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Tendency to Avoid Physical Activity and Sport: Associations with Weight Stigma, and Psychological Distress in a Two-Wave Longitudinal Study

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ABSTRACT

Background: Physical inactivity is a major public health problem worldwide that results in physical and mental health problems. One major issue for physical inactivity is weight stigma (WS), especially perceived WS, which could lead to a tendency to avoid physical activity (PA). To better understand the association between perceived WS and PA, knowledge of the likely mediators in this association such as weight bias internalization (WBI) and psychological distress were investigated in the present study.

Method: Using a two-wave longitudinal study and convenient sampling, 388 Taiwanese participants (55% females; mean age = 29.7 years [SD ± 6.3]) completed two surveys six months apart. Body mass index (BMI), Perceived Weight Stigma Scale (PWSS),



Weight Bias Internalization Scale (WBIS), Depression, Anxiety, Stress Scale (DASS-21), and Tendency to Avoid Physical Activity and Sport Scale (TAPAS) were assessed. **Results:** A mediation model controlling for age, gender, and BMI with 5000 bootstrapping resamples was performed. Perceived WS exerted significant direct effects on WBI ($\beta = 0.25$; $p < 0.001$), psychological distress ($\beta = 0.15$; $p = 0.003$), and tendency to avoid PA ($\beta = 0.10$; $p = 0.027$); WBI exerted a significant direct effect on tendency to avoid PA ($\beta = 0.47$; $p < 0.001$). Standardized indirect effects of WBI and psychological distress on the association between perceived WS and tendency to avoid PA were 0.12 and 0.01, respectively. **Conclusion:** Given the direct association of perceived WS on the tendency to avoid PA and the mediating role of WBI in this association, interventions addressing perceived WS and WBI may contribute to promoting PA. Therefore, health interventionists (both when planning and executing PA programs) need to consider weight stigma when encouraging physical activity.

KEYWORDS

Mediation model; physical activity; psychological distress; weight stigma; young adults

Introduction

Physical inactivity is an important health-threatening issue among young people. This may result in individuals developing obesity (the most common metabolic disorder) [1]. Moreover, over 13% of adults are diagnosed as obese [2], with a growing prevalence globally, including in East Asian countries [3]. For example, a recent population health survey reported nearly 33% of 15–84-year-old individuals in Hong Kong were obese [4]. The prevalence of obesity in Taiwan increased from 11.5% in 1996 to 23% in 2016 [5]. Although obesity (body mass index [BMI] at 30 kg/m² or above for Westerners; 25 kg/m² or above for Asians) and being overweight (BMI between 25 and 29.99 kg/m² for Westerners; 23 and 24.99 kg/m² for Asians) [6] are defined differently, their impacts on health are similar and hereafter, the present study uses the two terms interchangeably. Moreover, it should also be noted that the use of terms like ‘overweight’ and ‘obese’ (as defined by BMI measures) may also contribute to weight stigma (WS). Therefore, neutral word such as ‘higher weight’ may be preferable daily. However, the present study uses the terms ‘overweight’ and ‘obese’ because they are commonly used in the literature.

Individuals who have concerns about weight (especially those who are overweight) are at a higher risk for psychological distress than the general population [7]. Those who are overweight report elevated levels of psychological distress, body dissatisfaction [8], impaired self-esteem, and exposure to bullying [9,10]. Moreover, several longitudinal studies have emphasized that weight stigma rather than weight itself may cause psychological distress [11–13].

WS is defined as a kind of social devaluation among those who have weight concerns, even for those who are not overweight [14]. WS can be classified into different forms. In the present study, two specific types of WS were examined: perceived WS (how individuals perceive other people’s negative thoughts, feelings, and behaviors toward him/her) and weight bias internalization (WBI; how individuals accept the perceived weight stigma toward themselves) [15]. In most cultures and communities, body shapes beyond regular norms are exposed to judgment and frequent teasing in different situations, including education, job, and healthcare settings [16].

In general, WS may be considered as a risk factor for chronic stress, increased psychological distress, and lower engagement in healthy lifestyle, such as physical activity (PA) engagement and having a healthy diet [13,17]. Thoughts of victimization may also lead to suicidal behaviors/thoughts among this population due to being overweight [15]. Moreover, increasing evidence indicates that psychological distress may contribute to the development and continuity of being overweight [18]. For example, individuals having WS may use unhealthy coping strategies such as overeating and tend to engage in sedentary behaviors, which exacerbate weight gain [19].

The severity of perceived WS can include behaviors such as job discrimination [14]. Moreover, individuals who are overweight can experience isolation, rejection, feeling unattractive, feeling less competent, and feeling less intelligent due to stigmatization by strangers, friends, and even members of their own family [11,13]. There is also a significant association between increased risk of stress and stigmatization [19]. Moreover, psychological stress may concurrently be considered as one of the causes and outcomes of WS [8,20].

Frequently experiencing WS may be coupled with the perception of individual negative stereotypes and beliefs of being socially devalued, which may lead to internalizing weight bias [21]. Individuals may engage in a self-devaluation process and experience chronic stress due to being stigmatized for their weight irrespective of excess or not. This may lead to the development of WBI. Unfortunately, there is less information regarding WBI than WS is caused by social discrimination [22]. Nevertheless, studies have shown that WBI exists among individuals with all types of weight status and is associated with psychological distress and eating disorders [23].

However, some scholars have argued that WBI does not exist among individuals without weight problems but as other forms of disturbance (e.g., body image concerns) [24]. Nevertheless, the contribution of WBI (or body image disturbance; hereafter, WBI is used to indicate body image disturbance/concerns) to lowering engagement in health-promoting activities by negatively affecting self-efficacy has also been demonstrated [25]. Indeed, feelings such as not wanting to exercise and laziness are negative weight-related stereotypes may decrease self-efficacy and cause

unwillingness to engage in a healthy lifestyle [23,26]. Therefore, a likely factor for this population's the high prevalence of physical inactivity may be related to WBI.

Adolescents who sought treatment for obesity with less WS have shown a stronger desire to engage in PA than those with frequent WS exposure [27]. Similarly, youth who report more frequent WBI have lower levels of PA [28]. However, other studies have not reported significant associations between WS and PA [29,30]. They proposed other pathways that may mediate the associations between WS and PA. For example, PA and engagement in sports to get fit may provide a protective effect against social discrimination and WS, suggesting an interaction in this association [31]. Similarly, the positive effects of PA to decrease depressive symptoms and stress manifestations have been reported [32]. Therefore, further research is needed to assess the extent to which WS may influence PA and other factors that may affect this relationship is needed.

The present study investigated how perceived WS affects the tendency to engage in PA and whether WBI and psychological health mediate this relationship. Accordingly, the following two hypotheses (H_s) were proposed: (i) there would be a significant association between perceived WS and a tendency to avoid PA (H_1), and (ii) WBI and psychological distress may play mediating roles between direct associations of perceived WS with a tendency to avoid PA (H_2). Since most studies suggest a direction from stigmatization towards the tendency not to engage in PA, the likely causal direction between them was also investigated. Moreover, examining the associations over time provides a better picture of the relationships between these variables (perceived WS, WBI, psychological distress, and tendency to avoid PA) than cross-sectional designs. Therefore, the present study comprised longitudinal data collection over two waves (six months apart) to examine changes in the study's variables over time.

Methods

Transparency and openness

The data, procedures, ethical code, and statistical software used are appropriately cited in the text. The corresponding author can request the data used for analyses in the present study. The present study was not preregistered in its design, hypotheses, or analyses. Using a Monte Carlo simulation calculator (https://schoemanna.shinyapps.io/mc_power_med/, accessed on 25 April, 2024) with moderate effect sizes of the studied variables (i.e., $r = 0.3$ for every two studied variables) [33,34], the required sample size to have significant parallel mediation effects with power at 0.9 is between 250 and 300.

Participants and recruitment procedure

The present study convenience sampling to recruit participants for a two-wave longitudinal design. For the first data collection (T1), 592 participants completed an online survey between August and September 2022. More specifically, the present authors posted a link to the online survey on social media platforms (e.g., Facebook and LINE) that are commonly used in Taiwan. If an individual

(irrespective of weight status) was interested in participation, they could log onto the online survey via the link to complete the questions hosted on the SurveyMonkey platform.

Participants' informed consent was obtained using the following method. The first page of the online survey clearly described the study's purpose and the participants' rights (e.g., the participant could withdraw anytime without any consequences). The participants could begin answering the survey after they had clicked the 'agree' icon on the first page. The online survey ended immediately if the participant clicked the 'disagree' icon. At the end of the online survey, the participants were requested to leave their contact email or cellphone number if they were interested in participating in the second wave of the study (i.e., Time 2). All the participants who provided their contact information were invited six months later to participate in the second wave of data collection. The first page of the T2 survey restated the study's purpose and the participants' rights. Again, only when the participant clicked the 'agree' icon could the participant complete the survey at T2. Moreover, only data from participants who completed both surveys were used for the formal analyses in the present study.

When a follow-up rate is between 60% and 80% (i.e., attrition rate <40%), the nonsignificant or trivial differences of demographics lost-to-follow-up suggests no severe biases [35,36], procedures for T1 and T2 surveys adhered to the (i) Declaration of Helsinki and (ii) ethical principles for medical, psychological, and sociological research involving human participants. The National Cheng Kung University Human Research Ethics Committee approved the study protocol (Approval No. NCKU HREC-E-110-486-2) before the authors distributed the online survey. Participants signed the informed consent form for the present study.

Measures

Demographics. The participants reported answers to the following demographic variables: age (in years), gender (male, female, or other), height (in cm), and weight (in kg). The height and weight information were then used to calculate the body mass index (BMI) with the unit of kg/m^2 (i.e., weight in kilograms divided by the squared height in meters). Moreover, according to the WHO definition (among Asians), a BMI between 23 and 24.99 kg/m^2 indicates being overweight, and a BMI of 25 kg/m^2 or above indicates obesity [6].

Perceived Weight Stigma Scale (PWSS). The PWSS contains 10 items assessing how an individual perceives or experiences weight stigma (WS) [37]. All the PWSS items (e.g., "People act as if you are inferior") with a suffix stem of "Because of your weight" were rated using a dichotomized scale (yes vs. no), and a higher PWSS score (possible score range: 0–10) indicates higher levels of perceived WS. The PWSS has been reported to have good psychometric properties [38–40], including the Chinese version [41]. In the present study, the Cronbach's α of the PWSS was 0.86 (T1) and 0.84 (T2); McDonald's ω was 0.86 (T1) and 0.84 (T2).

Weight Bias Internalization Scale (WBIS). The original WBIS contains 11 items assessing how an individual

internalizes WS, especially for individuals who are overweight [42]. A modified WBIS was later developed for individuals with all types of weight categories [43]. All the WBIS items (e.g., “I am less attractive than most other people because of my weight”) are rated using a five-point Likert scale (1 to 5), and a higher WBIS score (possible score range: 11–55) indicates higher levels of weight-related self-stigma. The WBIS has been reported to have good psychometric properties [37,39,40,44], including the Chinese version [45]. In the present study, the Cronbach’s α of the WBIS was 0.90 (T1) and 0.90 (T2); McDonald’s ω was 0.91 (T1) and 0.90 (T2).

Depression, Anxiety, Stress Scale (DASS-21). The DASS-21 contains 21 items assessing psychological distress, including depression, anxiety, and stress [46]. All the DASS-21 items (e.g., “I found it hard to wind down”) are rated using a four-point Likert scale (0 to 3), and a higher DASS-21 score (possible score range: 0–63) indicates higher levels of psychological distress. The DASS-21 has been reported to have good psychometric properties [46], including the Chinese version [47]. In the present study, the Cronbach’s α of the DASS-21 was 0.93 (T1) and 0.95 (T2); McDonald’s ω was 0.94 (T1) and 0.95 (T2).

Tendency to Avoid Physical Activity and Sport Scale (TAPAS). The TAPAS contains 10 items assessing how an individual tends to avoid PA or sport [48] because of considerations regarding weight, appearance, or physical fitness. All the TAPAS items (e.g., “I find myself avoiding participating in sport because of my weight”) are rated using a five-point scale (1 to 5), and a higher TAPAS score (possible score range: 10–50) indicates higher levels of tendency to avoid PA and sport. The TAPAS has been reported to have good psychometric properties in the literature [48], including the Chinese version [49]. In the present study, the Cronbach’s α of the TAPAS was 0.94 (T1) and 0.94 (T2); McDonald’s ω was 0.94 (T1) and 0.94 (T2).

Statistical analysis

The participants’ demographics and scores on the measures were analyzed using descriptive statistics (e.g., means with standard deviations (SDs) and frequencies with percentages). Moreover, skewness and kurtosis values were used to examine if the continuous variables were normally distributed. When both skewness and kurtosis values are smaller than 3, normal distribution is supported. Pearson correlations were then used to examine the associations between the studied variables of PWSS, WBIS, DASS-21, and TAPAS scores at T1 and T2. A mediation model was then constructed to examine the mediating effects of WBIS and DASS-21 change scores in the association of PWSS with TAPAS change scores. In the mediation model, age, gender, and body mass index (BMI) were controlled for. The change scores of WBIS, DASS-21, PWSS, and TAPAS were calculated using their T2 scores minus T1 scores.

Moreover, a parallel mediation model was chosen to examine the mediating effect (i.e., Model 4 in the Hayes’ Process Macro) [50] and 5000 bootstrapping resamples were used to examine the mediating effects. The mediating effects are significant when the 95% confidence interval (CI) of the

bootstrapping resample findings does not include 0 [51]. All the statistical analyses were conducted using the IBM SPSS 20.0 (IBM Corp., Armonk, NY, USA).

Results

Among the 592 participants, 388 completed the Time 2 (T2) survey between February and April 2023 (34.4% attrition rate). There were no significant differences between the participants who completed two waves of surveys ($n = 388$) and those who only completed the T1 survey ($n = 204$) in terms of their gender (only completed T1: 45.1% male, 54.4% female, and 0.5% other; completed T1 and T2: 45.1% male, 54.6% female, and 0.3% other; $p = 1.00$) and body mass index (only completed T1: 23.89 [SD \pm 4.75]; completed T1 and T2: 23.93 [SD \pm 4.22]; $p = 0.92$). However, those who only completed the T1 survey were significantly younger than those who completed T1 and T2 surveys (28.12 years [SD \pm 6.37] vs. 29.65 years [SD \pm 6.27]; $p = 0.01$). Because the attrition rate was lower than 40% with nonsignificant to trivial differences between the retained and lost samples in the present study, the findings were not likely to have any severe biases.

The analyzed data included 388 participants who completed both T1 and T2 surveys. Over half of the 388 participants were female ($n = 212$; 54.6%), and one participant identified gender as other (0.3%), with the remaining participants being male ($n = 175$; 45.1%). Detailed information on the participants’ characteristics is presented in Table 1. In particular, over half of the participants did not have perceived weight stigma because 57.5% of the participants scored 0 for the PWSS at T1 and 59.3% at T2. Moreover, all the continuous variable scores were normally distributed (i.e., both skewness and kurtosis values < 3).

Table 2 presents the Pearson correlation coefficients between PWSS, WBIS, DASS-21, and TAPAS scores across T1 and T2. All the correlations were significant with the magnitude of r -values ranging between 0.24 and 0.69 (all p -values < 0.001). The mediation model results are presented in Table 3 and Fig. 1. More specifically, (i) PWSS score had significant direct effects on both WBIS (standardized coefficient [β] = 0.25; $p < 0.001$) and DASS-21 ($\beta = 0.15$; $p = 0.003$); and (ii) WBIS ($\beta = 0.47$; $p < 0.001$) but not DASS-21 ($\beta = 0.08$; $p = 0.077$) had significantly direct effects on TAPAS. In addition, the standardized indirect effect of (i) WBIS in the association of PWSS with TAPAS was 0.12 (bootstrapping SE = 0.04; 95% bootstrapping CI = 0.04, 0.20); and (ii) DASS-21 in the association of PWSS with TAPAS was 0.01 (bootstrapping SE = 0.01; 95% bootstrapping CI = -0.001, 0.03). The standardized total effect of PWSS on TAPAS (i.e., direct effect and indirect effects via WBIS and DASS-21) was 0.13 (bootstrapping SE = 0.04; 95% bootstrapping CI = 0.05, 0.21).

Result and Discussion

The present study was designed to investigate the associations between weight bias (WS) (including perceived WS and weight bias internalization [WBI]) and the tendency to

TABLE 1
Participants' characteristics (N = 388)

Variables	N (%)	Mean (SD)	Skewness	Kurtosis
Gender				
Male	175 (45.1)		–	–
Female	212 (54.6)		–	–
Other	1 (0.3)		–	–
Age (years)		29.65 (6.27)	0.07	–0.71
Height (cm)		166.43 (8.62)	0.20	2.34
Weight (kg)		66.64 (14.64)	0.95	2.51
Body mass index (BMI; kg/m²)		23.93 (4.22)	0.94	2.20
Weight status				
Non-overweight (BMI < 23 kg/m ²)		187 (8.2)	–	–
Overweight (BMI = 23 to 24.99 kg/m ²)		54 (3.9)	–	–
Obesity (BMI = 25 kg/m ² or above)		147 (37.9)	–	–
PWSS score at Time 1 (possible range: 0–10)		1.47 (2.32)	1.71	2.20
PWSS score at Time 2 (possible range: 0–10)		1.34 (2.18)	1.74	2.20
WBIS score at Time 1 (possible range: 11–55)		30.04 (8.36)	0.02	–0.41
WBIS score at Time 2 (possible range: 11–55)		29.29 (7.68)	–0.07	–0.51
DASS-21 score at Time 1 (possible range: 0–63)		14.05 (10.86)	1.02	1.05
DASS-21 score at Time 2 (possible range: 0–63)		13.68 (11.56)	1.08	0.98
TAPAS score at Time 1 (possible range: 10–50)		26.31 (9.27)	0.19	–0.80
TAPAS score at Time 2 (possible range: 10–50)		26.36 (8.85)	0.14	–0.68

TABLE 2
Correlation matrix of the studied variables

		Time 1				Time 2			
		PWSS	WBIS	DASS-21	TAPAS	PWSS	WBIS	DASS-21	TAPAS
Time 1	PWSS	–							
	WBIS	0.42	–						
	DASS-21	0.33	0.39	–					
	TAPAS	0.35	0.68	0.39	–				
Time 2	PWSS	0.62	0.29	0.27	0.24	–			
	WBIS	0.31	0.69	0.30	0.47	0.34	–		
	DASS-21	0.27	0.24	0.64	0.28	0.33	0.32	–	
	TAPAS	0.31	0.49	0.33	0.65	0.37	0.64	0.37	–

Note: PWSS = Perceived Weight Stigma Scale; WBIS = Weight Bias Internalization Scale; DASS-21 = Depression, Anxiety, Stress Scale; TAPAS = Tendency to Avoid Physical Activity and Sport Scale. All *p*-values < 0.001.

avoid physical activity (PA) among a convenience sample of the Taiwanese population. Moreover, the indirect associations between these two variables were assessed by including WBI and psychological distress as the mediators. The study findings indicated that while there was a significant association between the main variables of the study (i.e., perceived WS and tendency to avoid PA), there were significantly notable associations between the PWSS and both psychological distress and internalization of weight bias. The mediating role of WBI in the relationship between

the main variables was also significant. However, the indirect association between perceived WS and the tendency to avoid PA via psychological distress was not confirmed.

Several studies have assessed the relationships between WS and PA particularly among youth. In a cross-sectional survey, Ajibewa et al. [17] examined the relationship between prior WS experiences and PA intention among college students. The average body mass index (BMI) score was similar to that of the present sample (23.9 ± 4 kg/m²). They found that prior experiences with WS were

TABLE 3

Results of the mediation models of PWSS on TAPAS with WBIS and DASS as mediators

	Unstandardized coefficient (or effect)	SE (or bootstrapping SE)	t-value (or bootstrapping LLCI)	p-value (or bootstrapping ULCI)
Dependent variable = TAPAS				
Direct effect of PWSS on mediators				
WBIS	0.79	0.16	4.97	<0.001
DASS-21	0.75	0.25	3.05	0.003
Direct effect of PWSS on TAPAS				
Direct effect of PWSS on TAPAS	0.38	0.17	2.23	0.027
Direct effect of WBIS on TAPAS				
Direct effect of WBIS on TAPAS	0.57	0.06	10.30	<0.001
Direct effect of DASS-21 on TAPAS				
Direct effect of DASS-21 on TAPAS	0.06	0.04	1.78	0.077
Indirect effect of PWSS on TAPAS				
Through WBIS	(0.45)	(0.16)	(0.16)	(0.78)
Through DASS-21	(0.05)	(0.03)	(-0.003)	(0.13)
Total effect of PWSS on TAPAS	(0.50)	(0.17)	(0.19)	(0.85)

Note: PWSS = Perceived Weight Stigma Scale; WBIS = Weight Bias Internalization Scale; DASS-21 = Depression, Anxiety, Stress Scale; TAPAS = Tendency to Avoid Physical Activity and Sport Scale.

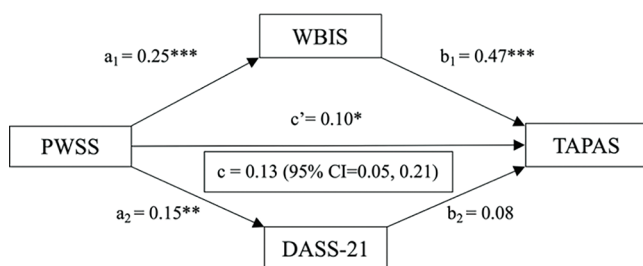


FIGURE 1. Results of the mediation model for Perceived Weight Stigma Scale (PWSS), Weight Bias Internalization Scale (WBIS), Depression Anxiety Stress Scale (DASS-21), and Tendency to Avoid Physical Activity and Sport Scale (TAPAS).

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; 95% CI = 95% bootstrapping confidence interval; a_1 = standardized coefficient from PWSS to WBIS; b_1 = standardized coefficient from WBIS to TAPAS; a_2 = standardized coefficient from PWSS to DASS-21; b_2 = standardized coefficient from DASS-21 to TAPAS; c' = standardized coefficient from PWSS to TAPAS (i.e., standardized direct effect); c = standardized total effect.

significantly associated with PA avoidance, while the association between WS and intention to do PA was non-significant [17]. Bevan et al. [48] in a similar study among college students that the development of the Tendency to Avoid Physical Activity and Sport Scale (TAPAS) (the scale used in the present study), recommended that due to the strong association between the WS and PA, any attempts to increase PA participation must firstly address WS concerns particularly among individuals who are overweight or have obesity [48]. A systematic review conducted in 2021 found 38 studies that investigated the associations between WS and PA. It was concluded that both perceived WS and WBI had significant associations with PA behaviors [16]. Moreover, direct and indirect effects of WS on PA were recognized which concur with the present study's findings. However, one specific matter that differentiates the present study's findings from previous results is the utilization of a

new scale to assess the tendency to avoid PA. Apart from the study by Bevan et al., all the previous studies' assessments were carried out by assessing PA behaviors through observation or self-report [16], whereas the present study did not assess the actual PA behaviors but rather the tendency to avoid such behaviors. It is believed that because the tendency to engage in or not to engage in a specific behavior may be a prerequisite of that behavior happening, it may provide more accurate information on the likelihood of its occurrence in the future.

To the best of the authors' knowledge, the present study is the first to investigate the indirect pathways between perceived self-stigma and the tendency to avoid PA. Previous studies have confirmed the association between WS, and the mediators used in the present study (WBI and psychological distress). For example, Romano et al. suggested that due to the strong association between perceived WS and WBI and since WBI may be an underlying factor for general WS, interventions focusing on WBI are recommended for individuals who are overweight or have obesity [21]. Shank et al., in assessing the relationships between WS, WBI, and physical health among military personnel who were mostly at-risk of obesity, found that while WS and WBI were positively associated, only WS predicted a medical condition among these individuals and the WBI was not a significant predictor [52]. This finding confirms that although these variables are very similar, each one assesses different things, and they may be considered as underlying contributors for explaining their associations with other biopsychological variables.

In a study relatively similar to the present one, O'Brien et al. [20] assessed the relationship between WS and eating disorders by examining WBI and psychological distress as the mediators. They recruited 632 college students to complete an online survey and reported a direct association between WS and eating disorders. In addition, indirect associations between these two variables via WBI and

psychological distress confirmed their mediating roles [20]. Although the measure used by O'Brien et al. to investigate WS differed from that of the present study, the same measures were used to assess WBI and psychological distress in both studies, suggesting consistency of measurement except for the dependent variable (eating disorders vs. TAPAS). Because diet and PA have determinative roles in weight-related problems, especially among those who are overweight or have obesity (and both are inter-correlated), similar results for both studies would be expected.

However, in the present study, the indirect association between WS and the dependent variable (i.e., PA) via psychological distress was non-significant (unlike the study by O'Brien et al. [20]). In addition to the similarities between these studies, there are also considerable differences between them that may explain relatively different outcomes. First and most important, there were different dependent variables. While there are associations between eating disorders such as polyphagia and the tendency to avoid PA [53], these are related to other behavioral patterns and are not necessarily inter-correlated. Second, the present study had a longitudinal design in an attempt to establish causation between variables since it covers the changes over time. In contrast, O'Brien et al.'s study [20] had a cross-sectional design. Third, the cultural differences between the two samples may also be a possible source of difference in outcomes.

Despite the strengths of the present study, such as the longitudinal design with adequate sample size and robust statistical methods to assess the likely associations (mediation analysis), several limitations should be noted when interpreting the results. First, a convenience sample was used with no specific inclusion or exclusion criteria, and all interested individuals could participate. Therefore, the generalizability of the findings specifically for defined categories of the individuals in terms of BMI or other relevant criteria was limited. Second, although the individuals who participated in the study in the second wave of data collection were not so different from the first wave in terms of demographic characteristics, there was an attrition rate of approximately 35% that may have negatively impacted the external validity of the findings. Third, all measures used were subjective and susceptible to reporting biases such as social desirability or recall bias. More objective measures, such as assessing the behaviors through observation or an individual's actual height and weight, would likely provide more trustworthy data. Moreover, the variables used in the present study were primarily psychological and no objective measures were used to assess PA.

Conclusion

Along with the direct association between perceived WS and the tendency to avoid PA, these variables may also be correlated through bilateral mechanisms, including the WBI. Perceived WS should be considered as a likely source both for WBI as well as avoiding PA. Therefore, any program planning to address physical inactivity across weight status

from healthy weight to obesity should include WS reduction strategies to be successful. For example, program planners may suggest environments that are supportive for PA among people with overweight/obesity without any triggers that may arouse weight stigma. Also, when exercising, grouping people with the same anthropometric measures may reduce the chance of weight stigmatization. Moreover, due to the underlying effect of WBI in the association between the PWSS and TAPAS, addressing interventions to reduce WBI would be helpful to improve PA intention, particularly among those who are at higher risk for weight gain and obesity. Therefore, further assessment of other likely effective psychological mediators such as self-esteem and self-concept in such associations are warranted.

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