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Original Article

Effects of weight stigma in news media on physical activity, dietary and weight loss intentions and behaviour

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ABSTRACT

Objectives: To investigate the effect of weight stigma in news media on (a) intentions to increase physical activity (PA), improve diet quality and lose weight, and (b) changes in PA, diet quality and body mass index (BMI) over one month, in (i) women of all weight categories and (ii) a subsample of women living with obesity.

Methods: UK-based women (N = 172; subgroup with obesity N = 81) were assigned to read an experimental (weight stigma; N = 75) or control (smoking stigma; N = 97) news article. Questionnaires were administered immediately after, and one month subsequently to collect information on BMI, PA, diet quality, intentions, past stigma, and diet and PA self-efficacy. Logistic and linear regression analyses were used to assess the effect of weight stigma on all outcome variables.

Results: In the whole sample, there was no significant effect of weight stigma on any primary or secondary outcome. In women with obesity, there was no significant effect of weight stigma on diet quality (0.26 units, 95% CI: −0.36 to 0.87) or PA (−1.83 units, 95% CI: −11.11 to 7.44) at follow up, but exposure to weight stigma was associated with a significant increase in BMI at 1-month follow-up (1.15 kg/m^2, 95% CI: 0.38 to 1.92) compared with the control group.

Conclusions: In people with obesity, exposure to weight-stigmatising media may contribute to increased BMI over time. Larger trials with longer follow-up are needed to confirm these findings.

Introduction

Obesity represents one of the greatest determinants of preventable illness and death worldwide. Obesity affects approximately one in five adults worldwide [1]. An increase in weight-related stigmatisation (weight stigma) has accompanied the rise in obesity. Weight stigma refers to negative social devaluation of people due to excess body weight and is estimated to be as prevalent as racial discrimination [2]. Individuals with obesity are often stereotyped as lazy and weak-willed and subsequently blamed and held responsible for their condition [2].

Weight stigma has been used as a political strategy to motivate weight loss [3]. However, the underlying assumption that it will arouse health-motivating effects is not evidence-based. Individuals exposed to weight stigma appear more vulnerable to depression, anxiety and stress [4,5], and have higher body dissatisfaction [6] than those free of weight stigma. Weight stigma is also associated with increased or loss of control of caloric intake [7,8], and avoidance of exercise [9] and medical treatment [10]. Furthermore, pilot interventions to help individuals cope with weight stigma appear to aid weight loss [11].

Diet and physical activity (PA) are the cornerstones for weight management, but it is unclear how weight stigma affects them. In cross-sectional and longitudinal studies, weight stigma has been shown to be negatively associated with intention and motivation for PA [9,12,13], but has been associated both positively and negatively with PA behaviours [14–16]. To our knowledge, only one study [16] has experimentally induced weight stigma to investigate its effect on PA intentions and behaviour over a one-week follow-up. The researchers found participants exposed to situationally induced weight stigma with more past stigma experiences reported higher PA intentions and increased PA behaviour [16].

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However, it is unclear whether this increase in PA intention and behaviour is maintained longer-term.

In terms of diet, weight stigma has been negatively associated with intention for better dietary quality [12], and dietary quality itself [17]. An experimental study showed that weight stigma in a newspaper article caused increased consumption of energy-dense foods in individuals with overweight [7]. However, participants' desire for high-calorie foods may have been artificially heightened as they were required to fast before the experiment. Another study showed that emotional eating mediated the relationship between weight stigma in childhood and poorer weight loss maintenance in adulthood [18]. To our knowledge, no study has experimentally induced weight stigma to investigate its effect on intentions to eat more healthily and actual changes in diet over time in individuals with obesity.

Longitudinal evidence indicates that initiation of health-compromising behaviours, such as exercise avoidance and increased calorie consumption, in response to weight stigma encourages the onset, maintenance, and severity of obesity [19,20]. Few studies have directly investigated the effect of weight stigma on weight over time, and those that have have produced inconsistent results [2,18,21,22]. This may be due to the different measures used and time periods of experienced stigma considered [2]. A study that looked at internalised weight stigma found it significantly predicted poorer maintenance of weight loss after accounting for stress, physical health and weight loss behaviours [2]. Thus, it is unclear whether external weight stigma affects weight over time. To our knowledge, no study has experimentally induced weight stigma and measured weight loss intentions and change in body mass index (BMI) in a population-based sample.

The present study aimed to investigate how exposure to situationally induced weight stigma affects (a) immediate PA, diet quality and weight loss intentions of women across all weight categories, and (b) changes in PA, diet quality and BMI over one-month follow-up. We ran a subgroup analysis on individuals with obesity because weight stigma has been found to be experienced more by individuals with higher BMI [23].

Participants

We chose an exclusively female sample because evidence at the time of recruitment suggested women might be more vulnerable to weight stigma in the workplace [24] which was the focus of our news article. Women were recruited via advertisements on online forums including weight loss websites and flyers distributed around London. Adverts mentioned research exploring "the general health and lifestyles of females" to reduce the salience of weight as a variable of interest. Participants were required to be female, at least 18 years old and not pregnant. Of the 203 participants who consented, 29 were randomised but did not complete the initial questionnaire stage.

Materials and Methods

Procedures and randomisation

The study was conducted via Opinio, a web-based survey platform. Participants followed a link to provide informed consent. As there was no randomisation function within Opinio, we constructed a dummy question with two options ("click button 1 or 2 to continue"). Depending on which button was pressed, participants were assigned to read a news article on either weight stigma "*Lose Weight or Lose your Job*" (experimental group) or smoking stigma "*Quit Smoking or Lose your Job*" (control group). They were highly similar and described why employers are disinclined to employ individuals with obesity/who smoke, with content taken from actual news reports [7]. We adapted the articles for use in the UK population (Supplementary Appendix 1).

Immediately after reading the article, participants completed a questionnaire that included the measures described below. At one-month follow-up, participants provided information on their current height, weight, level of physical activity and dietary intake. Participants were not reimbursed. The study was approved by UCL's Research Ethics Committee (10221/001).

Measures

Sociodemographic variables collected were age, employment status, and smoking status. Height and weight were self-reported, and BMI calculated as weight in kilograms divided by the square of height in metres. Perceived weight status was self-reported as very overweight, slightly overweight, about right, slightly underweight, or very underweight.

Physical activity was assessed with the validated Leisure Time Exercise Questionnaire (LTEQ) [25]. Participants reported how many days they engaged in: (i) strenuous, (ii) moderate, (iii) mild PA in an average week. Strenuous scores were multiplied by nine, moderate scores by five, and mild scores by three, and these were summed to create a composite PA score [25]. Higher scores indicated higher PA levels.

Diet quality was assessed with a validated questionnaire that asked participants how many portions of (i) fruit and (ii) vegetables they ate and (iii) how many times they cooked from scratch in an average week [26,27]. Fruit and vegetable responses were ranked on a 7-point scale (less than one per week/one per week/two-three per week/four-six per week/one per day/two per day/three or more per day). Cooking from scratch responses were ranked on a 5-point scale (never/one-two days per week/three-four days per week/five-six days per week/seven days per week). Scores for the three items were summed to create a composite diet quality score. Higher scores indicated higher diet quality (Cronbach's $\alpha = 0.54$). Given poor internal consistency of this measure, results may not be valid.

Exercise and dietary self-efficacy were assessed using Schwarzer and Renner's reliable physical activity and nutrition self-efficacy scales [28]. These ask how certain an individual is that they can overcome five barriers to carrying out exercise intentions and eating only healthy foods from 1 (very uncertain) to 4 (very certain). Separate composite scores for exercise and diet self-efficacy were calculated by summing the five items, with higher scores indicating higher perceived self-efficacy. Cronbach's α was 0.88 for exercise and 0.87 for nutrition.

Avoidance of exercise was assessed using three items: "I feel uncomfortable going to a gym with lots of mirrors", "I avoid going to the gym when I know there will be a lot of thin people there", and "I'm too embarrassed to participate in physical activity in public places", with responses from 1 (not true) to 7 (completely true) [29]. Scores were summed to create a composite score, with higher scores indicating greater avoidance of exercise (Cronbach's $\alpha = 0.79$).

Past stigma was assessed using the 10-item Brief Stigmatising Situations Inventory [30] which asks respondents to rate the frequency of their experiences with weight stigma in a range of domains on a 9-point scale from never (0) to daily (9). Scores were summed across items. Higher composite scores indicated more past experiences with weight stigma (Cronbach's $\alpha = 0.87$).

As a manipulation check, participants were asked whether they felt stigmatised by the article (yes/no).

Intentions to change behaviour were assessed with three questions: (i) "I plan to lose weight over the next month", (ii) "I plan to

increase my PA over the next month", and (iii) "I plan to improve my diet over the next month" (yes/no).

At one-month follow-up, participants reported their height and weight and repeated the measures of physical activity and diet quality.

Statistical analyses

Sample size was calculated using GPOWER based on a moderate effect size ($R^2 = 0.14$) as previously reported [16]. The study was powered to detect effects of the same magnitude with 80% power and an alpha level 0.05. Hence, we needed 59 participants in our subsample with obesity.

Baseline characteristics were compared using independent samples *t*-tests for continuous variables and X^2 tests for categorical variables, to assess the success of randomisation on balancing variables between groups.

We analysed differences between the experimental and control groups on the three primary outcomes using the intention to treat approach: changes in BMI, PA, and diet quality over one-month follow-up and on the three secondary outcomes: intention to lose weight, increase PA, and improve diet quality immediately after stigma exposure. We used logistic regression (for dichotomous intention outcomes) and linear regression (for continuous behaviour outcomes) to test the effect of situationally induced weight stigma on all outcomes. Variables that differed between groups and covariates that were associated with loss to follow-up were controlled for. For primary outcomes at follow-up, we also controlled for baseline score. For the primary outcome models, only baseline and follow-up data from participants who completed follow up questionnaires were included.

We re-ran the analysis on the subsample with obesity (BMI $\geq$30 kg/m^2). Analyses were performed using SPSS version 22. All tests were two-tailed and *P*-values <0.05 considered significant.

Results

Sample characteristics

One hundred and seventy-four women completed the baseline questionnaires: 59 had a BMI in the normal-weight range (BMI 18.5–24.9 kg/m^2), 32 in the overweight range (25–29.9 kg/m^2) and 83 in the range of obesity ($\geq$30 kg/m^2). There were no exclusions on age or medical grounds, although one participant with invalid data (based on a physically impossible recorded weight) and another participant with missing data were excluded, so the total sample comprised 172 women, of whom 81 participants had obesity. Follow-up data were obtained from 104 participants (60.5% response rate), and from 53 participants (65.4% response rate) in the subsample with obesity.

Mean BMI in the whole sample was 30.2 kg/m^2 (*SD* = 8.3) and 37.8 kg/m^2 (*SD* = 5.2) in the subsample with obesity. Mean age of the whole sample was 41.0 years (*SD* = 14.3) and 45.7 years (*SD* = 13.2) in the subsample. Baseline characteristics are summarised in Table 1. In the whole sample, the control group was older and had higher diet quality scores and diet self-efficacy than the experimental group. Employment status also differed significantly between groups. In the subsample with obesity, the control group was older and had a lower average BMI than the experimental group. The control group had higher diet self-efficacy than the experimental group, and employment status differed significantly. No other variables were significantly different between groups.

In both the total sample and the subsample with obesity, past stigma scores were higher in the group unavailable at follow-up. No other variables were significantly different between either of these groups.

Manipulation check

The experimental condition did not initiate a statistically significant higher number of stigma responses than the control condition in the whole sample (35% of participants felt stigmatised in the control group vs. 44% in the experimental group, $p = 0.233$) or the subsample with obesity (65% of participants felt stigmatised in the control group vs. 79% in the experimental group, $p = 0.168$).

Bivariate correlations

Bivariate correlations for both samples can be found in Supplementary Tables 1 and 2. Significant correlations are reported in Supplementary file 1.

Baseline whole sample analysis: weight stigma and intentions

Behavioural intentions did not differ significantly between groups (see Table 2). Results of the adjusted logistic regression models are presented in Table 3. Age, baseline diet quality, diet self-efficacy and employment status were controlled for in each model. There was no significant effect of weight stigma on intention to improve diet quality (OR = 1.04, 95% CI 0.46–2.35), to improve PA (OR = 1.72, 95% CI 0.82–3.60), or to lose weight (OR = 0.77, 95% CI 0.33–1.76). Only diet self-efficacy made a significant contribution to predicting diet quality intention (OR = 0.80, 95% CI 0.71–0.91) and weight loss intention (OR = 0.88, 95% CI 0.78–0.99).

Follow-up whole sample analysis: Weight stigma and behaviours

Energy balance behaviours did not differ significantly between groups (see Table 2). Results of the multiple linear regression models are presented in Table 4. Age, baseline diet quality, diet self-efficacy, employment status and past stigma were controlled for in each model. In addition, baseline BMI was controlled for in the follow-up BMI model and baseline PA was controlled for in the follow-up PA model. There was no significant effect of weight stigma on diet quality at one-month follow-up (*B* = 0.45, 95% CI −0.24 to 1.13), PA at one-month follow-up (*B* = 7.29, 95% CI −3.21 to 17.80), nor BMI at one-month follow-up (*B* = 0.39, 95% CI −0.11 to 0.88).

Baseline subsample analysis: Weight stigma and intentions

The proportion of participants with obesity who reported intentions to lose weight, improve diet quality and increase PA was larger in the experimental than control group (Table 2). However, the differences between groups were not statistically significant.

Results of the adjusted logistic regression models are presented in Table 3. Age, baseline BMI, diet self-efficacy and employment status were controlled for in each model. There was no effect of weight stigma on intention to improve diet quality (OR = 2.26, 95% CI 0.37–13.75), intention to improve PA (OR = 1.72, 95% CI 0.39–7.50) or intention to lose weight (OR could not be computed). Only diet self-efficacy made a significant contribution to predicting diet quality intention (OR = 0.71, 95% CI 0.53–0.95).

Follow-up subsample analysis: Weight stigma and behaviours

At follow-up, BMI had decreased in the control group by 0.37 kg/m^2 (*SD* = 1.33) and increased in the experimental group by 0.67 kg/m^2 (*SD* = 1.19). Unadjusted analysis indicated that this dif-

Table 1
Baseline characteristics of the control group and experimental group in the whole sample and the subsample with obesity.

Mean (SD) or % (N)	Whole sample (N = 172)				Subsample with obesity (N = 81)			
	Control group (N = 97)	Weight stigma Group (N = 75)	t/X^2	p-Value	Control group (N = 43)	Weight stigma Group (N = 38)	t/X^2	p-Value
Age, years	43.4 (*15.7*)	38.0 (*11.6*)	−2.57	0.011*	49.2 (*13.5*)	41.7 (*11.8*)	−2.65	0.010***
Baseline BMI, kg/m^2	29.3 (*7.6*)	31.4 (*9.1*)	1.61	0.110	36.4 (4.9)	39.3 (*5.1*)	2.58	0.012***
Smoking[a]	6.2% (*6*)	10.7% (*8*)	1.14	0.287	7.0% (*3*)	13.2% (*5*)	0.87	0.352
Employment status								
Employed (full-time)	38.1% (*37*)	56.0% (*42*)	11.54	0.009**	41.9% (*18*)	50.0% (*19*)	11.16	0.011***
Employed (part-time)	19.6% (*19*)	22.7% (*17*)			20.9% (*9*)	28.9% (*11*)		
Student	17.5% (*17*)	14.7% (*11*)			0% (*0*)	10.5% (*4*)		
Unemployed/retired	24.7% (*24*)	6.7% (*5*)			37.2% (*16*)	10.5% (*4*)		
Self-perceived weight status								
Slightly underweight	1.0% (*1*)	2.7% (*2*)	1.09	0.779	0% (*0*)	0% (*0*)	1.15	0.562
About right	29.9% (*29*)	26.7% (*20*)			2.3% (*1*)	0% (*0*)		
Slightly overweight	32.0% (*31*)	29.3% (*22*)			18.6% (*8*)	23.7% (*9*)		
Very overweight	37.1% (*36*)	41.3% (*31*)			79.1% (*34*)	76.3% (*29*)		
Felt stigmatised	35.1% (*34*)	44.0% (*33*)	1.42	0.233	65.1% (28)	78.9% (*30*)	1.90	0.168
Exercise self-efficacy scale	12.3 (*4.6*)	11.1 (3.9)	−1.97	0.051	10.3 (*4.2*)	9.4 (*3.5*)	−1.05	0.297
Diet self-efficacy scale	15.0 (*3.8*)	13.3 (*3.8*)	−2.94	0.004**	13.8 (*4.0*)	11.7 (*3.8*)	−2.44	0.017***
Past stigma experience scale	11.6 (*14.6*)	15.3 (*18.1*)	1.40	0.165	17.0 (*18.1*)	25.3 (*19.5*)	1.98	0.051
Exercise avoidance scale	10.7 (*6.4*)	11.4 (*6.3*)	0.75	0.458	12.9 (*6.7*)	15.1 (*5.5*)	1.58	0.118

Notes. BMI: body mass index; PA: physical activity; Self-efficacy scales: higher scores indicate higher efficacy. Past stigma experience scale: higher scores indicate higher stigma. Exercise avoidance scale: higher scores indicate higher avoidance.

* Groups differ on variable at $p < 0.05$.

** Groups differ on variable at $p < 0.01$.

[a] Non-smoker: no cigarettes smoked at all per week.

Table 2
Outcomes at immediate follow-up and at 1-month follow-up between the two trial groups in the whole sample and in the subsample with obesity.

	Whole sample							Subsample with obesity						
	Control group			Weight stigma group			Unadjusted B/OR (95% CI)	Control group			Weight stigma group			Unadjusted B/OR (95% CI)
	Immediate follow up	1-month-follow-up	*N*	Immediate follow-up	1-month follow-up	*N*		Immediate follow up	1-month-follow-up	*N*	Immediate follow-up	1-month follow-up	*N*	
Intentions														
Lose weight	78.4% (76)	–	97	78.7% (59)	–	75	1.02 [0.50–2.12]	90.7% (39)	–	43	100% (38)	–	38	NA
Improve diet quality	71.1% (69)	–	97	78.7% (59)	–	75	1.50 [0.74–3.03]	79.1% (34)	–	43	94.7% (36)	–	38	4.77 [0.96–23.65]
Increase PA	64.9% (63)	–	97	77.3% (58)	–	75	1.84 [0.93–3.64]	81.4% (35)	–	43	89.5% (34)	–	38	1.94 [0.54–7.06]
BMI (kg/m^2)	30.50 (7.67)	30.33 (*7.44*)	68	30.02 (*8.66*)	30.19 (*9.01*)	42	0.34 [−0.11 to 0.80]	36.54 (*5.23*)	36.17 (*5.11*)	35	38.44 (*6.17*)	39.11 (*5.98*)	18	1.14 [0.39–1.88]**
Behaviours														
Diet quality	4.55 (*1.74*)	4.29 (*1.91*)	66	4.13 (*1.74*)	4.37 (*1.75*)	42	0.05 [−0.68 to 0.78]	4.29 (*1.93*)	3.94 (*1.92*)	34	3.78 (*1.80*)	3.72 (*1.84*)	18	−0.18 [−1.27 to 0.91]
PA	37.15 (*26.83*)	36.22 (*28.55*)	67	37.65 (*23.20*)	43.24 (*30.00*)	42	6.53 [−2.99 to 16.05]	26.31 (*22.36*)	28.56 (*28.36*)	34	21.94 (*15.34*)	21.06 (*16.77*)	18	−3.92 [−12.39 to 4.56]

Notes. Unadjusted B/OR represents the difference in BMI, diet quality and PA between groups at follow-up, adjusting for baseline values, and the odds of intentions to lose weight, improve diet quality and increase PA at baseline in the intervention group compared with the control group. Diet quality, PA and weight loss intention is for yes (coded as 1) compared to no (coded as 0); BMI: body mass index; CI: confidence interval; OR: odds ratio. PA: physical activity. NA: OR and 95% CI could not be computed.

Table 3
Multivariable logistic regression models predicting behavioural intentions immediately after stigma exposure, in the whole sample ($N = 172$) and the subsample ($N = 81$).

	Whole sample (N = 172)						Subsample with obesity (N = 81)					
	Intention to lose weight		Intention to increase PA		Intention to improve diet		Intention to lose weight		Intention to increase PA		Intention to improve diet	
	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	p	OR [95% CI]	p	OR [95% CI]	p
Stigma condition	0.77 [0.33–1.76]	0.530	1.72 [0.82–3.60]	0.149	1.04 [0.46–2.35]	0.920	NA	-	1.72 [0.39–7.50]	0.472	2.26 [0.37–13.75]	0.377
Baseline BMI	–	–	–	–	–	–	1.21 [0.87–1.69]	0.258	0.97 [0.84–1.11]	0.611	1.07 [0.92–1.25]	0.363
Age in years	1.01 [0.97–1.04]	0.691	1.02 [0.98–1.05]	0.340	1.01 [0.98–1.05]	0.541	0.93 [0.85–1.03]	0.154	1.03 [0.98–1.09]	0.242	1.00 [0.94–1.06]	0.932
Baseline diet quality	0.90 [0.71–1.15]	0.404	0.87 [0.71–1.07]	0.192	0.84 [0.66–1.06]	0.133	–	–	–	–	–	–
Diet self-efficacy	0.88 [0.78–0.99]	0.037*	0.95 [0.86–1.05]	0.319	0.80 [0.71–0.91]	<0.001**	0.86 [0.57–1.30]	0.479	0.96 [0.78–1.17]	0.657	0.71 [0.53–0.95]	0.021*
Employment status		0.340		0.433		0.836		0.910		0.360		0.969
Employed part-time	1.41 [0.46–4.37]	0.548	0.64 [0.27–1.53]	0.313	0.85 [0.31–2.32]	0.753	0.36 [0.01–9.64]	0.539	0.29 [0.05–1.58]	0.153	0.81 [0.11–5.83]	0.835
Student	0.41 [0.13–1.24]	0.114	1.92 [0.60–6.16]	0.276	1.63 [0.46–5.69]	0.447	NA	-	NA	-	NA	-
Unemployed/retired	1.17 [0.33–4.15]	0.809	0.76 [0.27–2.15]	0.610	0.81 [0.26–2.51]	0.721	1.05 [0.05–21.54]	0.974	0.23 [0.04–1.35]	0.103	1.38 [0.23-8.40]	0.725

Notes. Experimental condition is for obesity stigma (coded as 1) compared to smoking stigma (coded as 0); Diet quality, PA and weight loss intention is for yes (coded as 1) compared to no (coded as 0); BMI: body mass index; CI: confidence interval; OR: odds ratio. Missing data represents the omission of this variable in the regression model. NA: OR and 95% CI could not be computed.

* $p < 0.05$.

** $p < 0.01$.

Table 4
Multivariable linear regression models predicting behaviours at one month follow up, in the whole sample ($N = 104$) and the subsample with obesity (N = 52).

	Whole sample (N = 104)						Subsample with obesity (N = 52)					
	BMI at follow up		PA level at follow up		Diet quality at follow up		BMI at follow up		PA level at follow up		Diet quality at follow up	
	B [95% CI]	*p*	*B* [95% CI]	p	*B* [95% CI]	*p*	*B* [95% CI]	*p*	*B* [95% CI]	p	*B* [95% CI]	*p*
Stigma condition	0.39 [−0.11 to 0.88]	0.122	7.29 [−3.21 to 17.80]	0.171	0.45 [−0.24 to 1.13]	0.197	1.15 [0.38−1.92]	0.004**	−1.83 [−11.11 to 7.44]	0.692	0.26 [−0.36−0.87]	0.403
Age in years	0.01 [−0.01 to 0.03]	0.256	−0.18 [−0.56 to 0.20]	0.360	−0.01 [−0.03 to 0.01]	0.400	0.02 [−0.02 to 0.05]	0.328	−0.02 [−0.44 to 0.40]	0.915	0.02 [−0.01 to 0.05]	0.305
Baseline diet quality	0.09 [−0.06 to 0.24]	0.223	1.33 [−1.95 to 4.61]	0.423	0.49 [0.28−0.69]	<0.001**	–	–	–	–	0.83 [0.64−1.01]	<0.001**
Diet self-efficacy	−0.07 [−0.14 to −0.01]	0.025*	0.05 [−1.32 to 1.42]	0.941	0.10 [0.01−0.18]	0.035*	−0.09 [−0.18 to 0.00]	0.063	0.12 [−1.00 to 1.23]	0.835	0.06 [−0.01 to 0.14]	0.098
Employment status	0.06 [−0.14 to 0.26]	0.558	1.84 [−2.49 to 6.18]	0.402	0.05 [−0.23 to 0.34]	0.710	0.21 [−0.11 to 0.53]	0.193	2.23 [−1.67 to 6.13]	0.255	−0.16 [−0.42 to 0.10]	0.224
Past stigma	−0.00 [−0.02 to 0.02]	0.698	−0.28 [−0.66 to 0.11]	0.155	−0.01 [−0.03 to 0.02]	0.464	−0.01 [−0.04 to 0.01]	0.404	−0.18 [−0.48 to 0.13]	0.258	0.02 [−0.00 to 0.04]	0.063
Baseline BMI	0.98 [0.95− 1.02]	<0.001**	–	–	–	–	0.95 [0.89−1.02]	<0.001**	−0.35 [−1.20 to 0.49]	0.404	−0.00 [−0.06 to 0.05]	0.953
Baseline PA	–	–	0.56 [0.34– 0.77]	<0.001**	–	–	–	–	0.98 [0.76–1.20]	<0.001**	–	–

Notes. Experimental condition is for obesity stigma (coded as 1) compared to smoking stigma (coded as 0); Diet quality, PA and weight loss intention is for yes (coded as 1) compared to no (coded as 0); BMI: body mass index; CI: confidence interval. Missing data represents the omission of this variable in the regression model.

* $p < 0.05$.

** $p < 0.01$.

ference was statistically significant (Table 2). Change in PA and diet quality between the two groups was, however, not significant.

Results of the multiple linear regression models are presented in Table 4. Age, diet self-efficacy, employment status, past stigma and baseline BMI were controlled for in each model. In addition, baseline diet quality was controlled for in the follow up diet quality model and baseline PA was controlled for in the follow-up PA model. There was no significant effect of weight stigma on diet quality at one-month follow-up ($B = 0.26$, 95% CI −0.36 to 0.87), nor PA at one-month follow-up ($B = -1.83$, 95% CI −11.11 to 7.44), while variables controlled for were held constant. Exposure to weight stigma was associated with a significant increase in BMI over one-month follow-up ($B = 1.15$, 95% CI 0.38–1.92).

As a sensitivity analysis, we ran the same models with smokers excluded from each group and found no change in results (data not shown).

Discussion

This study examined effects of situationally induced weight stigma on intentions for PA, diet and weight loss, and changes in PA, diet quality and weight over time in a sample of UK-based adult women. In the whole sample of women of all weight categories, there was no main effect of weight stigma on any primary or secondary outcome. However, in the subsample of women with obesity, there was a significant main effect of weight stigma on change in BMI. On average, women living with obesity who were exposed to weight stigma gained weight over the one-month follow-up period, whilst the weight of women with obesity in the control condition remained relatively stable; a difference between groups of +1.0kg/m^2. There was no significant effect of weight stigma on intentions to change behaviour, or actual changes in PA or diet quality over one-month follow-up in the subsample.

The results of the current study dovetail with previous research [19–21], providing further evidence that weight stigma may undermine efforts to lose weight and contribute to weight gain. Our data suggest the effects of weight stigma are unique in their application to individuals living with obesity. Our study contrasts with a previous study [22] which found that a higher number of weight stigma experiences predicted more successful weight loss. However, they did not measure whether stigma directly related to participants' efforts to lose weight so the weight loss may have been influenced by other factors.

In our subsample with obesity, weight stigma was inversely correlated with diet self-efficacy, meaning individuals who were exposed to weight stigma reported lower diet self-efficacy compared with controls, which aligns with previous findings [12]. However, weight stigma was not associated with changes in diet quality, which contrasts with previous findings [7,17]. Weight stigma is often linked to emotional and binge eating behaviours [31] but our study does not provide support for this. It is possible that our diet quality measure was not sensitive to all potential changes in diet quality; the measure focused only on fruit and vegetable consumption and whether meals were cooked from scratch, and did not capture consumption of energy-dense foods.

The lack of effect of weight stigma on diet quality could also be due to our stimuli not initiating a stress response. Stress is associated with consumption of unhealthy foods [32]. Reading a news article is likely less stressful than being targeted in person. Our measure of past stigma captured some of these 'more stressful' experiences, and past stigma was associated with baseline diet quality (see Supplementary Table 2). The current study may have not observed an effect of situational weight stigma on diet quality because the stimulus was not powerful enough to evoke this change. In line with this, Major and colleagues found an effect of weight stigma on quantity of energy-dense foods consumed using near-identical stimuli to ours [7], but they augmented stress by requiring participants to speak on video. It is also plausible that diet was resistant to change due to the nature of our sample. Among all women in the whole sample who responded to the baseline questionnaire, diet quality did not differ significantly according to weight status (data not shown). It is possible that women in our analysed sample may have had particularly healthy diets as many were recruited from online weight support forums, so it is likely they were engaged in efforts to improve or maintain their baseline diet quality. Similarly, this could also be down to social desirability bias, where participants are more likely to over-report eating healthy food during self-report questionnaires.

This study had several limitations. Our stimuli generated high stigma responses in both groups. Both articles mention physical activity and whilst the control group were not exposed to weight stigma per se, they still appear to have experienced some weight-related stigma. In addition, it is plausible that the manipulation did not last over time and that participants from both groups experienced additional weight stigma over the one-month follow-up period. Another limitation relates to the study's self-reported nature which may have introduced measurement error. Participants read the stigmatising article prior to self-reporting height, weight, physical activity and diet which may have influenced their responses. In addition, within the subsample, almost all participants in the weight stigma group reported an intention to lose weight, improve diet quality, and increase PA. These ceiling effects may have affected the observed lack of significant differences between groups. It is important for future research to consider using more sensitive measures to detect these differences (such as a Likert scale). There was substantial attrition between baseline and follow-up, limiting confidence that our longitudinal results were representative of those who participated at baseline, Furthermore, the fact that past stigma scores were higher in the group unavailable at follow-up suggests that missing data may not be missing at random. The potential impact of past stigma on research engagement should be addressed in future research. Finally, our manipulation check may not have adequately captured whether participants attended to content thoroughly.

Despite this, our study filled gaps in the literature and benefitted from the use of reliable and validated measures. Future research could utilise Ecological Momentary Assessment to look at the effects of weight stigma on outcomes during a typical day, and in light of new evidence that males may be equally vulnerable to weight stigma [33], future studies should include males.

Weight stigma has previously been justified as a strategy that motivates weight loss [3]. Our results contribute to evidence that challenges this. As such, weight stigma in the news media might perpetuate obesity over time. It is important that news providers play a more proactive role in removing stigma from their outlets and portraying obesity using respectful language and pictures. Considering social norms condemning other forms of stigma do not yet apply to weight stigma, this process of assimilation might be facilitated by engaging the press with researchers, public support, and introducing legislation on weight stigma. In addition, the inclusion of specific educational sessions focusing on the impact of media and culture on body image into weight loss programs may be useful in reducing negative effects of weight stigma, as shown in pilot research [11].

Conflict of interest

There are no conflicts of interest.

Ethical statement

The study was approved by the UCL's Research Ethics Committee (10221/001). Participants all provided informed consent and were given the opportunity to ask questions or withdraw at any point in the study. The study abides by the statement of ethical standards for manuscripts submitted to the Obesity Research & Clinical Practice.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.orcp.2019.09.001.

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