



# Outcomes of exposure to healthy weight and lifestyle advertising: An experimental study of adults from the United Kingdom

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## ABSTRACT

Mass media advertising promoting healthy weight and lifestyles represents an important approach to the prevention of non-communicable diseases. However, concerns have been raised that advertisements promoting a healthy weight may be stigmatizing and contribute to negative outcomes. This study explored the potential negative and positive cognitive, psychological, and behavioral intention outcomes of exposure to different public health campaign advertisements that promote positive behavior change and healthy weight. A total of 1,098 adult residents of the United Kingdom (50% female,  $M_{age} = 35.21$  years) viewed one of four video advertisements: one control advertisement and three healthy weight and lifestyle advertisements that differed in message content (negative health impacts, support/encouragement, and social norms) and execution style (graphic, animation, and depicted scene). Participants then responded to items assessing a variety of cognitive, psychological, and behavioral intention outcomes. Compared to those in the control condition, those exposed to a healthy weight and lifestyle advertisement reported significantly higher scores for (i) perceptions of weight stigma, (ii) negative emotions, and (iii) intentions to engage in adaptive lifestyle behaviors. There were no differences observed between conditions for maladaptive behavioral intentions, internalized weight bias, anti-fat attitudes, and body dissatisfaction. The advertisement featuring a supportive/encouraging message and animation style performed most favorably. Results suggest that healthy weight and lifestyle advertisements have the potential to promote positive behavior change but may be associated with some negative outcomes. Of the assessed communication approaches, a supportive/encouraging message with animation style appears least likely to induce negative emotions and is preferred for minimizing weight stigma.

## 1. Introduction

Overweight and obesity are risk factors for a variety of non-communicable diseases including type 2 diabetes, cardiovascular disease, and some cancers (Hruby et al., 2016; World Health Organization, 2021). Addressing the lifestyle determinants of overweight and obesity (e.g., poor diet and physical inactivity) is thus considered a global public health priority (World Health Organization, 2021; 2018; 2000). However, despite efforts to reduce rates of overweight and obesity, prevalence remains high. Globally, 52% of adults are overweight or obese; a figure that has tripled in the last three decades (World Health Organization, 2021). In the United Kingdom (UK), the context of the present study, 64% of adults are overweight or obese (Conolly and Craig, 2019).

Overweight and obesity have multiple determinants (Hruby et al.,

2016). Accordingly, a comprehensive approach to prevention that directs efforts to all levels (e.g., individual, community, public policy) is needed (Sacks et al., 2009; World Health Organization, 2014). Healthy weight and lifestyle advertisements (ads) have been highlighted as a potential means of targeting the lifestyle determinants of overweight and obesity at the individual level (World Health Organization, 2000; 2018), and constitute an important part of prevention efforts. Evidence from evaluations of such ads suggests exposure (i) increases weight- and lifestyle-related knowledge (e.g., knowledge of the health risks associated with overweight, obesity, and sugar-sweetened beverage consumption); (ii) improves weight- and lifestyle-related attitudes (e.g., attitudes toward obesity, weight gain prevention, fruit and vegetable consumption, and physical activity); and (iii) increases intentions to engage, and actual engagement in, adaptive lifestyle behaviors (e.g.,

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physical activity and improved diet) (Wakefield et al., 2010; Morley et al., 2018; Kite et al., 2018; Beaudoin et al., 2007; Cavill and Bauman, 2004; Gebreslassie et al., 2020; Bonnevie et al., 2020; George et al., 2016; Miles et al., 2001; Boles et al., 2014; Wammes et al., 2007; Morley et al., 2009; Robles et al., 2015; King et al., 2013).

Although healthy weight and lifestyle ads appear to effectively target the lifestyle determinants of overweight and obesity, it has been suggested that such ads promote weight stigma and that exposure to them may result in a variety of negative outcomes (Pausé, 2017; Bristow et al., 2020; Couch et al., 2018; Ringel and Ditto, 2019; Thomas et al., 2014). Weight stigma has been associated with (i) less acceptance of overweight, (ii) decreases in motivation to maintain a healthy diet and engage in exercise, (iii) decreases in self-efficacy to achieve healthy behavior changes, and (iv) engagement in weight gain and retention mechanisms such as increased caloric intake (Brochu and Dovidio, 2014; Major et al., 2014; Puhl et al., 2013a; Vartanian et al., 2018; Brewis, 2014; Friedman et al., 2005). Weight stigma has also been associated with body dissatisfaction and internalized weight bias (Corrigan et al., 2006; Hatzenbuehler et al., 2009; Pearl and Puhl, 2018; Stevens et al., 2017), which occurs when individuals are aware of and agree with weight stereotypes, apply these stereotypes to themselves, and engage in weight-related self-devaluation.

Given the potential risk of promoting weight stigma, ads targeting weight and lifestyle behaviors require thorough evaluation. Yet, research assessing such ads on their potential to result in weight stigma and other negative outcomes is limited (Puhl and Suh, 2015). Separate studies by Puhl et al. (Puhl et al., 2013a, b) found that image stills and message slogans from a healthy weight ad were rated as highly stigmatizing and negatively impacted health behavior intentions and self-efficacy. Two studies have assessed video ads, with mixed results observed. In one, ads that explicitly referenced obesity reduced self-efficacy and increased weight-stigmatizing attitudes (Simpson et al., 2019). In the other, ads widely criticized for being weight-stigmatizing were associated with fewer weight-stigmatizing attitudes (Barry et al., 2014).

The limited and inconclusive research conducted to date warrants further investigation, especially given the increasing public health focus on obesity prevention. There are also several important gaps in the literature that should be addressed. First, prior studies have primarily evaluated ad messages or image stills rather than entire video ads (Puhl et al., 2013a, b). Evaluating entire video ads would provide a more naturalistic assessment of how audiences engage with and respond to healthy weight and lifestyle content (Kite et al., 2018; Johnstone and Grant, 2019). Second, although ads can differ in both message content (what is communicated) and execution style (how it is communicated) (Dixon et al., 2015a), research assessing the characteristics of healthy weight and lifestyle ads that are likely to be most effective but least stigmatizing is limited. One study found that graphic ads featuring messages relating to the negative health consequences of overweight and obesity are considered by adults to be more effective than ads using other messages (e.g., support and encouragement) and styles (e.g., animations) (Dixon et al., 2015b). By contrast, other studies have found that ads featuring hopeful and empowering messages induce the highest intention to comply with the health message being communicated and are considered most motivating and favorable (Puhl et al., 2013b; Vaala et al., 2016). An evaluation of both the effectiveness and potential unintended consequences of various approaches to healthy weight and lifestyle advertising has the potential to provide some clarity on specific ad features to retain or avoid in future campaigns (Dixon et al., 2015b).

Finally, there is evidence to suggest that those who consider themselves to have overweight or obesity may respond to weight- and health-related content differently than those who consider themselves to be a healthy weight (Major et al., 2014; Himmelstein et al., 2015). This makes it important to assess whether self-perceived weight moderates relevant outcomes of healthy weight and lifestyle ads (Himmelstein et al., 2015; Vartanian and Shaprow, 2008). However, research

examining the influence of self-perceived weight is limited.

This study aims to address the aforementioned gaps in the literature by comparing healthy weight and lifestyle video ads differing in message content and execution style to a control ad and to each other on a variety of cognitive, psychological, and behavioral intention outcomes. This study also aims to assess whether weight status or self-perceived weight moderate the relationship between exposure to a healthy weight and lifestyle ad and (i) perceptions of stigma, (ii) psychological outcomes, and (iii) behavioral intentions.

## 2. Methods

### 2.1. Recruitment and eligibility

This study was approved by the University of Melbourne's Human Research Ethics Committee (#2056543.1). Participants were recruited through Prolific, a UK-based research recruitment platform where surveys are advertised and completed for small financial reimbursement. Participants eligible for this study were 18–65-year-old English-speaking UK residents. Data collection occurred in July and August of 2020.

A total of 1,183 individuals participated in the study. The responses of 85 participants were removed for failed attention checks or because participants did not complete the survey within the Prolific-set time limit (<56 min). The final sample size was 1,098.

### 2.2. Design and stimuli

This study utilized an online, between-subjects, experimental design. After reviewing a plain language statement detailing the study, participants were informed that proceeding with the survey evidenced their informed consent. They then responded to items assessing demographic characteristics and height and weight, after which they were randomly assigned to view one of four video ads: three healthy weight and lifestyle ads and one control ad. Participants could not progress through the survey and complete the outcome measures listed below until they had viewed the ad to which they were assigned twice.

The characteristics of the ads selected for this study are presented in Table 1. Detailed descriptions and image stills are presented in the Supplementary Material. Ad 1 (Toxic Fat) featured a 'negative health consequences' message with a 'graphic' execution style (Dixon et al., 2015a, b): it presented evidence on the risks associated with unhealthy eating and overweight and obesity and featured images of internal organs covered in visceral fat. Ad 2 (Swap It) featured a 'supportive/encouraging' message with an 'animation' execution style: it provided positive information on how to change one's diet and increase engagement in physical activity, with this information being delivered by an animated balloon man and his family (Dixon et al., 2015a, b). Ad 3 (Correctly Identified) featured a 'social norms/acceptability' message with a 'depicted scene' execution style (Dixon et al., 2015a, b): it presented information on the unacceptability and undesirability of overweight and obesity and featured scenes involving actors without graphic imagery. These three healthy weight and lifestyle ads were chosen because they have not aired in the UK, thus minimizing the potential for prior ad exposure to influence outcomes.

As is customary in experimental research, a control condition was included. Participants assigned to this condition were exposed to a video ad that was unrelated to healthy weight and lifestyle. This ad promoted credit cards offered by MBNA Corporation. The inclusion of this condition assists with determining the extent to which scores on the outcome variables of interest could be explained by exposure to a healthy weight and lifestyle ad.

**Table 1**  
Characteristics of the video ads evaluated in the present study.

Ad	Evaluations	Country	Length (seconds)	Message content	Execution style
Ad 1 ( <i>Toxic Fat</i> ) Developed by Cancer Council Western Australia for the <i>LiveLighter</i> campaign	<a href="#">Morley et al. (2016)</a>	Australia	30	Negative health consequences	Graphic imagery
Ad 2 ( <i>Swap It</i> ) Developed by the Australian Government for the <i>Swap It, Don't Stop It</i> campaign	<a href="#">O'Hara et al. (2016)</a>	Australia	45	Supportive/encouraging	Animation
Ad 3 ( <i>Correctly Identified</i> ) Developed by LiveWell Colorado (now Nourish Colorado) for the <i>Social Change</i> campaign	<a href="#">Tsai et al. (2014)</a>	United States	30	Social norms/acceptability	Depicted scene
Ad 4 ( <i>Control ad; MBNA Corporation</i> )	Not applicable	United Kingdom	30	Not applicable	Not applicable

Note. Advertisements were categorized as per [Dixon et al., 2015b](#).

## 2.3. Measures

### 2.3.1. Demographics, height, and weight

Information on participants' gender and age was supplied by Prolific. Participants were asked to report their education level and household income. Participants also reported their height, weight, and self-perceived weight status (5-point scale: 1 = *Very underweight* to 5 = *Very overweight* ([Robinson et al., 2015](#))). Participants' height and weight was used to calculate their body mass index (BMI) and weight status (underweight = BMI < 18.5; healthy weight = BMI 18.5 to < 25; overweight = BMI 25 to < 30; obese = BMI 30<sup>+</sup>). As per [Morley et al. \(2016\)](#), weight status was collapsed into the two categories of underweight/healthy weight and overweight/obese.

### 2.3.2. Cognitive outcomes

Responses to the items comprising each of the measures that follow were made on a scale of 1 (*Strongly disagree*) to 5 (*Strongly agree*), and items within measures were randomized. Five statements taken or adapted from [Dixon et al. \(2015b\)](#) assessed perceived strength of the argument presented in the ad (Cronbach's alpha = 0.93). Six statements taken or adapted from [Dixon et al. \(2015b\)](#) assessed perceived ad effectiveness (Cronbach's alpha = 0.87). One item taken from [Puhl et al. \(2013a\)](#) assessed self-efficacy, with participants asked to report on the extent to which they agree the ad makes them believe they have the ability to engage in the behavior being promoted. Message acceptance was assessed as per [Dixon et al. \(2015b\)](#), with participants rating the extent to which they agree the ad they viewed is (i) easy to understand and (ii) believable. As Cronbach's alpha was suboptimal (0.68), these items were analyzed separately. As per [Dixon et al. \(2015b\)](#), negative cognitive responses were assessed by asking participants to report on the extent to which they agree the ad they viewed is (i) exaggerated and (ii) trying to manipulate them. These items were assessed separately. Finally, seven statements taken from [Puhl et al. \(2013a\)](#) assessed the degree to which participants considered the ad they viewed to be stigmatizing (Cronbach's alpha = 0.91).

### 2.3.3. Psychological outcomes

Participants completed the 11-item Modified Weight Bias Internalization Scale ([Pearl and Puhl, 2014](#)), the 13-item Anti-Fat Attitudes Questionnaire ([Crandall, 1994](#)), and the Body Dissatisfaction Scale from The Eating Disorder Inventory ([Garner, 1991](#)). Cronbach's alpha for each was 0.84, 0.87, and 0.89 respectively. Participants were also asked to report on the extent to which they agreed that the ad they viewed made them feel the following emotions (adapted from [Dixon et al. \(2015\)](#)): alarmed, anxious, ashamed, determined, disgusted, distressed, fearful, guilty, inspired, interested, sad, and uncomfortable (rated on a 5-point Likert scale of 1 (*Strongly disagree*) to 5 (*Strongly agree*)). The presentation of these emotions was randomized. A principal components

analysis (PCA) with direct oblimin rotation identified two components: 'negative emotions' (e.g., ashamed, disgusted, distressed, guilty; loadings > 0.74, Cronbach's alpha = 0.93) and 'positive emotions' (e.g., determined, inspired; loadings > 0.82; Cronbach's alpha = 0.82). Grand means for each were created for analysis purposes.

### 2.3.4. Behavioral intentions

Participants were asked how likely they were to engage in seven adaptive (e.g., "Exercise more often/be more active") and three maladaptive (e.g., "Go without food for a day or more in order to lose weight") weight loss and lifestyle behaviors over the next seven days (adapted from [Morley et al. \(2016\)](#)). Participants responded to each item on a scale of 1 (*Very unlikely*) to 5 (*Very likely*) and the presentation of these behaviors was randomized. A PCA with direct oblimin rotation identified two components: 'adaptive behaviors' (loadings > 0.61, Cronbach's alpha = 0.84) and 'maladaptive behaviors' (loadings > 0.70, Cronbach's alpha = 0.75). Grand means for each were created for analysis purposes.

## 2.4. Statistical analysis

Analyses were conducted in SPSS v26. Conditions were compared on each outcome using one-way ANOVAs with post-hoc Tukey's tests. Outcomes that violated the assumption of homogeneity of variance were assessed using Kruskal-Wallis rank sum tests with post-hoc Mann Whitney *U* tests. A Bonferroni corrected *p*-value of 0.008 was used to control for the family-wise error rate.

Possible moderating effects of weight status (0 = underweight/healthy weight, 1 = overweight/obese) and self-perceived weight (0 = perceived underweight/healthy weight, 1 = perceived overweight/obese) on the relationship between exposure to a healthy weight and lifestyle ad and (i) perceptions of stigma, (ii) each of the psychological outcomes, and (iii) behavioral intentions were assessed using MANOVAs that were conducted for each ad pair (*Toxic Fat* vs. *Swap It*; *Toxic Fat* vs. *Correctly Identified*; *Swap It* vs. *Correctly Identified*). A Bonferroni corrected *p*-value of 0.008 was applied.

Power calculations were performed in G\*Power to determine the minimum sample size required to detect a small to medium effect ( $f = 0.15$ ), with power set at 0.80 and significance at  $p < 0.008$ . The minimum sample size required was 720. Analyses were therefore sufficiently powered.

## 3. Results

### 3.1. Sample composition

Participants' demographic characteristics are presented in [Table 2](#). The sample was slightly younger, had a slightly higher income and

**Table 2**  
Sample composition (overall and stratified by condition).

Variable	Toxic Fat	Swap It	Correctly Identified	Control	Total	UK Population
N	292	285	273	248	1,098	–
Gender (% women)	52	53	48	46	50	51
Age (in years)						
Mean (SD)	34.43 (11.40)	36.53 (12.10)	35.66 (11.39)	34.12 (10.34)	35.21 (11.38)	40.20 (-)
Body Mass Index						
Mean (SD)	27.29 (8.38)	28.29 (9.22)	28.41 (9.45)	27.40 (7.74)	27.85 (8.75)	27.50 (-)
Healthy/underweight (%)	49	45	41	48	46	37
Overweight/obese (%)	51	55	59	52	54	64
Income (%)						
Under £50,000	57	62	62	66	61	86
Over £50,001	39	33	34	32	35	14
Prefer not to say	4	5	4	2	4	–
Education						
% tertiary educated	67	57	62	62	62	42
Self-perceived weight (%)						
Healthy/underweight	41	40	41	40	41	–
Overweight	59	60	59	60	59	–

Note. A dash (-) indicates that population information for this variable could not be reliably sourced. UK population is not given due to the different sources used to calculate UK population estimates. Differences between conditions for age and body mass index were assessed using one-way ANOVAs. Differences between conditions for gender, income, education, weight status, and self-perceived weight were assessed using Pearson's chi-squared tests.

education level, and comprised a greater proportion of individuals who were of a healthy weight than what would be expected from national figures (Office for National Statistics., 2011; 2017; HM Revenue and Customs, 2019). Significant differences were not observed between those assigned to each of the conditions, indicating successful randomization.

### 3.2. Cognitive outcomes

Descriptive statistics and significance test results for all cognitive outcomes are presented in Table 3. Full results can be found in the Supplementary Material (Table S1).

For each of the healthy weight and lifestyle ad conditions, scores for perceived argument strength, perceived effectiveness, self-efficacy, and message acceptance (believable and understandable) were significantly higher than scores observed for the control ad condition. Significant differences between the healthy weight and lifestyle ad conditions were also identified. Notably, significantly higher scores were observed on the outcomes of perceived argument strength, perceived effectiveness, self-efficacy, and believability among those who viewed the ads featuring a (i) negative health consequences message with a graphic execution style (Toxic Fat) or (ii) supportive/encouraging message with an animation execution style (Swap It) compared to those who viewed the ad featuring a social norms/acceptability message with a depicted scene execution style (Correctly Identified). Additionally, Swap It was perceived to be more understandable than both Toxic Fat and Correctly Identified.

For the negative cognitive outcomes, each of the healthy weight and lifestyle ads was perceived to be significantly less exaggerated than the control ad, and both Swap It and Correctly Identified were perceived to be significantly less manipulative than the control ad. Among the healthy weight and lifestyle ads, Swap It was considered significantly less manipulative than both Toxic Fat and Correctly Identified.

In terms of participants' perceptions of stigmatizing content, scores were low overall, with participants generally disagreeing that the ads were stigmatizing. The scores of those who viewed the healthy weight and lifestyle ads were, however, significantly greater than the scores of those who viewed the control ad. Among the healthy weight and lifestyle ad conditions, Toxic Fat was perceived to be significantly more stigmatizing than both Correctly Identified and Swap It, and Correctly Identified was perceived to be significantly more stigmatizing than Swap It.

### 3.3. Psychological outcomes

Descriptive statistics and significance test results for scores on all psychological outcomes are presented in Table 3, with full results presented in the Supplementary Material (Table S2). There were no significant differences in internalized weight bias, anti-fat attitudes, or body dissatisfaction between (i) each of the healthy weight and lifestyle ad conditions and the control ad condition and (ii) each of the healthy weight and lifestyle ad conditions.

Several differences were observed for the emotion outcomes. In terms of the positive emotions, significantly higher scores were observed among those who viewed a healthy weight and lifestyle ad compared to those who viewed the control ad. When exploring differences between healthy weight and lifestyle ads, Swap It generated significantly higher positive emotion scores than both Toxic Fat and Correctly Identified, and Toxic Fat generated significantly higher scores than Correctly Identified. For the negative emotions, significantly higher scores were observed among those who viewed Toxic Fat or Correctly Identified compared to those who viewed the control ad. When exploring differences between healthy weight and lifestyle ads, Toxic Fat generated significantly higher negative emotion scores than both Swap It and Correctly Identified, and Correctly Identified generated significantly higher scores than Swap It.

### 3.4. Behavioral intentions

Participants exposed to the healthy weight and lifestyle ads reported significantly greater intention to engage in adaptive lifestyle behaviors compared to participants exposed to the control ad (see Table 3). Participants exposed to Toxic Fat and Swap It each reported significantly greater intention to engage in adaptive behaviors than participants exposed to Correctly Identified. No significant differences were observed in participants' intention to engage in maladaptive behaviors. Full results are presented in the Supplementary Material (Table S3).

### 3.5. Moderation analyses

Weight status was found to moderate the relationship between ad exposure and body dissatisfaction at the Bonferroni-adjusted alpha level of 0.008 (see Table 4). Specifically, those who were overweight/obese reported significantly greater body dissatisfaction compared to those of a healthy weight when exposed to Swap It (2.63 vs. 3.34,  $p < 0.001$ ).

**Table 3**  
Descriptive statistics and significance results for the cognitive, psychological, and behavioral intention outcomes (stratified by condition).

Outcomes	Toxic Fat M (SD)	Swap It M (SD)	Correctly Identified M (SD)	Control M (SD)	Omnibus test
Perceived argument strength	4.06 (0.72) <sup>a</sup>	3.83 (0.79) <sup>b</sup>	3.26 (0.94) <sup>c</sup>	1.47 (0.75) <sup>d</sup>	$\chi^2(3,1098) = 558.23, p < 0.001$
Perceived effectiveness	3.77 (0.69) <sup>a</sup>	3.69 (0.70) <sup>a</sup>	3.31 (0.71) <sup>c</sup>	1.96 (0.72) <sup>d</sup>	$F(3,1097) = 366.61, p < 0.001$
Self-efficacy	3.76 (0.95) <sup>a</sup>	4.30 (0.80) <sup>b</sup>	3.45 (0.98) <sup>c</sup>	2.41 (1.20) <sup>d</sup>	$\chi^2(3,1098) = 346.35, p < 0.001$
Believable	4.38 (0.67) <sup>a</sup>	4.39 (0.69) <sup>a</sup>	4.08 (0.78) <sup>b</sup>	2.88 (1.17) <sup>c</sup>	$\chi^2(3,1098) = 324.14, p < 0.001$
Understandable	4.50 (0.60) <sup>a</sup>	4.73 (0.52) <sup>b</sup>	4.39 (0.66) <sup>a</sup>	3.83 (1.04) <sup>c</sup>	$\chi^2(3,1098) = 167.31, p < 0.001$
Exaggerated	2.15 (1.00) <sup>a</sup>	1.90 (0.86) <sup>a</sup>	2.10 (0.92) <sup>a</sup>	3.65 (1.16) <sup>b</sup>	$\chi^2(3,1098) = 292.72, p < 0.001$
Manipulative	2.64 (1.24) <sup>ac</sup>	1.98 (1.07) <sup>b</sup>	2.36 (1.14) <sup>a</sup>	2.89 (1.33) <sup>c</sup>	$\chi^2(3,1098) = 77.02, p < 0.001$
Perceived stigmatizing content	2.48 (0.88) <sup>a</sup>	1.85 (0.70) <sup>b</sup>	2.25 (0.90) <sup>c</sup>	1.54 (0.78) <sup>d</sup>	$\chi^2(3,1098) = 201.88, p < 0.001$
Internalized weight bias	3.71 (1.14) <sup>a</sup>	3.65 (1.18) <sup>a</sup>	3.49 (1.19) <sup>a</sup>	3.49 (1.12) <sup>a</sup>	$F(3,1097) = 2.48, p = .060$
Anti-fat attitudes	4.19 (1.40) <sup>a</sup>	4.18 (1.41) <sup>a</sup>	4.07 (1.42) <sup>a</sup>	4.05 (1.54) <sup>a</sup>	$F(3,1097) = 0.67, p = .569$
Body dissatisfaction	3.04 (0.78) <sup>a</sup>	2.95 (0.83) <sup>a</sup>	3.07 (0.80) <sup>a</sup>	3.09 (0.77) <sup>a</sup>	$F(3,1097) = 1.62, p = .184$
Positive emotions	3.49 (0.91) <sup>a</sup>	3.86 (0.77) <sup>b</sup>	3.17 (0.84) <sup>c</sup>	2.65 (0.90) <sup>d</sup>	$\chi^2(3,1098) = 236.88, p < 0.001$
Negative emotions	3.43 (0.81) <sup>a</sup>	1.52 (0.59) <sup>b</sup>	2.16 (0.84) <sup>c</sup>	1.58 (0.76) <sup>b</sup>	$\chi^2(3,1098) = 523.10, p < 0.001$
Adaptive weight loss intentions	3.51 (0.74) <sup>a</sup>	3.57 (0.75) <sup>a</sup>	3.28 (0.74) <sup>b</sup>	2.98 (0.87) <sup>c</sup>	$\chi^2(3,1098) = 83.79, p < 0.001$
Maladaptive weight loss intentions	2.12 (0.92) <sup>a</sup>	2.07 (0.94) <sup>a</sup>	1.93 (0.94) <sup>a</sup>	1.87 (0.85) <sup>a</sup>	$F(3,1094) = 4.37, p = 0.005$

Note. Different superscript letters within the rows indicate there is a significant difference between ads at the Bonferroni corrected level of  $p < 0.008$  (i.e., the same superscript letter means there is no significant difference between two ads). Items on the measure assessing internalized weight bias were rated on a scale of 1 (Strongly disagree) to 7 (Strongly agree). Items on the measure assessing anti-fat attitudes were rated on a scale of 1 (Disagree) to 9 (Agree). All other outcomes were rated on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

compared to Correctly Identified (2.92 vs. 3.28,  $p < 0.001$ ) (a lower score indicates greater body dissatisfaction). No other moderating effects were observed.

**4. Discussion**

The present experimental study compared healthy weight and lifestyle video ads to a control ad and to each other on a variety of cognitive, psychological, and behavioral intention outcomes to assess the effectiveness of different messaging and executional styles and the potential negative consequences of exposure to healthy weight and lifestyle advertising. Results have the potential to inform the delivery of such advertising, offering insights into which features could be retained or avoided in future campaigns.

The healthy weight and lifestyle ads tested in this study elicited favorable cognitive responses, indicating these ads to be potentially effective means of addressing the lifestyle determinants of overweight

**Table 4**  
Parameter estimates for the moderating effects of self-perceived weight and weight status on the relationship between ad exposure and the psychological and behavioral intention outcomes.

	Self-perceived weight		
	Toxic Fat cf. Swap It	Toxic Fat cf. Correctly Identified	Swap It cf. Correctly Identified
Perceived stigmatizing content	B = -0.29, p = 0.034, 95% CI = -0.55, -0.02	B = -0.29, p = 0.059, 95% CI = -0.59, 0.01	B = -0.00, p = 0.993, 95% CI = -0.28, 0.27
Internalized weight bias	B = 0.09, p = 0.625, 95% CI = -0.26, 0.43	B = 0.13, p = 0.452, 95% CI = -0.21, 0.48	B = 0.05, p = 0.795, 95% CI = -0.31, 0.40
Anti-fat attitudes	B = -0.03, p = 0.885, 95% CI = -0.50, 0.43	B = 0.61, p = 0.012, 95% CI = 0.13, 0.54	B = 0.64, p = 0.009, 95% CI = 0.16, 1.12
Body dissatisfaction	B = -0.20, p = 0.093, 95% CI = -0.43, 0.03	B = -0.03, p = 0.819, 95% CI = -0.26, 0.21	B = 0.17, p = 0.158, 95% CI = -0.07, 0.41
Positive emotions	B = 0.07, p = 0.612, 95% CI = -0.21, 0.35	B = -0.00, p = 0.979, 95% CI = -0.30, 0.29	B = -0.08, p = 0.581, 95% CI = -0.35, 0.19
Negative emotions	B = -0.10, p = 0.407, 95% CI = -0.33, 0.13	B = 0.08, p = 0.588, 95% CI = -0.20, 0.35	B = 0.17, p = 0.158, 95% CI = -0.07, 0.41
Adaptive weight loss intentions	B = 0.09, p = 0.461, 95% CI = -0.15, 0.34	B = 0.25, p = 0.045, 95% CI = 0.01, 0.50	B = 0.16, p = 0.208, 95% CI = -0.09, 0.41
Maladaptive weight loss intentions	B = 0.20, p = 0.208, 95% CI = -0.11, 0.50	B = 0.21, p = 0.182, 95% CI = -0.10, 0.52	B = 0.01, p = 0.929, 95% CI = -0.30, 0.33
	Weight status		
	Toxic Fat cf. Swap It	Toxic Fat cf. Correctly Identified	Swap It cf. Correctly Identified
Perceived stigmatizing content	B = -0.17, p = 0.202, 95% CI = -0.43, 0.09	B = -0.10, p = 0.532, 95% CI = -0.39, 0.20	B = 0.08, p = 0.587, 95% CI = -0.20, 0.35
Internalized weight bias	B = 0.18, p = 0.324, 95% CI = -0.18, 0.53	B = 0.01, p = 0.949, 95% CI = -0.35, 0.38	B = -0.17, p = 0.379, 95% CI = -0.53, 0.20
Anti-fat attitudes	B = 0.09, p = 0.707, 95% CI = -0.37, 0.55	B = 0.45, p = 0.057, 95% CI = -0.01, 0.92	B = 0.37, p = 0.129, 95% CI = -0.11, 0.84
Body dissatisfaction	B = -0.24, p = 0.058, 95% CI = -0.48, 0.01	B = 0.12, p = 0.337, 95% CI = -0.13, 0.38	B = 0.36, p = 0.006, 95% CI = 0.10, 0.62
Positive emotions	B = -0.10, p = 0.463, 95% CI = -0.38, 0.17	B = 0.14, p = 0.337, 95% CI = -0.15, 0.43	B = 0.25, p = 0.074, 95% CI = -0.02, 0.51
Negative emotions	B = 0.02, p = 0.862, 95% CI = -0.21, 0.25	B = 0.10, p = 0.486, 95% CI = -0.18, 0.37	B = 0.08, p = 0.534, 95% CI = -0.17, 0.32
Adaptive weight loss intentions	B = -0.03, p = 0.820, 95% CI = -0.27, 0.22	B = 0.06, p = 0.630, 95% CI = -0.19, 0.31	B = 0.09, p = 0.484, 95% CI = -0.16, 0.34
Maladaptive weight loss intentions	B = 0.32, p = 0.037, 95% CI = 0.02, 0.62	B = 0.21, p = 0.185, 95% CI = -0.10, 0.52	B = -0.11, p = 0.479, 95% CI = -0.42, 0.20

and obesity. The ad featuring a supportive/encouraging message and animation style (Swap It) and the ad featuring a negative health message and graphic style (Toxic Fat) elicited superior responses compared to the ad featuring a social norms/acceptability message with a depicted scene execution style (Correctly Identified) on almost all cognitive outcomes. Exceptions were observed on the outcomes of (i) 'understandable' and 'manipulative', where Toxic Fat and Correctly Identified did not differ; and (ii) 'exaggerated', where no differences between the healthy weight and lifestyle ads were observed. Results comparing Swap It and Toxic Fat tended to favor the former: participants who viewed Swap It (i) reported greater self-efficacy and ad understanding and (ii) perceived the ad to be less manipulative. The only cognitive outcome on which Toxic

Fat performed more favorably was perceived argument strength. These results provide mixed support for prior research by Dixon et al. (2015b), which identified Toxic Fat as being superior to Swap It on perceived effectiveness, message acceptance, and perceived argument strength.

In terms of participants' perceptions of stigmatizing content, scores observed among those who viewed the healthy weight and lifestyle ads were significantly greater than those observed among participants who viewed the control ad (although scores were low overall across all conditions). The ad featuring a negative health message and graphic style (Toxic Fat) was perceived as the most weight-stigmatizing, followed by the ad that featured a social norms message with depicted scene (Correctly Identified). This suggests a supportive/encouraging message and animation style (i.e., Swap It) may be the least stigmatizing of the assessed communication approaches.

The present study found no differences among any of the ads on the psychological outcomes of internalized weight bias, anti-fat attitudes, and body dissatisfaction. This may be because these outcomes are largely 'trait-based' and therefore unlikely to change after a single exposure to an ad. When examining state-based outcomes in the form of negative and positive emotions, several differences were observed. Those relating to the negative emotions were most noteworthy: significantly higher scores were observed among participants who viewed Toxic Fat or Correctly Identified compared to those who viewed the control ad, while a difference between those who viewed the control ad and those who viewed Swap It was not observed. When exploring differences between healthy weight and lifestyle ads, Toxic Fat generated significantly higher scores than both Swap It and Correctly Identified, and Correctly Identified generated significantly higher scores than Swap It. These results suggest that a supportive/encouraging message and animation style may be least likely of the assessed communication approaches to induce negative emotions such as shame, distress, and guilt.

There were no differences observed among the ads on intentions to engage in maladaptive weight loss and lifestyle behaviors. In addition, participants who viewed a healthy weight and lifestyle ad reported greater intentions to engage in adaptive behaviors than participants who viewed the control ad. These findings suggest the communication approaches adopted by the tested healthy weight and lifestyle ads may be suitable for increasing intentions to engage in healthy lifestyle behaviors without promoting intentions to engage in unhealthy behaviors. Results indicate that ads with either a (i) supportive/encouraging message and animation style or (ii) negative health message and graphic style may be most effective, with intentions to engage in healthy behaviors lowest among those exposed to the ad featuring a social norms/acceptability message and depicted scene style (Correctly Identified). This may be due to the differing calls to action: Correctly Identified encouraged individuals to more accurately assess their weight while Toxic Fat and Swap It encouraged individuals to make healthy lifestyle changes.

Just one moderating effect was observed, with weight status significantly moderating the relationship between ad exposure and body dissatisfaction. While the lack of moderating effects for other outcomes and for self-perceived weight is favorable as it suggests that healthy weight and lifestyle ads are viewed similarly by those of varying weights, further research is required given these results differ from some prior research that indicated self-perceived weight moderates the relationship between weight-stigmatization and psychological, physiological, and behavioral stress responses (Major et al., 2014; Himmelstein et al., 2015). The inconsistency in findings relating to the moderating effect of self-perceived weight may be due to the differing methodological approaches adopted across studies. Prior work used targeted and explicit instances of discrimination to experimentally-induce weight stigma, which is likely to have had a stronger effect on outcomes among those who perceived themselves to be overweight than the non-personalized, mass media video ads assessed in the present study (Major et al., 2014; Himmelstein et al., 2015; Puhl et al., 2008).

#### 4.1. Limitations and future directions

This study had several limitations. First, as the participant recruitment platform was unable to record response rate information and the sample was slightly younger, more educated, and less overweight than population estimates, results cannot be generalized. However, as this study assessed healthy weight and lifestyle ads relative to a control ad and each other, a representative sample was less important than ensuring similarity across groups (Dixon et al., 2015b), which was achieved. Second, this study used self-report data, which is subject to social desirability bias (Van de Mortel, 2008). Although the use of an anonymous survey is likely to have partially mitigated this bias, future research could use objective measures to assess stigma-related stress responses such as calorie consumption and cortisol levels, both of which increase in response to weight-stigmatizing experiences (Major et al., 2014; Himmelstein et al., 2015).

Third, this study did not assess behavior. Given circumstance and habit can influence whether intentions become behaviors (Papies, 2017), longitudinal research should be conducted to assess the degree to which health-related behavior intentions are followed by ongoing behavior change. Fourth, the Swap It ad was longer in duration than the other ads (45 vs. 30 s), which may have influenced responses. Fifth, as this study prioritized ecological validity by assessing authentic video ads (Puhl et al., 2013a, b; Johnstone and Grant, 2019), only combinations of messages and styles used in pre-existing ads could be assessed and the effects of each message and style could not be isolated. Future research could expand on the insights provided in the present study by (i) assessing a wider variety of combinations of messages and styles than those assessed and (ii) isolating the effects of each message and style. Finally, it could be argued that each of the tested healthy weight and lifestyle ads was stigmatizing as they focused on individual responsibility and/or promoted lifestyle changes as a means of controlling weight. Comparing the ads tested in this study to ads that promote health without focusing on weight (e.g., ads that promote physical activity or consumption of fruit and vegetables) is needed to more accurately determine the extent to which the assessed ads are perceived as stigmatizing.

#### 4.2. Conclusion

For health agencies committed to addressing the lifestyle determinants of overweight and obesity through health advertising, this study extends the limited literature on this topic by providing some clarity on the potential utility of these ads and the implications of adopting different communication approaches on ad effectiveness, weight stigma, psychological well-being, and behavioral intentions. This study indicates that a (i) supportive/encouraging message and animation style approach or (ii) negative health message with a graphic style approach may be most effective at promoting intentions to engage in adaptive weight loss and lifestyle behaviors, with the former approach best for minimizing weight stigma and negative emotions.

#### CRediT authorship contribution statement

**Freya Horn:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing.  
**Michelle I. Jongenelis:** Conceptualization, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

#### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Author MJ was previously employed by Curtin University. Her position at Curtin University was funded by the WA Cancer Prevention Research Unit, which receives part funding from Cancer Council

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The remaining author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2021.101679>.

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