated as a CG and the other was as an IG. Sex differences must take into account choosing activities and strategies that will enhance the effects of the program.

These findings follow up on the pilot study conducted on Mexican adolescents at a public high school (Saucedo-Molina et al., 2018). This second intervention contributes significant empirical evidence on the effects of PECANSS in reducing DEB and sedentary behaviors in male and female adolescents. To enhance the effects of PECANSS, major changes were included in this second application. We worked with a CG vs. IG; we incorporated an after six-month reinforcement to the IG, which involved giving the entire multiactivity session to all the IG participants and incorporating a one-year follow-up measurement. However, there is a need to strengthen and diversify the strategies for the improvement of the PA to create adherence and maintaining the long-term effect. In addition, we considered creating two versions of the program, one for males and one for females to improve PECANSS application in future interventions with Mexican adolescents. Finally, based on these findings, we are hoping to present the program to the health and education authorities of the state of Hidalgo for

its application in a large number of high schools, initially at the local level.

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Conflict of interest

The authors declare they have no conflicts of interest.

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